

# AGRICULTURE The National Agriculture Magazine TODAY

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# SEEDS

**HARBINGER OF FOOD SECURITY**

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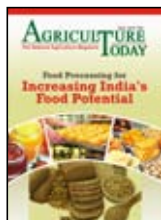
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## Sowing the Future

Seeds form a crucial and unavoidable component of agriculture. They convert the resources and labour into fruitful harvest. In fact the response of all other inputs depend on the seed. Quality of seeds alone can contribute to about 15 – 20% to the total production depending upon the crop and it can be further raised up to 45% with efficient management of other inputs.

The growth of seed industry has been commensurate with that of Indian agriculture. At each step, Indian agriculture was amply supported by the seed sector. While India's green revolution owed its results to the carefully selected and multiplied High Yielding Varieties, another major development was the hybrid seeds. Followed by the hybrid seed production, India also made rapid advances in cotton production via GM technology. However, these advancements were not comprehensive and restricted to certain categories of crops. For instance, most of the field crops were satisfied with open pollinated varieties whereas vegetables owed its yield advances to hybrids.

While Indian agriculture galore with examples of seed varieties and hybrids that transformed India's production statistics for good, India is also home to many traditional varieties that harbor some valuable traits. Being indigenous to the region, the varieties can survive the inclement weather parameters and have also resistance to pest and diseases. Their requirement for fertilizers and irrigation are modest which makes them an inexpensive option to pursue. The pronounced yield advantages of modern varieties have unfortunately displaced the traditional varieties and many have vanished to the oblivion.

India obviously has emerged as an important seed industry. Counted as the fifth in the world, India's seed market has emerged as one of the strongest pillars on which Indian agriculture rests. But the growth and development has not been comprehensive and inclusive. Most of the research is happening in food crops. India lags behind in the production of pulses, oilseeds and fodder. To effectively navigate through India's diversified needs, the country should also focus on other crops which have been left out considering its lesser economic value. Varietal replacement is another area where India needs to wake up.

India ranks first in the areas under rainfed agriculture. But ironically, we are interested in developing varieties that are high yielding and hence requiring more water and fertilizers, a total antithesis of rainfed requirements. India needs to focus on research that would positively focus on raising yields of the rainfed regions. We need to invest more on research catering to development of climate resilient seeds. In years to come we will be in more need of drought tolerant, salinity tolerant and submergence tolerant varieties. Not only research but seed production of these varieties in adequate quantities are essential. Seed enhancement is a very promising area that has been neglected in the Indian context. Presently, in the name of seed enhancement technologies, only seed treatment with fungicides and/or pesticides are being used while highly sophisticated technologies i.e. seed coating, seed pelleting and solid matrix priming etc. are yet to be explored.

India should also make its policy on GM technology clear. A consensus must be arrived upon by removing all the ambiguities existing in the regulatory mechanism for GM and should promote research in this promising area. GM technology is a promising area and India should not elude its farmers from the benefits of this useful technology.



*Anjana*

**Anjana Nair**

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## The Electronic Mandis

*National Agriculture Market becomes a Reality*

**T**he media are rejoicing it and the government is absolutely marketing it. The news about the electronic National Agri market has become a national sensation by now. The reform, one of the biggest in the agriculture sector in India is a complete revamp of the incumbent system which heavily relied on middlemen and lacked transparency.

As promised, the Prime Minister launched India's National Agriculture Market (NAM) on April 14, 2016 coinciding with Ambedkar Jayanthi. The NAM offers to be a single platform to carry out marketing activities between farmers and traders. The market offers the spectacular possibility of the farmers and traders being separated geographically by several thousand miles but connected electronically. NAM speaks about the possibility of unhindered trade between farmers and traders of different states, different market areas, different languages through a common e marketing platform. The middle men who formed the core of the mandis and their hefty commissions which was the norm of the mandi markets will be a foregone practice now, and the complete bargaining power would rest with the farmers. They can meet up electronically via a kiosk or their phones, fix the trade and materialize it with the click of a button.

The e-NAM platform—a key initiative of the National Democratic Alliance government's promise to double farm incomes by 2022—will connect 21 mandis from eight states in the first phase. The centre aims to bring 585 mandis across India on to the platform by March 2018. The eight states that will be part of the platform in the first phase are Gujarat, Telangana, Rajasthan, Madhya Pradesh, Uttar Pradesh, Haryana, Jharkhand and Himachal Pradesh. The platform will begin by trading in 25 crops, including wheat, maize, pulses, oilseeds, potatoes, onions and spices.

Beyond the obvious advantages of doubling farm incomes, the prospect offers the picture of real time availability of farm produce in the country which would allow the planners to identify the surplus and deficit regions which would help in eventually planning movement of commodities across the nation.

The reform of a pan India marketing of agri produce may not be an easy one to develop. Agriculture being a state subject requires considerable support from the states. For the states to be on board, they have to amend their marketing laws. Many states are reluctant to do away with the taxes and levies on the marketing of agri produce. Many states like Kerala and Bihar do not have an APMC Act at all.

Another major roadblock is the wide variation in standards existing in the agri produce across the country. There is wide quality variations in farm produce within a state, and even wider variations across states. This will be a challenge for the new market. Commodities with similar standards nationally are few. Wheat in Punjab and Haryana is of medium quality while that in Madhya Pradesh and Gujarat is superior. The concept requires absolute standardisation, gradation and assessment of the farm produce prior to marketing. Experts aver that the quality variations will ensure barely 10 per cent of commodities to be traded on NAM.

The concept is futuristic. It combines the government's two mission. One is to connect India digitally and the other to double farmer's income by 2022. National Agriculture Market uses the medium of electronic platform to market the farmers' produce ensuring income security. This would address the problems of distress selling and the farmers would get wider market beyond their immediate locality. Mandi reforms was long overdue. But unfortunately bringing about reforms in 6,500 APMCs in the country is not easy. It would take more than click of a button. NAM aims to link 585 large district-level mandis.

Although India is the largest producer of agriculture commodities worldwide, the existing anomalies in the marketing chain had deprived Indian farmers of the deserving profits. They live in penury, constantly under the lurking threat of middlemen. The electronic market which has already made some impressive gains in markets of Karnataka is a proven solution and will eventually help out farmers. But it will definitely consume more time and effort.

## Sweet Deal

*Stevia holds the potential of doubling farmer's income*

India has a major craving for sugar, no wonder this country is the largest consumer of sugar in the world. The country has also eventually become a hotspot for diabetes and obesity, all linked to the excessive consumption of sugar and sedentary lifestyle. With recent emphasis on health and with the desire to maintain optimum body weight, fitness enthusiasts are desperate to shun calorific sugar or find a suitable alternative. The market is flooded with artificial sweeteners like aspartame, Acesulfame potassium, Sucralose and Saccharin. The low calories beverages and food available in the market use these artificial sweeteners which are replete with objectionable effects on health in long term. There is hence a big demand for a product that can satiate the sweet tooth without sacrificing the health aspects.

Stevia is a crop that has been making inroads into the market of sugar substitutes and has gained wide popularity as a healthy alternative to sugar. India has more reason to rejoice as the Food Safety and Standards Authority of India (FSSAI) has recently approved the use of high purity steviol glycosides extracted from the stevia leaf for use in several food and beverage product categories. This has opened the doors for many companies across the world operating in this segment. Malaysia-based natural sweetener firm PureCircle will invest USD 200 million (about Rs 1,330 crore) over 5 years in India as it forays into the country. PureCircle, which sells zero-calorie natural sweetener, stevia across the world, received FSSAI nod in December 2015. This is also a good news for farmers as they can invest in this booming market.

Globally, the sweetener market is expected to reach at US\$ 95.9 billion by 2020, registering a CAGR of 5.7% during 2014-2020. Stevia market is estimated to reach US\$ 565.2 million by 2020, reflecting a CAGR of 8.5% during the forecast period. In terms of volume consumption of stevia, it is expected to reach 8,506.9 tonnes by the end of 2020, registering an annual growth of around 7-8% during the forecast period.

Stevia is not just a natural alternative, but a healthy alternative, as it contains zero calories, zero carbohydrates, zero gluten and has zero glycemic index. India holds immense potential for stevia cultivation. Most parts of India are suited for Stevia cultivation as the ideal temperature range would be between 25°C and 35°C and the plant survives between 4°C to 45°C. Many states like Madhya Pradesh, Rajasthan, Gujarat, Maharashtra, Karnataka and Andhra Pradesh have already expressed their interest in Stevia cultivation.

Stevia farming is also economically rewarding. Estimates point to the potential of earning Rs. 1.5 lakh return per acre in first year, with 10% increase every year and Rs 90,000 net income per acre in first year, Rs 1 lakh in second, Rs 1.1 lakh in third, up to Rs 1.5 lakh in fifth year (seeds and stems also source of income). Currently China is the largest exporter of Stevia extracts in the world, with way over 90 per cent market share. Though South America is the largest producer of Stevia leaves, most of the processing happens in China. India can leverage from this and bite into China's share, although it might need some awareness and processing facilities to fully explore the possibilities.

India consumes about 2.6 crore tonnes of sugar every year, a huge amount! India would benefit from healthier alternatives to sugar if given a choice. Moreover, Sugarcane which is India's primary source of sugar is a water guzzling crop which has time and again drawn flak for diverting water for irrigation even at times of drought. India needs to look into options of being prudent with utilization of resources. At a time when government is desperately in need of options to doubling farmers' income, stevia comes out as a wise choice as it can survive on one third of water requirement of wheat or paddy and also holds a lot of promise in the market. With companies such as Pepsi and Coca Cola who are in a bid to use this natural sweetener in their diet range of beverages, there is immense possibilities to this sweetening agent.

## Brewing Barley Bonanza

*Barley farming presents a good opportunity for Indian farmers*

India has been lethargic in improving its barley production. At least that is what data from the past few years have shown.

Production of barley, a winter crop grown mainly in Rajasthan, Uttar Pradesh and Madhya Pradesh, has been stagnating at less than 2 million tonnes. Barley production was a record 1.83 million tonnes in 2013-14, when total grain production increased to an all time high of 265 million tonnes in the country. Otherwise barley production had been around 1.6 million tonnes since 2008-09. The government has estimated 1.71 million tonnes output in 2015-16 crop year, up from 1.61 million tonnes last year. It has been impossible to break the 2 million tonnes barrier.

The stagnation in yield is despite the steady demand from the malting and brewing industry in India. Barley forms an important feed for the malting industry which primarily caters to the breweries and to a lesser extent to malted food industry. India's consumption of beer is increasing and a significant increase is expected to arrive in the years to come. With many breweries preferring to brew in places close to consumption, the malt demand is bound to increase. Currently India imports a few tonnes of barley to meet its demand.

In fact the world itself is facing a malting deficit. Globally, the supply of barley has failed to keep up with growth in demand for malt. In the past 15 years, global demand for beer has jumped by 53%, while the overall acreage devoted to barley has declined by 10%. Asia Pacific region another emerging beer destination where the malt exports from China is serving the regional demand, is passing through a similar phase. China itself being a large consumer for beer is feeling the strain in exporting malt due to its domestic demand. It presents a big opportunity for India whose geographical advantage and the already existing barley production fields can help in delivering to this regional demand.

However, the declining production levels in barley and continued neglect in arriving at better malting varieties have been blocking India to foray into this field. Traditionally, farmers cultivated six row varieties of barley, which were unsuitable for malting, and were mostly used for food and animal feed purposes. Research on developing better varieties are virtually absent in India. As the government has not yet allowed commercial cultivation of any genetically modified (GM) coarse grain crops, no seed companies or any public sector research institutions are interested to work on GM barley.

The prospect of barley demand will increase only when the malting industry expands its capacity. As the government has opened up the sugarcane for direct production of ethanol and not letting the zero excise duty benefit to any other than the sugar sector, the malting industry will think twice before expanding capacity. Rather they would shift to sugarcane for producing alcohol/spirit.

A few good malting-type barley varieties have been developed under public-private propagation schemes, which are steadily replacing the food/feed barley. Some malting and brewing companies have also started contract farming of malting barley in Rajasthan, Punjab and Haryana. Some new barley varieties are being used for brewing (around 700,000 tonne). There are DWRUB52 and RD2668 varieties released in 2006, while DWRB73 and DWRUB64 released in 2011 are giving better yield under irrigated condition.

Karnal-based Indian Institute of Wheat & Barley Research has taken up collaborative research project on development of barley strains with improved malting quality in collaboration with United Breweries. This was the first joint venture between private and government organisations in barley R&D (research and development) activities. The project involved research on development of new varieties of barley with good yield, malting and brewing traits. DWRUB52, a malt variety, was a product of this project and yields an average 4.5 tonnes per hectare.

Barley can be taken up as an alternative by Indian farmers as it has good demand and fairly economical demand for inputs. It can not only increase farmers' income but also can squarely pave the way to diversification of India's agri fields from the rice – wheat syndrome. Yet this would need complete support from the research bodies and private sector as well.



## GM losing its glory?

*GM crop acreage experiences decline world wide*

India had opened its doors for the Genetically Modified (GM) crops as early as 2002. The technology revolutionized India's cotton production to the point that we became the world's biggest producers of cotton. The fete introduced the concept of using GM technology to increase production and bring self sufficiency in many crops. GM crops have presence world wide mostly concentrated to crops like cotton, corn, canola and soyabeans. The resistance to this somewhat controversial technology used for developing GM crops withstanding, this genre of crops have drawn considerable support from a wide section of stakeholders including farmers and scientists in view of the yield advantages and resistance to pests and diseases, they offer.

However, a recent report suggesting a decline in the world area under GM crops have drawn considerable attention. Worldwide farmers have progressively increased the acreage under genetically modified crops, the progress of which has been steady and consistent, since the technology became broadly commercialised in 1996. But in 2015, for the first time, a report suggested that the acreage under GM crops have declined by one per cent from 2014 levels. The International Service for the Acquisition of Agri-Biotech Applications (ISAAA), which carries out the most authoritative annual survey of biotech crops worldwide, said the 1 per cent decrease reduced the total area from 181.5million hectares in 2014 to 179.7 million hectares. The organization has outrightly overruled the possibility of rejection of the technology by farmers as the reason but instead believes that this reduction was mainly on account of the overall decrease in total crop hectareage associated with low prices for commodity crops in 2015. This basically means the area under both genetically engineered and nonengineered crops suffered a decline. The decline was concentrated in industrialised countries where GM crop cover was down 3 per cent. In developing countries it rose 1 per cent. More than half of all GM crops (54 per cent) are grown in Latin America, Asia and Africa.

But the US remains the biggest single grower of GM crops, with 70.9million hectares. More than 90 per cent of the maize, soyabeans and cotton planted by American farmers is genetically modified. Brazil, the second largest GM country, is the "engine of biotech crop growth", the ISAAA report says, with 2 million more hectares planted in 2015 than the previous year. Only three countries -the US, Brazil and Argentina -account for more than three-quarters of the total global acreage. And only four crops -corn, soybeans, cotton and canola -account for the majority of biotechnology use in agriculture leaving much room for expansion.

ISAAS is positive regarding the opportunities for expanding GM crops of the traditional kind (resistant to herbicide and insect pests) into new countries. For example, biotech maize has the potential for 100million more hectares globally, including 60million hectare in Asia and 35million in Africa. Also, new GM crops are being commercialized for the first time, particularly in the US. These include potatoes with two new genetic traits — resistance to bruising and the "late blight" disease — and apples that do not turn brown so quickly when sliced.

Nevertheless, the expansion efforts have been consistently hindered by opposition from consumer and environmental groups, regulatory hurdles and in some cases political obstacles. Particular case in point would be that of India where successive governments have refused to take a stand on the GM crops. The country, a major producer of agricultural products has shied away from adopting GM technology beyond cotton. Even field trials have been stalled and regulatory processes have not been evolved to deal with commercialization of GM technology in food crops.

While GM supporters go an extra mile to prove the superlative abilities of this variety of crops, the anti GM lobby goes the other way to paint a dark picture of the technology. It is true that genetic engineering is a new vista of breeding that presents immense opportunities for the science of agriculture. But to deal with them responsibly is also a prerogative. Everything associated with science is not against nature. In some cases human involvement hastens the process of evolution to arrive upon solutions to problems faced by us. A balance is required if we need to survive in this planet in this era as we cannot totally shun either science or nature.



## JISL and its Food Subsidiary JFFFL, raises US\$ 120 Million ( INR 8046 Million ) through Equity Issuance

► Jain Farm Fresh Foods Limited (“JFFFL”), a subsidiary of Jain Irrigation Systems Limited (“JISL”) announced that it has successfully raised Rs. 4,022 Million from funds managed by Mandala Capital Limited (“Mandala”), an investment manager focused exclusively on Indian Agribusiness. JFFFL is a newly formed entity under which the global food processing business of JISL will now be held. JISL has been building its food processing business since 1994, into a leading global manufacturer of mango, banana, guava, strawberry and other fruit-based pulps, clarified juices and concentrates, as well as dehydrated vegetables such as onion, garlic and ginger.



## Escorts strengthens Leadership Team

► Escorts Ltd., the global Agri Machinery and Construction Equipment manufacturer, has appointed Mr Ravi A Menon as Chief Executive Officer of its Agri Machinery business. Mr Menon takes over from Mr S Sridhar who would now move to head Escorts Construction Equipment (ECE). MrMenon has been credited for shaping the development cultures of some of the most influential and valuable companies and brings over three decades of experience in marketing, sales, branding, international markets and production from industries as varied as tractor, cement and industrial products. Mr Sridhar will focus on transforming and building organizational energy at ECE to leverage emerging business opportunities. According to Mr Rajan Nanda, Chairman of Escorts Limited, “We have strengthened our leadership team at a time when Escorts has created a strong base for growth across its businesses. At Escorts, we have focused on creating synergies between the businesses. Mr Menon’s induction brings cross-industry



experience and a strong understanding of the different aspects of enterprises and Mr Sridhar’s movement to ECE would help further strengthen the process of integration in key areas.”

## Global Stevia Leader PureCircle Announces Plans to Invest In India

► PureCircle, the world’s leading producer of high-purity stevia ingredients for the global food and beverage industry, announced plans to invest in India’s stevia infrastructure over the next five years. The company plans to partner with thousands of Indian farmers to plant 5,000 hectares of stevia and eventually build a stevia processing facility in India. “Our investment in India signals the huge potential we see in this market for stevia as a sweetener and as an agricultural commodity,” said Jason Hecker, PureCircle’s President of Group Sales and Marketing. “We believe this plant can not only help farmers in the region earn extra income, but also help to naturally reduce calories for Indian consumers while



maintaining the sweet tastes they want.” India is the last major market to approve stevia leaf extract as a sweetener, opening the doors for PureCircle investment. This highlights PureCircle’s ongoing commitment to the PureCircle Stevia Agronomy Program and to working directly with farmers. The agronomy program provides farmers with a contract that states a fixed price for the stevia they produce and teaches them how to grow the plant sustainably. Indian farmers that grow PureCircle stevia on one hectare of land can expect to yield an income of about 400,000 Rupees per year. Early agricultural trials are already underway in Punjab, Uttar Pradesh, Tamil Nadu, Jharkhand and Madhya Pradesh.

## Continental Consistently Further Expanding Industrial Business

▶ International technology company Continental is intensifying its activities outside the automotive sector and further expanding its industrial business. In the future, technologies for construction, agricultural, and material handling machines and vehicles will come increasingly into focus. "With this in mind, we are consistently working toward our strategic aim of achieving a more balanced customer portfolio across the automotive sector and other industries, and doing an even better job of safeguarding the future viability of the company in the face of possible economic fluctuations. We see great opportunities here: based on current forecasts, we are assuming possible sales potential in the high triple-digit million euro range by 2020," explained Helmut Matschi, member of the Continental Executive Board. The portfolio ranges from displays and instrumentation to solutions for telematics, electronic control units, and tires as well as drive and exhaust-gas after treatment technologies, conveyor belts, vibration and hose technology, air spring systems, and interior materials. Continental will present a selection from its portfolio at the bauma in Munich. "We are therefore contributing to safe, efficient, clean, and comfortable mobility outside the automotive sector as well and offering solutions tailored to our customers' individual needs – all from a single source," added Hans-Jürgen Duensing, member of the Continental Executive Board, who used this year's visit at the bauma for on-site talks.



## NRDC, Nagarjuna Agro ink pact

▶ The National Research Development Corporation, under the Ministry of Science & Technology, has entered into a licence agreement with Nagarjuna Agro Chemicals Pvt Ltd for commercialization of the soil moisture indicator. "The technical know-how has now been licensed to Nagarjuna Agro Chemicals Pvt Ltd, Hyderabad. The company plans to take this technology forward to all the parts of the country through a network of dealers and also promoting through different support schemes of the Department of Agricultural and other Allied Departments in various States of the country," said a Ministry release. The "simple and user-friendly" electronic device has been developed by the Sugarcane Breeding Institute, under the Indian Council of Agriculture Research, Coimbatore.

## Hybrid wheat on Syngenta's pipeline for Indian market

▶ Swiss crop protection products and seeds giant Syngenta has a pipeline of products it plans to launch in India, including hybrid wheat, on which it is currently working.



"We are going to launch a huge number of new products, in the medium term, specifically for the Indian market. In the seed space, we are working on hybrid wheat, which we will also bring into India," John Ramsay, CEO of Syngenta International AG said. The company, which is the only one globally to have hybrid barley, and currently also has rice, corn and vegetables in its hybrid seed portfolio, plans to launch the hybrid wheat first in western Europe, and then bring it to India by 2020.

## NFL produces record high 3.8 lakh mt of urea in 2015

▶ Surpassing the previous records, National Fertilizers Limited (NFL), the leading fertiliser PSU of the country has achieved the ever highest urea production of 38 Lakh mt with an overall capacity utilisation of 118 per cent during the year 2015-16. This accounts for 15.5 per cent share of the total Urea production of 245 lakh mt done in the country during 2015-16. NFL's contribution shall immensely help to reduce the import of urea and further enhance food security in the country. It is remarkable that two of the company's plants at Nangal and Panipat, despite being vintage units i.e. more than 38 years old have achieved ever highest urea production of 5.47 lakh mt and 5.67 lakh mt with 114.2 per cent and 110.9 per cent capacity utilisation respectively during the year. In addition to this, almost all the units of the company have achieved ever lowest energy consumption in 2015-16, which has helped in optimising energy consumption in production of urea. The company has also recorded ever highest sale of 55,199 mt of nitric acid during 2015-16. During the year, the company has taken several new initiatives. The company has commenced the multiplication of seeds program for production and sale of quality seeds under its brand 'Kisan'. After a gap of 20 years, company has undertaken import of DAP and supplied it to the farmers. With the objective of providing all agri products under one roof, NFL has undertaken trading of seeds, pesticides, Bentonite Sulphur, Diammonium Phosphate (DAP) and Bio-fertilisers.

The company is on the path of growth and has set a target to achieve the turnover of Rs 15,000 crore with the profit of Rs 500 crore in the next five years. To attain these targets, the company is exploring a number of opportunities.

## The new Agriculture Land Leasing Act

➤ The Bharatiya Janata Party-led National Democratic Alliance government has come out with a model Agricultural Land Leasing Act, 2016. The Centre says it will improve agricultural efficiency and bring about equity, occupational diversification, and rapid rural transformation. An Expert Committee of the NITI Aayog, headed by T Haque prepared the Act. The Committee says the Act has tried to balance the rights of actual land owners and actual cultivators/tenant farmers. Legalisation of land leasing would ensure the security of land ownership rights for landowners, which in turn would provide security of tenure to tenants. It (legalisation) will also help improve tenant farmers' access to credit, crop insurance, and input use. This will result in the utilisation of fallow land. The Task Force on Agricultural Development set up by the NITI Aayog had identified the absence of formal recognition of tenancy in many states as a major hurdle in consolidating landholding. Prior to the passing of the Act, tenant farmers and sharecroppers were not able to get benefits from various development programmes and also were not eligible to get any relief and compensation in the event of crop damage due to natural disasters since they were not formally recognised. Currently, land ownership in India is recognised through the Registration Act of 1908. But on strictly technical terms, this Act only records the selling and buying of lands and doesn't indicate ownership. As of now, most state governments have either legally banned or imposed various restrictions on agricultural land leasing.



## Agriculture gets 'national market'

➤ Mandis in Haryana, Himachal Pradesh and six other states will now be linked on a common e-platform — the National Agricultural Market (NAM), which was launched by Prime Minister Narendra Modi on April 14, 2015. Farmers in Haryana or Himachal can now sell their produce on the NAM platform to traders South or West, selecting the highest price being offered. Eventually, NAM aims to link all agriculture markets (Agriculture Produce Market Committees or APMCs) in all states, linking farmers directly with buyers through this digital trading platform. However, Punjab — the largest contributor to the grain stock — has not yet conceded to be a part of the grouping.

While Kerala and Bihar (states which do not have an APMC Act) are yet to take a call, officials say Punjab has "agreed to the scheme in principle". At the same time, they concede that bringing Punjab on board continues to be the biggest



challenge. The state, the sources say, has not taken any concrete step for integration with NAM, except "talking about completing requisite reforms" in the APMC Act to join the scheme and allow e-trading. So far, 15 states have amended APMC Acts - state laws that govern how farm produce can be traded. Apparently, being a BJP-ruled state, Haryana was "told"

to send its proposal so that Punjab could be asked to follow suit. States levy taxes and duties on trading of farm produce and for Punjab, it is a substantial amount - almost Rs 5,000 crore - which the state may not want to lose. But unless a major producer like Punjab is brought on board, the complete market reforms may not be possible.



## Government mulls growing pulses abroad

➤ After exhausting many options to raise the domestic pulses production and rein in prices in the short-term, the government now plans to speak to African countries for growing lentils. In fact, the government is open to cultivating pulses in any country in the world. The idea is to persuade the private sector to grow pulses overseas with a guaranteed buy-back arrangement at lucrative rates. It has been pointed out in a review meeting in the agriculture ministry that neither area under pulses has increased nor productivity has shown any upward trend. In the absence of both, the only solution lies in importing in bulk, sources said. Import of pulses is allowed under the open general licence without any duty. The government does not want to be a permanent buyer of pulses from overseas in large quantities. The government has imported about 5,000 tonnes of tur from Africa's Malawi since September 2015. The only option left now is growing pulses in Africa and bring it here if prices are to be controlled in the short-term, an official, who was present in the review meeting, said. Agriculture minister Radha Mohan Singh has agreed to speak with foreign minister Sushma Swaraj on this, the official said.



## Govt expedites work on GM cotton seed

➤ With US-based seed giant Monsanto facing regulatory heat in India over monopoly concerns, the government has expedited work to bring out a local genetically-modified (GM) version of cotton seed by next year, Agriculture Secretary Shobhana K Pattanayak said. The direction comes at a time when pests like pink bollworm have developed resistance to Monsanto's second generation Bt cotton variety, Bollgard II, in some parts of India and caused crop damage. Also, Monsanto's Bt cotton is the only GM crop allowed for commercial cultivation in the country.



## Fertiliser firms: Subsidy cut could offset cost gain

➤ Complex fertiliser manufacturing companies, having faced a bad monsoon for two years, have a new issue to handle. The government's recent decision to cut the subsidy rate on decontrolled fertiliser by 25-30 per cent is not good news for these companies, as they have limited scope to raise prices, given the drought-like situation in many regions. Further, while the nutrient-based fertiliser policy was to help promote proper use of all nutrients, urea still remains under price control. Complex fertilisers are, therefore, priced higher than urea and any more of this in the former could push farmers towards the latter. Also, producers have high inventory due to the earlier bad monsoon. In fact, analysts were expecting producers to provide discounts to clear these. Inventory of NPK (nitrogen, phosphorous & potassium) fertiliser and DAP (di-ammonium phosphate) is elevated at about 4.5 million tonnes; annual demand is about 16 mt, say analysts. Hence, the move will adversely impact the NPK player's profitability.

## Make GM mustard data public: CIC

➤ The Central Information Commission (CIC), arbitrator on Right To Information requests, has asked the Environment Ministry to make public all the data pertaining to the safety of genetically-modified (GM) mustard, sans proprietary intellectual property data. GM mustard is likely to be the first transgenic seed, to be available in farmer fields. It has had a tumultuous history in India with activist groups claiming that it will be a gateway to several

other GM food crops — tomato, rice, brinjal, etc. — and that these may pose health and ecological risks. Currently, GM cotton is the only transgenic crop commercially available in farmer fields. The GM mustard in question has been developed by Deepak Pental, a geneticist at Delhi University, with support from the National Dairy Development Board and the Department of Biotechnology. The technology involves using a complex of genes,

sourced from soil bacterium, which makes it easier for seed developers to easily develop hybrid varieties of mustard, generally a self-pollinating plant. Hybrid varieties are generally known to produce greater yields but they necessitate farmers to keep going to seed companies every year to buy fresh seed. The technology, according to Mr. Pental, will contribute to increasing yields of such hybrids by 25% of existing varieties.

## Goa Horticulture corporation to start AC mini supermarket on trial basis



► Goa State Horticulture Corporation Limited intends to start an air-conditioned mini supermarket on a trial basis that will sell vegetables, fruits and other perishable products at subsidised rates. The board headed by Corporation chairman Kiran Kandolkar, discussed to hand over the construction project to Goa State Infrastructure Development Corporation (GSIDC). "The vegetables will be sold at the same rate as in all our carts, mobile vans and outlets. Fruits, flowers, farm products and locally grown vegetables will also be put on sale," he said at a press meet after the meeting. The project will have the existing sale centre converted into the mini super market. GSHCL expects that GSIDC will complete the project in two-three months after which the former proposes to entrust the construction of structures at Mapusa, Margao, Vasco, Ponda and Curchorem where the supermarkets are currently operating on rent. The corporation recorded a turnover of Rs 108.83 crore in the last financial year, nearly Rs 2 crore less than what it achieved in 2014-15. Kandolkar attributed it to lower vegetable prices among other factors while clarifying that GSHCL is not running at a loss.

## Maharashtra's drought zone: Govt looks at counselling to help farmers

► While Maharashtra reported more than 40 per cent of the total number of farmer suicides in the country last year, and 57 suicide cases have been reported from the state in the three months so far this year, a few lives may have been saved by counsellors at the state health advice call centre operated from Pune. "We received 2,089 calls (from farmers identified to be suffering from depression) between October 2015 and March 31 this year, and 60 were (found) with suicidal tendencies. Our counsellors had long chats with them and explained what crops can be grown in a drought-prone region that does not require (much) water," Nirja Banker, coordinator of call centre said. "There is always a solution to a problem," Banker added. The idea to get farmers suffering from depression to get counselling was sparked by a massive survey launched by the state government in October last year. In the last four months, the survey has identified 2.95 lakh farmers with significant health problems. Of them, 4,607 were found suffering from depression, 15,622 had hypertension and another 14,808 were identified with diabetes. In all, nearly 4.26 lakh farmers were screened — by more than 19,000 accredited social health activists (ASHA workers), who underwent training in conducting the survey with special questionnaires. They visited homes of 4.75 lakh farmers in 14 drought-prone, high-risk districts of Maharashtra from October 2015. "Ninety per cent of the survey is complete and these findings are now helping us set up a comprehensive farmer health programme," DrSadhanaTayade, Additional Director (mental health), told The Indian Express. Dr Manish Renghe, Assistant Director (mental health), said that by and large the farmers surveyed are impacted by drought and other agriculture-related issues, and this has led to stress-related health problems.

According to official data, 1,690 cases of farmer suicides were reported in 10 states in 2015. Maharashtra reported the maximum — 725 — followed by Punjab (449), Telangana (342), Karnataka (107) and Andhra Pradesh (58). While the 57 farmers suicide reported so far this year gives indication of the severity of the situation, the alarming drought conditions does not bode well for the state this year.



## Punjab, Haryana go all out to save cotton crop from pests

► Having witnessed extensive damage to cotton crop due to whitefly attack last season, Punjab and Haryana are taking measures such as pushing for timely sowing of recommended crop varieties to safeguard this season's output. Experts of agriculture departments of both States are also undertaking training programmes for growers at village levels to apprise them about steps needed to achieve higher output. Last season, whitefly pest attack had caused widespread damage to Bt cotton varieties in Punjab and Haryana, which had witnessed dip of about 40 per cent in output. In Punjab, 1.36 lakh hectares out of total 4.50 lakh hectares of cotton acreage was damaged by whitefly attack while in Haryana, out of 5.83 lakh hectares, 3.06 lakh hectares were affected. "We are educating cotton growers in order to prevent attack of any pest on cotton crop," Deputy Director, Punjab Agriculture Department, Sukhdev Singh Sidhu said.

## Bundelkhand farmers to get drought aid directly into accounts

► Farmers in UP's Bundelkhand region will get drought assistance directly into their bank accounts within a week, with the Samajwadi party government set to disburse Rs 1,304 crore out of its drought-assistance kitty given to it by the Centre. The decision was taken during a review meeting on the drought-affected Bundelkhand region by the Prime Minister's Office. A provision to extend man-days from 100 to 150 under MGNREGS in Bundelkhand for 2016-17 was also approved in the meeting, attended by officials from UP. Besides, the state government was advised to ensure 'Aadhaar' seeding of MGNREGS beneficiaries and ration cards on high priority. "State

government will ensure distribution of Rs 700 crore, released under the labour component of MGNREGS, directly to eligible beneficiaries via electronic payment system," the PMO said. It was



also decided that the Centre and the state will work together for sustainable solutions to address the problem of vulnerable regions in natural distress. Modi has directed that a high-level review be undertaken for Vidarbha and Marathwada regions as well. It was agreed that the state would ensure completion of all ongoing 37 piped water schemes on priority. It was also agreed that the MSP for sesame, most important kharif crop for Bundelkhand, for 2016-17 should be announced expeditiously. A bonus of Rs 20 over and above the MSP will be considered. The state will finalise a procurement plan for sesame in consultation with agriculture secretary.

## Gujarat farmers benefit as potato output dips in other states

► Potato farmers in Gujarat are a happy lot this year, as they are getting better prices for their produce despite 15% increase in potato production. As compared to the price of Rs5-6 per kg in 2015, local farmers are currently fetching Rs10 per kg in the wholesale markets, thanks to lower production in other states. Top potato growing states Uttar Pradesh and West Bengal have seen production decline by 5% and 15%, respectively, due to unfavourable weather conditions. Although the yield in Gujarat, too, has dipped by 10% this year, unlike other major states Gujarat has registered an increase in potato production on account of higher acreage. In fact, the potato output has galloped substantially over the last two years. The potato production in an area of one lakh hectare was around 35 lakh tonnes as against 31 lakh tonnes of 2015 and 23 lakh tonnes in 2014.

## Maharashtra to rope in Israeli agri dept to up crop production

► The Maharashtra government has decided to rope in the Israeli government's agriculture department to learn about and adopt advanced agri technology and increase crop production. Israel will set up six excellence centres across the state to do research on orange, mango pomegranate, among other fruits. The centre at Jalgaon will be dedicated to research on banana. "The move will help our farmers make use of technology. Israel does not have its own soil or water. They import both things. Yet, they are number one agricultural crop production. We are facing



a severe shortage of water. So the Israeli technology will help us get maximum yield with minimum use of water," said agriculture minister Eknath Khadse. He said agricultural growth in Maharashtra has ceased in the last several years. "And continuous drought has worsened the situation in the state. We will work in coordination with the agriculture department of Israel. Many farmers delegations have been visiting Israel to study technology. These tours were

being organised by private parties. Now we have decided to organise such tours in large numbers at government level," said Khadse. He said in Israel, the semi-desert Negev area resembled some parts of Maharashtra. "Weather in both parts is dry, so we can easily use their technology in Maharashtra. If we want to see agriculture surviving and subsequently thriving in the state, we have no option but to maximise the use of technology," said the minister.



## Govt mulling loan waiver for farmers hit by drought



➤ A proposal to waive loans of farmers hit by drought is under active consideration of the Centre, which has taken up the issue with the Reserve Bank of India (RBI) and is expected to reveal its decision to the Supreme Court. The disclosure was made by the Government during the hearing on a PIL by NGO Swaraj Abhiyan on the drought situation facing the country. As the court felt that the Government response to a drought is often slow, unregulated by any legislation, and lacking in urgency to reach immediate relief to affected persons, the Bench mooted the idea of declaring drought as a “national disaster or calamity”. By doing so, funds under the National Disaster Management Act could be disbursed by the Centre to the affected States or districts, thus enabling quick relief.

## Worried Banks to Petition RBI on Bad Loan Tag

➤ Banks that have extended loans of Rs. 12,000 crore to fund the Punjab government's foodgrain procurement programme will meet RBI officials to try and avoid taking a hit on their books. RBI has told the lenders to mark the loans as potential non-performing assets and provide for them because the food stocks can't be verified. That's jolted the banks, which have traditionally assumed loans to state governments to be sovereign debt in no danger of default. The Punjab government has denied any misuse of funds.



## Nabard to conduct survey on financial inclusion

➤ With the Centre's financial inclusion efforts gaining traction across the country, the National Bank for Agriculture and Rural Development (Nabard) has decided to conduct a mega financial inclusion survey to capture the progress at the grassroots level. The survey will cover 40,000 households spread across 29 States. Nabard has floated a request for proposal (RFP) to empanel an agency towards this end, said Harsh Kumar Bhanwala, Chairman, Nabard. The survey, among other aspects, will cover asset base and other farm household characteristics; household expenditure on production and consumption; and financial inclusion covering credit, savings, insurance, remittances, payments and pensions.

It will also seek feedback on availability of credit, intermediaries involved, terms and cost of credit, and micro-finance related information. Bhanwala said the survey will add to the information provided by the National Sample Survey Organisation and help stakeholders to better target their financial inclusion drive. The survey will be conducted once in three years. Financial inclusion is aimed at providing access to the formal financial sector for the marginalised and formal-finance deprived sections of society. The big push towards financial inclusion in India has emanated from the Pradhan Mantri Jan Dhan Yojana (PMJDY) launched in August 2014 and the Jan Dhan-Aadhaar-Mobile (JAM) trinity.



## Maharashtra bank raises valuation for sugar

➤ The Maharashtra State Cooperative Bank (MSCB) has increased valuations for sugar yet again. This time, valuations have been raised by R210 per tonne to R2,975 per tonne, Pramod Karnad, MD, MSCB, said. In March, valuations were raised to around Rs 2,765 per tonne. However, mills have not been able to sell stocks in large scale due to lack of demand. Valuations have been raised for the third consecutive month by the apex cooperative bank of Maharashtra. This is the highest valuation rate for the 2015-16 season so far. Valuations have been raised since prices are now hovering between Rs 3,500 per tonne and R3600 per tonne. As per the new valuations, the pledge rate now comes up to Rs 2,530 per tonne. The cane payment last month was around Rs 1,600 per tonne. The bank, however, as per directions of the state government has been giving an additional 5% margin money to borrowers for the season. As per the 90% formula, the cane payment comes up to R1,920 per tonne, an increase of R148 per tonne. This leaves a good amount with sugar mills to make



cane payments to farmers. Industry observers, however, pointed out that there has not been much movement in stocks despite a rise in rates. As per market speculation, sugar prices are likely to go up to R4,000 per tonne. But international sugar prices have fallen to \$435 per tonne from \$ 465 per tonne which has also impacted export. According to Sanjeev Babar, MD, Maharashtra State Cooperative Sugar Factories Federation, although the mills have been willing to sell their

stocks, large scale buying has not been happening. It is a traders market and at present, there is very little demand, he pointed out, adding that mills have been able to sell just about 3,000-5,000 bags, which is a very small amount. Babar dismissed speculation that sugar prices could cross the Rs 4,000 per tonne-mark, saying that prices may hover around Rs 3,700 to R3,800 per tonne and may again drop since mills in Brazil will start production soon.

## Manipal University, Nabard join hands in farm-to-table project



➤ People in Manipal will soon be able to check the availability of farm fresh produce from Benegal, Kukkehalli and Mattu villages on their mobile handsets. Manipal University and Nabard (National Bank for Agriculture and Rural Development) have joined hands to connect farmers directly with consumers, eliminating the need for intermediaries such as middlemen. Farmers from these villages near Manipal will list their produce with farmer producer organisations (FPOs) in their respective villages. The Centre for Social Entrepreneurship of Manipal University, with help from Nabard and other agencies, will market them in the Manipal University campus. Prasad Rao, Assistant General Manager of Nabard, Mangaluru, said that each FPO has been sanctioned Rs 9.06 lakh to implement the project.



## Aavishkaar announces its first investment in Sri Lanka with MA's Foods, a leading food processing company

➤ Aavishkaar, one of the world's leading impact investor, marks its first foray in Sri Lanka with an investment in Ma's Foods. The South & South-east Asia focused Aavishkaar Frontier Fund has agreed to invest LKR 300 million in MA's Foods, Sri Lanka's premium food processing company. This investment will enable MA's Foods to accelerate its new phase of growth, expand into the North of Sri Lanka and meet its strategic plan objectives. Founded in 1986 by husband and wife team of Mario



and Suzette De Alwis, MA's Foods is the manufacturer of some of Sri Lanka's most popular brands in the food processing sector including MA's Kitchen, Happy Home, Dad's Garden and Pasta Roma. MA's markets a large portfolio of organic, fair-trade and

conventional gourmet meal solutions including spices, seasonings, curry pastes, sauces, ready-to-eat foods and coconut based products. The company is known for its commitment to strict quality standards, sustainable practices and its responsibilities to the community. A family owned company, MA's Foods has matured from an ingredient supplier to a diverse food solutions provider with the inclusion of seasoned industry professionals complementing the family management team.

## Brazilian agricultural & livestock exports to Middle East surge 46.3 per cent

➤ According to statistics released by the Brazil Ministry of Agriculture and Supply (MAPA), exports of agricultural and livestock products from Brazil to the Middle East generated sales of USD 724.3 million in March 2016, up 46.3 per cent from USD 495.1 million for the same period last year. Overall, the sale of Brazilian agriculture and livestock to the external market during March recorded a profit of USD 8.3 billion, accounting for 52.2 per cent of all revenues generated by exported products. The Middle East ranks third in the world in Brazilian agricultural and livestock imports after Asia and the European Union. The Kingdom of Saudi Arabia (KSA) has emerged as the largest importers from Brazil, registering an increase of 5.9 per cent, followed by Egypt at 16.8 per cent, and the UAE at 69.4 per cent.

## Basmati exports likely to touch 40 lakh-tonne mark

➤ Thanks to lower global prices and increase in demand from countries like the UAE, Iraq, Iran etc, basmati exports from India is likely to touch a historic high of 40 lakh tonne in 2015-16 against 37 lakh tonne in 2014-15 while it was 37.5 lakh tonne in 2013-14. Experts said despite the low realisation to farmers this fiscal as compared to 2013-14, the area under basmati cultivation in Punjab and Haryana, which accounts for around 70% of the total basmati production in India, would be more or less the same in 2016-17. Basmati fetches higher returns than other varieties. The exporters cite high realisation, which is around Rs 2,000 to Rs 2,500 per quintal, as the main reason behind farmers opting for the crop. In 2015, the total area under basmati cultivation was 21 lakh hectares as compared to 21.3 lakh hectares in 2014. According to the data, in 2014-15, the basmati prices hovered between Rs 1,150 and Rs 4,000 a quintal, while in 2015-16, due to bumper harvest in Punjab and Haryana, the price of the crop crashed and with the government's intervention it was between Rs 925 and Rs 3,100 per quintal. "This year the exports would cross 40 lakh-tonne mark. However, prospects for the next year are worrisome as it depends upon a lot of factors. Having said that, I believe the price of the crop would be more or less the same," said Gurnam Arora, joint managing director, Kohinoor Foods Ltd. He said the buffer stock with millers who are having assured supply chain is around 5% more than last year. As far as the exports for 2016-17 is concerned, the exporters are optimistic and expect that the market will respond favourably on account of GI tag and other factors.





## World cereal production to remain elevated in 2016: FAO

Despite an adverse climatic condition in parts of Africa and the European Union, world cereal production is estimated to have been at almost the previous year's level in 2016, due to a recovery in output in China and India. A study by the FAO of the United Nations estimates world production at 2,521 million tonnes, a marginal 0.2 per cent or four mt less from a year before, and third highest ever. Large inventory levels and relatively sluggish demand mean market conditions for staple foodgrain appear stable for at least another season. This would put pressure on grain prices across the world, especially from large exporting countries, including India. "Most of the decline stems from expectation of lower world wheat production, revised downward by almost 10 mt since last month to 712.7 mt. The year-on-year decrease is mainly the result of expected declines in the Russian Federation and Ukraine, where plantings were trimmed because of dry weather. Production is also forecast lower in drought-stricken Morocco and in the European Union, where yields are set to decline to near-average levels from last year's highs. Offsetting part of these declines, China is anticipated to harvest a slightly larger crop in 2016, sustained by higher yields, while India might see output recover from last year's drought-reduced level, despite recent negative revisions from earlier expectations," said the report.



## India losing ground in global oilmeal market on high prices

India is gradually vanishing from the global oilmeal map due to higher domestic price and lower crop. Total oilmeal exports have declined sharply by about 87 per cent in value terms over past three years from Rs 11,508 crore in 2013-14 to Rs 1,510 crore in 2015-16, revealing the growing insignificance of India's oil meal shipments. The latest data compiled by the Solvent Extractors' Association of India (SEA) showed overall oilmeal exports in quantity terms declining by over 72 per cent in the past three years, from 4,381,994 tonnes in 2013-14 to 1,184,441 tonnes in 2015-16. Compared to last year's 2,465,663 tonnes, exports this year have halved. The trade body holds the price disparity and lower crop as key responsible factors for the poor export performance of India's oilmeals.

## Drought-like conditions may hit pepper output in India, Vietnam

Drought-like conditions in pepper growing regions of Vietnam and India is likely to support the market, traders said. Harvesting is in the last phase in the two nations and concerns on next season's crop could lead to hoarding. India is the largest consumer of pepper in the world and the second largest producer after Vietnam. Kishore Shamji, one of the senior exporter and member of the India Pepper and Spice Trade Association (IPSTA), said that availability in India is low and dry conditions could impact the production for next season. Pepper is being sold for Rs 670-R690 per kg in the terminal market of Kochi with the daily arrivals limited to 8-9 tonne. "Reports from Vietnam say that 39 out of 63 provinces have been impacted by drought. Twelve provinces have declared state of emergency. Gia Lai, Daknong and Daklak which contribute close to 100,000 tonne of pepper put together are in the midst of a severe water crisis," Jojan Malayil of Kochi-based Bafna Enterprises said. Farmers are holding on to the pepper and availability in major markets is low, he added.

"Imports look attractive as Indian rupee has appreciated. The pepper released by the Food Safety and Standards Authority of India (FSSAI) is available in the market and pulling down the price. Nearly 3,000 tonne from the 6,800 tonne has already been sold but the quality of the stock is suspect," Shamji said. He estimates Indian production to be less than 40,000 tonne. "Vietnam has sold 50,000 tonne up to March and has 1,00,000 tonne stocks left to sell till the next crop. But they are likely to bargain for a higher price on the present climatic conditions," he added. Global pepper production during the crop year of 2016 is estimated to increase by a marginal 6,000 tonne mostly on higher production in Vietnam, according to the reports of the 43rd annual meet of International Pepper Community's (IPC) held in India recently. Black pepper production is expected to increase only marginally to 3,26,063 tonne from 3,25,033 tonne in 2015. The total production of black and white pepper is estimated to be around 413,713 tonne as against 407,158 tonne in 2015. Indian production is projected to decline to 53,000 tonne in 2016 from 65,000 tonne in 2015.

## A high-tech attempt to ease Egyptian grain drain

► At the far corner of a faceless government building in Cairo, an unusually high-tech attempt to stem Egypt's waste-and-theft-riddled wheat market is quietly coming online this month. A dimly-lit room awash with the soft glow of CCTV feeds from around the country, Blumberg Grain's command and control centre is the central nervous system of a fast-expanding network of grain storage facilities the company says will save Egypt nearly \$2 billion in five years. As Egypt begins its wheat harvest this month, storage systems from the grain logistics company will process and monitor about a quarter of the domestic crop for the first time. If the government signs up for a second fleet of storage sites, a decision expected by May 1, Blumberg will handle the country's entire crop by 2018. "(The full system) will be able to save the Egyptian government approximately \$550 million a year in wheat savings, value addition and additional labour benefits," CEO David Blumberg said. "It is all monitored and evaluated from this command and control centre," he said, pointing to a monitor streaming live images from the interior of a steel hangar in the port city of Alexandria.

Egypt is the world's largest importer of wheat but also a prolific squanderer of its own crop. About 3.5 million tonnes of the crop is procured by the government each year and much of it is stored in dilapidated open-air sites — known as "shounas" — that offer little protection against weather, pests and theft. To promote greater self-sufficiency in a staple that feeds tens of millions of Egypt's poorest citizens, the North African nation buys its domestic wheat at a generously subsidised rate. Egypt will pay farmers \$370 a tonne this year, nearly twice the \$190 paid for foreign wheat in its latest tender. This premium makes any crop loss highly expensive, with the dollar-starved country also

forced to dip into its dwindling foreign currency reserves to import additional grain to cover its domestic shortfall. Trimming waste Blumberg Grain estimates that Egypt loses 40 per cent of its locally procured wheat because of inadequate storage and processing techniques — from pigeons helping themselves at open-air sites to some unscrupulous farmers boosting crop weight with rocks and water to increase their returns. Part of a US holding company that also does business in steel and real estate, Blumberg provides harvest protection systems for



developing countries around the world. Its grains command centre was inspired by a control room that the real estate business uses to automate operations including security and temperature at its Miami offices. Blumberg says its shouna storage systems — the first 60 of which have been constructed at breakneck speed since November — will reduce waste to less than 5 per cent by sifting, weighing and tracking the crop in an enclosed environment.

## UWA Professor named FAO Special Ambassador for Pulses

► The United Nations Food and Agriculture Organization (FAO) has designated The University of Western Australia's Agriculture Chair, Hackett Professor Kadambot Siddique the Special Ambassador for Pulses 2016 at a ceremony in Marrakesh, Morocco. Professor Siddique received the Special Ambassador designation on 18 April 2016 at the 2016 International Conference on Pulses for Health, Nutrition and Sustainable Agriculture in Drylands where world experts are gathering to find a path forward to boost pulse production in developing countries using science, development investments, policy and markets. As Special Ambassador, Professor Siddique will raise awareness on the important contribution of pulses to food security and nutrition, including the positive impact of pulses to climate change, human health and environmental sustainability. "In the changing climate, the role of pulses in farming systems is important for crop diversification, nitrogen fixation, availability of nutrients in the system, and for human health, including cardiovascular disease, diabetes, obesity and dementia," Professor Siddique said. The Director General of Food and Agriculture Organization of the United Nations, José Graziano da Silva said the appointment was made in recognition of Professor Siddique's outstanding contribution to Australian and international agriculture, leading innovative research in production agronomy, development and breeding of pulses and cereal crops for the benefit of the grains industry in Australia and overseas.

## Bihar first to opt for DBT in foodgrain distribution

► Away from the Modi-Nitish rivalry, Bihar has become the first state to experiment with direct benefit transfer (DBT) in the distribution of food grains under the National Food Security Act (NFSA). DBT will be introduced as a pilot project in one of the blocks in Purnia district, a state government official said. The pilot project is likely to be launched in May, he confirmed. By doing so, Bihar became the first state to launch DBT in the public distribution system (PDS) after three union territories — Chandigarh, Puducherry and Dadra & Nagar Haveli — earlier did the same. Under this scheme, consumers receive the food subsidy in their Aadhaar-linked bank account directly and purchase rice and wheat from the open market. Under the DBT scheme, the Centre pays the subsidy amount of rice and wheat directly into the bank account of the beneficiaries. The subsidy is based on price difference between 1.25 times of the minimum support price and the central issue price of rice and wheat. Under the NFSA, the government supplies rice at Rs 3 per kg and wheat at Rs 2 per kg, to each beneficiary every month at 5 kg of either of the grain, per person. With regard to DBT in Puducherry and other places, the government bears a subsidy of about Rs 17 per kg for wheat and approximately Rs 23-24 per kg for rice. A group of secretaries appointed by prime minister Narendra Modi had recommended in January, 100 per cent coverage of public distribution system under DBT by December 2016.



## SIM-enabled pump sets for farmers

► Government today launched two schemes, the National Energy Efficient Agriculture Pumps Programme and National Energy Efficient Fan Programme in Vijayawada, Andhra Pradesh. The scheme was launched by Andhra Pradesh chief minister N Chandrababu Naidu during the inaugural session of the two-day International workshop on energy efficient lighting. These schemes will be implemented by Energy Efficiency Services Limited, a joint venture of PSUs under the ministry of power. Under the NEEA programme, farmers can replace their inefficient pumps free with the new BEE star rated energy efficient agricultural pump-sets.



## Kerala farmers' cooperative to launch café chain, push organic coffee



► Kerala-based farmers' cooperative Manarcadu Social Service Society (MASS), which has more than 5,000 members, is all set to launch a café chain by the name 'Café de Monde', with its specialty brand of premium organic coffee. MASS is a first-of-its-kind farmers' cooperative in Kerala exporting organic and Fairtrade spices, cocoa and coffee to Europe. "Café de Monde will be an exclusive top-of-the-line experience café chain. With this brand, we propose to redefine the coffee beverage segment through clear, differentiating factors," Bijumon Kurian, president, MASS, said. "Café de Monde will strive to create a unique coffee-shop experience where customers can socialise and interact with one another

in a great ambience, while enjoying the aroma and taste of freshly-brewed organic coffee. Only organic beans from virgin plantations will be used at the café," he said. The first flagship outlet will be launched next month in Kochi and followed by another nine stores in one year.





Seeds are integral to food security. They sow the seeds of a food sufficient country. India too had witnessed the power of good seeds. Our green revolution and our recent position in the world as a major food producer owes its gratitude to the team of scientists and researchers for developing a batch of dependable and quality seeds. But with changing times, we are also confronted with challenges. New threats and risks engulfs our food priorities. Fortunately our seed sector has been dynamic enough to incorporate those risks and develop better solutions.

# SEEDS

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## HARBINGER OF FOOD SECURITY

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**A**griculture in India has travelled through different levels and have taken many historic turns. Each phase in the Indian agriculture took different paths and yielded exceptional results. Notably, each of these phase was engendered by 'a set of seeds' that changed the course of history of Indian agriculture. Seeds, in fact, were responsible for many revolutions and transformations that this country had witnessed. The famed 'Green Revolution' that took India's agriculture to new heights was also based upon the seeds that produced good yields. Seeds of High yielding varieties of wheat sowed the seeds of green revolution in India. The most recent would be 'Bt cotton' which transformed India's cotton economics. Good yields coupled with resistance to pest attack gave the cotton farmers in India better returns. Invariably good seeds produced good results.

But arriving upon a good seed is a herculean task. It involves years of research and standardization before it reaches the farmers. Today, most of the farming in India depends upon these seeds that are released by research bodies or private companies. These seeds have become the staple of Indian agriculture.

### **Indian seed sector owes to favourable Government Policies**

Seeds form a crucial and unavoidable component of agriculture. They convert the resources and labour into fruitful harvest. In fact the response of all other inputs depend on the seed. Studies have pointed out that quality seeds can alone contribute to about



15 – 20% to the total production depending upon the crop and it can be further raised up to 45% with efficient management of other inputs.

The growth of seed industry has been commensurate with that of Indian agriculture. At each step the Indian agriculture was amply supported by the seed sector. Sixties were particularly a crucial time in Indian seed sector and several impactful changes happened during this time. In 1963, National Seeds Corporation (NSC) was established. The objective was to undertake production of foundation and certified seeds. Now it has grown into a Schedule 'B'-Miniratna Category-I company wholly owned by Government of India under the administrative control of Ministry of Agriculture and Farmers Welfare. At present, NSC is undertaking production of certified seeds of nearly 600 varieties of 60 crops

**Seeds of High yielding varieties of wheat sowed the seeds of green revolution in India. Most recently 'Bt cotton' seeds transformed India's cotton economics**





through its registered seed growers. There are about 8000 registered seed growers all over the country who are undertaking the seed production programmes in different agro-climatic conditions. The turnover of the Corporation for the F.Y. 2014-15 was Rs. 890.03 crores.

The Government of India enacted the Seeds Act in 1966 to regulate the growing seed industry. The Seeds Act stipulated that seeds should conform to a minimum stipulated level of physical and genetic purity and assured percentage germination either by compulsory labelling or voluntary certification. Further, the Act provided a system for seed quality control through independent State Seed Certification Agencies which were placed under the control of state departments of agriculture.

The eighties were also impressive for seed sector as it witnessed two more important policy developments for the seed industry, viz. granting of permission to MRTP/FERA companies for investment in the seed sector in



1987 and the introduction of 'New Policy' on seed development in 1988. Besides this, the time saw launching of the World Bank aided National Seeds Programme (1975-85) in three phases leading to the creation of State Seeds Corporations, State Seed Certification Agencies, State Seed Testing Laboratories, Breeder Seed Programmes etc. Seed Control Order (1983), Creation of the Tech-

nology Mission on Oilseeds & Pulses (TMOP) in 1986 now called The Integrated Scheme of Oilseeds, Pulses, Oil Palm and Maize (ISOPOM), Production and Distribution Subsidy, Distribution of Seed Mini-kits and Seed Transport Subsidy Scheme were also enacted during the same period.

Seed sector garnered further support in the beginning of nineties. Under the 1991 Industrial Policy, seed





production was identified as a 'high priority industry'. In line with India's larger liberalization and privatization policies during the same period, the new policy on Seed Development opened the doors for import of vegetable and flower seeds in general and seeds of other commodities in a restricted manner and also encouraged multinational seed companies to enter the seed business. As a result more than 24 companies initiated research and development activities.

Further to strengthen the seed sector and to address certain unattended areas in Seeds order, National Seed Policy 2002 was initiated. The aim was to provide intellectual property protection to new varieties; usher this sector



into planned development; protect the interest of farmers and encourage conservation of agrobiodiversity. This policy had 10 thrust areas - Varietal Development and Plant Varieties Protection, Seed Production, Quality Assurance, Seed Distribution and Marketing, Infrastructure facilities, Transgenic Plant Varieties, Import of seeds and planting materials, Export of seeds, Promotion of Domestic Seed and Strengthening of monitoring system. Under the policy a Plant Varieties & Farmers' Rights Protection (PVP) Authority was established to undertake registration of extant and new plant varieties. A National Gene Fund was also established for implementation of the benefit sharing arrangement, and payment of compensation to village communities for their contribution to the development and conservation of plant genetic resources and also to promote conservation and sustainable use of genetic resources. The National Seeds Board (NSB) was established in place of existing Central Seed Committee and Central Seed Certification Board which was entrusted with the responsibility of executing and implementing the provisions of the Seeds Act and advising the Government on all mat-

## Importing Excellence

**N**amdeo Umaji Agritech (India) Pvt. Ltd. has been serving Indian agriculture for the past 130 years by supplying vegetable seeds, flower seeds, garden tools and plants. The company today has an accountable share in vegetable and flower seed business in India. Apart from producing seeds on its own R & D farm, they also procure the seeds from foreign companies in various countries like Thailand, Korea, USA, China, etc., and supply them to farmers. The company has quite a large share of flower seed segment in central India and South India. Being involved in the business of importing of plant materials Mr. Sachin Bhalinge, Managing Director, Namdeo Umaji Agritech (I) Pvt. Ltd. in an interaction with Agriculture Today made his stand clear on the government policies on importing companies. "Government Policy on importing planting material should be more liberal compared to current situation. There is need for making modifications of government policies for import of planting materials in view of making policy much more practical. Quarantine should be done for planting materials such as live plants at the facility, and it should be released immediately as plants cannot be kept for long time. They should be planted in the soil immediately", said Mr. Bhalinge. However, he was satisfied by the existing plant quarantine laws but stressed that conditions should be changed as per practical conditions on yearly basis. The foreign seeds being expensive they have an appreciable demand among Indian farmers according to Mr. Bhalinge. "The imported seeds are expensive for Indian farmers, however the farmers having good infrastructure purchase these seeds. The dealers are given good training for agronomic practices and cultivation practices and therefore they pass the technology to farmers while buying the seeds. The seed cost in total Cultivation practices is around 7 to 8% only compared to other expenses", he said. According to him the foreign seeds are high yielding with super quality produce. "The foreign seeds in some of the crops is superior to indigenous seeds. Therefore that is ongoing in Indian markets. Moreover, globalization has made this more easy. Imported varieties are high yielding varieties with good quality and also disease & virus tolerant varieties and also Seed quality and uniformity is better", avers Mr. Bhalinge. Namdeo Umaji company also has its own sizable breeding farm at Urulikanchan Pune where highly qualified experienced staff retired from ICAR institutes and also from Agriculture Universities of the state are employed. Therefore, the company is in position to introduce its own varieties in important vegetables and flower crops especially in tomato, Okra, Chilli, Cucumber and watermelon. Company has introduced high yielding and Disease resistant varieties. Mr. Bhalinge also informed that under "Make in India" slogan, they are training farmers to build green houses, so they can take up seed production in India. "We are also convincing foreign companies to take seed production in India & take back the good quality seeds to their countries as climatic condition of India is very good. We have a cheap but skilled labour. So they can get a good quality seeds", said Mr. Bhalinge.





ters relating to seed planning and development.

The Seeds Bill seeks to regulate the production, distribution and sale of seeds. It requires every seller of seeds (including farmers) to meet certain minimum standards. The Standing Committee has recommended that farmers selling or exchanging seeds from other farmers be exempt from this requirement. The Bill has been pending since December 2004.

With ample support from the government, India's seed industry has flourished. Currently, ranked as the fifth in the world, the domestic seed industry will continue to grow at a double-digit growth rate in the medium-term driven by improved seed replacement ratio (SRR) and rising adoption of improved hybrid seeds, according to ratings agency ICRA. The profitability of private seed companies will remain healthy while investments in R&D and working capital to maintain a strong product pipeline will keep private sector's indebtedness at moderately high levels, the ICRA said in a statement. The studies suggest the favourable policy environment generated through National Seeds Plan and National Food



Security Mission (NFSM) has augured well for the industry.

According to the report, the Indian seeds industry grew at a Compound Growth Rate (CAGR) of 8.4 percent in volume terms from FY 2009 to FY 2015 to reach 3.5 million tonnes in consumption. On an average, private sector companies saw operating margin of about 15.5 percent between Financial Year 2011 - FY 14 vis-a-vis 9.3 percent for state run companies. Private sector companies have a longer cash conversion cycle of about 160 days versus 75 days for state run players as observed by ICRA during the period FY 11 - FY 14.

### India's seed heritage

While India's green revolution owed its results to the carefully selected and multiplied High Yielding Varieties, another major development was brewing in the hybrid seed sector which also marked yet another milestone in Indian agriculture. Followed by the hybrid seed production, India also made rapid advances in cotton production via GM technology.

India's first phase that owed considerable credit to seeds during sixties. India was struggling with low yields and was staring at a gaping void between demand and supply of food grains in the country. It was a struggle that was put to rest by the visionaries who decided to seek help from Norman Borlaug who was invited to India by the adviser to the Indian minister of agriculture, C. Subramaniam. Wheat seeds with striking yield advantages were imported to India and trials began in Punjab. The results propelled India's wheat production capabilities. In rice too, India adopted a revolutionary stand by adopting IR8 – a semi-dwarf rice variety developed by the International Rice Research Institute (IRRI) that could produce more grains of







rice per plant when grown with certain fertilizers and irrigation. IR8 was also developed into Semi-dwarf IR36. The change in rice yields made India self sufficient and a reliable exporter of rice. The advances were also extended to other field crops.

Another major breakthrough took place when hybrids were introduced and widely accepted into the India's agriculture system. Hybrids are now becoming the new favourites of the Indian farmers. "Except for few self-pollinated pulses and oil seed crops, hybrid segment is going to take over OPV. Opportunity in the hybrid market lies in the conversion of large scale field crops like wheat and paddy which are traditionally self-pollinated and development of hybrids in these food. Now a day's big companies are focusing on the development of hybrids in these food crops to increase the market share," says Mr. K. Ramakoteswara Rao, Chairman & MD, Sri Sathya Agri Biotech Pvt. Ltd.

Although the adoption of hybrids have not been uniform across all crop categories, the deepest impact has been felt on the cotton production segment. India became a pioneer country for commercial cultivation of cotton hybrids, which covered more than 50% of the cotton area. Cotton hybrids gave fifty percent higher productivity than conventional varieties. Their wider adaptability, high degree of resistance to biotic and abiotic stresses and better fibre quality made them a favourite of the Indian farmers. The first intra-hirsutum hybrid cotton Hybrid - 4(H-4) was released in 1970 from Main Cotton Research Station, Surat of G.A.U. by Dr. C.T. Patel. This was followed by the development of world's first inter-specific hybrid Varalaxmi in 1972 from U.A.S., Dharwad by Dr. B.H. Kataraki. Hybridization also gripped the rice fields in India, albeit at a slower pace. Research programme was initiated during 1970 to develop hybrid rice variety in the country. There was no



success in this programme during the subsequent two decades. However, the research programme was accelerated and intensified from 1989 with a mission mode project. With these concerted research efforts, a remarkable success was achieved within a short span of 5 years and half a dozen rice hybrid rice varieties were developed from public and private sectors. The first four hybrid rice varieties were released in the country during 1994. Subsequently, two more hybrid rice varieties were also released. By the end of 2001, a total of 19 hybrid rice varieties were released. During the year 2007, around 1.1 million hectares were estimated to be planted under hybrid rice. The "National Food Security Mission" has specifically placed significant thrust on hybrid rice. However, Indian farmers have been reluctant to fully exploit the potential of hybrid rice as the cooking qualities of hybrid rice were not acceptable by the Indian palate. Another benefactor of hybrid seed technology is the vegetable segment in India. With the entry of private segment in the seed sector hybrid technology in vegetable received a major boost.

After the hybrid technology, India witnessed a major breakthrough in

cotton production. Genetic engineering made a formal entry into India's commercial agriculture scene. At a time, when cotton production in India was facing a major threat from boll worm – a pest that severely reduces the boll quality and quantity, Bt varieties of cotton were introduced. The genetically engineered variety with borrowed genes from a bacterium *Bacillus thuringiensis* produced a protein in the plant itself that killed the pest – boll worm. The technology reduced the expenses incurred upon pest management and also increased the yield manifold. India's cotton yield was 225 kg per hectare in 1990-91. It fell to 190 kg per hectare in 2000-01, a bad monsoon year. Bt cotton cultivation began in 2002, and its acreage shot up from 0.29 million hectares in 2002 to 9.4 million hectares in 2011-12. By this time, the Bt variety accounted for 90% of cotton acreage. Cotton yield rose to 362 kg per hectare in 2005-06, and then increased further with fluctuations to 510 kg per hectare in 2010-11. In 2001, India was a large importer of cotton. But within seven years of introduction of Bt cotton, India became the world's second-largest producer and exporter of cotton. Today, India's share of world cotton production is





up 68%, and exports are at an all-time high.

While Indian agriculture galore with examples of seed varieties and hybrids that transformed India's production statistics for good, India is also home to many traditional varieties that harbor some valuable traits. Being indigenous to the region, the varieties can survive the inclement weather parameters and have also resistance to pest and diseases. Their requirement for fertilizers and irrigation are modest which makes them an inexpensive option to pursue. The pronounced yield advantages of modern varieties have unfortunately displaced the traditional varieties and many have vanished to the oblivion. But Dr. Debal Deb, an ecologist and a farmer, has a completely a different take on the matter. "It's only a myth that all traditional crop varieties are characterized by 'low productivity'. Today's politics is food politics, and it pays agribusiness – the key players of food politics - to perpetuate this myth. There are quite a few agronomists who know very well that there are hundreds of crop varieties that can out-yield modern varieties on marginal environmental conditions. Even on optimal conditions of soil nutrients and water availability, several rice varieties outperform the so-called 'high yielding varieties' (HYVs). I have at least 10 such varieties growing on Basudha farm. Moreover, none of these folk varieties need any external inputs of agrochemicals. However, such information seldom hits the headline because that would



serve to enlighten our farmers, and dissuade them from buying HYV seeds and agrochemicals for years together. That would be bad omen for agribusiness and hence bad for GDP growth! Thus, mainstream agronomists, economists and agriculture bureaucrats alike, stick to the corporate lies and institutional myths", says Dr. Deb. He founded Vrihi, the first and the largest rice seed bank in eastern India, to distribute folk rice seeds free to farmers. Dr. Deb strives to preserve India's biodiversity without sacrificing India's food sovereignty. Working with local communities, he hopes to help make farmers independent of large corporations and GM crops, and help secure their access to local seed varieties. Also lately, there has been an increase in the interest among farmers to preserve and cultivate them. Traditional rice seed sharing festival are being organized annually in many parts where farmers share seeds in good faith that they will cultivate the seeds organically, share the seeds freely and return double the quantity during the next festival. Nel Thiruvizha, is a similar festival organized in Tamil Nadu. Now its popularity has soared and farmers are enthusiastically participating in these festivals.

### Seed bumps

India obviously has emerged as an important seed industry. Counted as the fifth in the world, India's seed market has emerged as one of the strongest pillars on which Indian agriculture rests. But the growth and development has not been comprehensive and inclusive.

Post the introduction of seed policy of 1988, many private players entered the seed market. This raised the bar of seed production and the seed sector expanded. But the private





seed sector has only been interested in multiplying high value seeds. On the other hand, the public sector is inundated with the massive task of supplying high volume low cost seeds across the nation with their intention to mainly secure food security of the country. Having said that it is mainly concentrated on major food crops. India is also facing a huge deficit in fodder requirements. Fodder cultivation is not where it is needed and one of the reasons is the lack of availability of quality seeds. Similarly traditional millets and pulses are neglected. India religiously imports a good amount of pulses to meet its protein requirements. To effectively navigate through India's diversified needs, the country should also focus on other crops which have been left out considering its lesser economic value.

Another significant factor that has affected India's productivity is seed replacement. Use of good quality seeds can increase India's agricultural productivity by 15-20%. So all the attempts to turn around India's productivity is positively dependent on higher seed replacement rate of better varieties and hybrids. Unfortunately, seed replacement rates are below the optimal levels. So is the case of varietal replacements. Newer varieties are constantly appearing in

the market, but the rate at which older varieties are replaced is quite low. There are many reasons for the low varietal replacement as it is difficult to convince the farmers of the apparent benefits of a new variety when they are already satisfied by their existing varieties. Field demonstration involves time and money both of which may not be easily forthcoming. However, varietal replacement is important for the health of the agriculture system as quite often the cultivated varieties become less productive and more prone to newer threats like epidemics, droughts or other forms of stresses. Timely updation with varieties can save them from these losses.

India ranks first in the area under rainfed irrigation. The rainfed agriculture accounts for 56.0 per cent of total cropped area, 48.0 per cent of the area under food crops and 68.0 per cent of that under non-food crops. But ironically, we are interested in developing varieties that are high yielding and hence requiring more water and fertilizers, a total antithesis of rainfed requirements. India needs to focus on research that would positively focus on raising yields of the rainfed regions. This will also help in raising the income of small and marginal farmers who are the largest benefactors of rainfed agriculture.

Climate change is yet another threat to modern day agriculture. Climate changes have already been noticed and agriculture is coping with last 2 back to back droughts. The recent heat waves are also indications of the same. As agriculture is deeply dependent on climate, our production systems must be geared to face the challenges arising out of climate change. We need to invest more on research catering to development of climate resilient seeds. In years to come we will be in more need of drought tolerant, salinity tolerant and submergence tolerant varieties. Not only research but seed production of these varieties of adequate quantities are essential. The Indian crop improvement programme has released a number of varieties which are tolerant to various abiotic stresses and the real impact of these varieties will be realized only if their seeds are made available to the farming community.

Seed enhancement is a very promising area that has been neglected in the Indian context. Seed quality enhancement involves the elevation or improvement of one or more aspects of seed performance (e.g. germination, emergence) above the level set by inheritance and achievable under natural conditions. It encompasses not only physiological treatments and conditioning (e.g. priming), but also improvements or alterations in physical seed properties that enhance plant ability and facilitate achievement of optimal stand geometry (e.g. coatings, hulling), and chemical/ biological treatments that protect seeds in the soil and regulate germination (e.g. fungicides, plant growth regulators). Presently, in the name of seed enhancement technologies only seed treatment with fungicides and/or pesticides are being used by public sector seed supply system while highly sophisticated technologies i.e. seed coating, seed pelleting and solid matrix priming etc. are applied by the private seed sector in case of hybrids,



vegetables and flower seeds. During the past three decades, the global seed industry has made tremendous progress in terms of technology marketing and regulation. India should invest more in these technologies.

India should also make its policy on GM technology clear. A consensus must be arrived upon by removing all the ambiguities existing in the regulatory mechanism for GM and should promote research in this promising area. GM technology is a promising area and India should not evade its farmers of this useful technology. "Genetic engineering technology can be considered as a powerful and profitable extension of conventional crop breeding methods enabling the introduction of genes for traits that have previously been inaccessible to the conventional plant breeder, or which do not exist in the crop of interest. This holds tremendous potential for genetic enhancement of important food crops where progress has remained elusive to-date. For example, in the case of pigeonpea and chickpea, despite screening all accessions in the germplasm bank, stable and durable sources of resistance to the legume pod borer have not been found. To make the improved varieties of these pulse crops resistant to this economically damaging pest, GM technology is the only option available in the foreseeable future. There are many constraints to increasing productivity and profitability for several crops of economic importance to smallholder farmers in India. Bt-cotton with resistance to similar insect pests, the bollworm has already revolutionized the cotton production with over 95% adoption over the past 13 years.

Similar robust technologies in pulses will be important in addressing India's growing demand for pulses,' said Dr. David Bergvinson – Director General, International Crops Research Institute for the Semi-Arid Tropics (ICRISAT) in an interaction with Agriculture Today.

Growth in India's seed and agrobiotech industries will require close collaboration between the public and private sectors. "Seed Industry, both private and public sector has played an important role to sustain food security of the country as well as of the world. Both the sectors are engaging into research and development of superior product for the farming community based on their agro climatic and economic needs.

'Branded Seeds' offered by both private and public seed sector ensure quality standard to reap the best benefits by consumers. It is important for farmers to have consistency in quality both in the input and output side. Also in country like India, there are strict quality standard specified by government to protect farmers interest," said Mr. Pascal PRAT, Managing Director, BISCO BIO SCIENCES Pvt. Ltd. in an interaction with Agriculture Today.

In the past, public - private collaborations have often worked well – India's public research system is typically credited with producing the upstream research on hybrid parent line development that has led to a vibrant private sector-led market in hybrid seed for pearl millet, sorghum and cotton. Yet, despite increasing public expenditure on agricultural research in recent years in India, the public sector's contribution to crop improvement remains constrained by factors including top-heavy organization and management structures, and a lack of incentives to encourage public researchers to rapidly release viable technology products or collaborate with the private sector. Greater policy attention must be given to improving management systems and innovation incentives in India's vast public research system, and to strengthening the public-private interface in the areas of crop improvement.

Seeds are central to our food security. They sow the seeds of prosperity in the lives of farmers and nation. India should take bold measures to address the inefficiencies or gaps in the system.





Vegetable Seed Division

# Rasi Seeds (P) Ltd.



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# 'A CLEAR POLICY ENVIRONMENT NEEDED'

Rasi Hybrid Seeds has made rapid advances from seed production and supply ventures to a commendable position in Research and Development (R&D) and emerged as Rasi Seeds (P) Ltd. in 1986. Having 600 qualified workforce and over 4 million Indian farmers as customers, Rasi Seeds has been recognized as the leader in cotton hybrids, besides hybrids in maize, pearl millet and vegetables. When the company launched its first research cotton hybrid, RCH 2 in 1992, the agricultural industry was overwhelmed by the tremendous yield of this hybrid. In an interview with Agriculture Today, Dr. Arvind Kapur, CEO-Vegetable Seed Division, Rasi Seeds (P) Ltd., discusses the significance of hybrid seeds in Indian agriculture.

## How are hybrid seeds significant in today's agriculture?

There are many challenges that are being faced by Indian agriculture. From land degradation to irrigation issues, from land holding to soil fertility, from climate change to actual productivity per unit area, from traditional to mechanized and protected agriculture, all these issues are not cohesively addressed. The Open pollinated varieties in various crops have limitation in productivity, besides having issues of diseases, quality traits etc. Hybrid seeds, on the other hand, have the advantages of higher productivity besides disease resistance, quality traits and tolerance to abiotic stresses. The examples are single cross hybrids of corn, cotton, millets, Sorghum, Sunflower, oil Brassicas and many vegetable crops. All these crop hybrids has not only increased the productivity, but also given farmers higher income per unit area. In rice also, presence of hybrids are increasing and they are yielding higher productivity per ha.



## What is the market share of hybrid seeds in India across different segments?

Depending on the crop, the hybrid seed market share is different. In cotton it is more than 95%, in corn more than 80%, in vegetables and major crops, it is more than 50%. So in crops where hybrids are there, the hybrid seed market is expanding rapidly. The farmers are seeing advantage in growing hybrid seeds and getting higher yields and better profits.

## What is the level of acceptance of hybrid seeds in India?

Hybrid seed technology has been fast adopted by farmers in many crops. The hybrid cotton seed with Bt. genes has been adopted the fastest, and in ten years it reached to 95% of the total grown area of cotton. The single cross hybrid seed is another example where farmers have adopted fast and it has reached more than 80%. In vegetables crops like Tomato, Hotpeppers, Okra, Gourds, Watermelons, the hybrid seed adoption is more than 60%. So by seeing the value of growing hybrid seed, the farmers are moving towards hybrid seeds rather than growing low yielding Open pollinated varieties.

## GM technology has revolutionized cotton production in India. Can this achievement be replicated in other crops in India?

Depending on the value creation by GM traits, certainly revolution will come in other crops as well. In cotton, farmers were suffering due to huge damage of crop by cotton boll worm. But now there is inherent protection which is safe for human being and environment due to less use of chemicals. In other crops like Brinjal, the same achievement will be replicated due to huge damage happening to crop by fruit and shoot borer of Brinjal. The farmer will save on chemicals and losses in crops,





while consumer will get the benefit by having lower residues of chemicals in fruits. So this technology if used in a need based and proper manner, it will have huge impact on the productivity, human health and environment safety.

### How was Rasi's performance in last fiscal?

Rasi Seeds Company is one of the fast growing Indian companies and has strong breeding programs in all major crops. In cotton, besides Bt. genes, Rasi has conventional breeding based resistance to sucking pests and better quality cotton fiber. In cereals crops, Rasi is bringing higher productivity hybrids in Rice, Corn, Millets and Oil Brassicas. In Vegetable seeds, the HyVeg brand of Rasi seeds is growing faster than the industry growth and many hybrids of various vegetable crops are top sellers. HyVeg vegetable

seeds are also being exported to Asian and African countries. At present, Rasi Seeds is the most respected Indian company in India and abroad.

### Are there any climate smart seeds developed by Rasi?

Rasi Seeds has released many hybrids in various crops which can withstand changing climatic conditions. Our cotton hybrids are performing best under changing climatic conditions of North and South. Similarly, our corn hybrids are performing best under high and low temperatures. Our Millet hybrids are best performing under low moisture conditions. In vegetables, we have tomato hybrids which are suitable under high temperature and high humidity conditions. We have high virus resistant Hot peppers, gourds and melons.

### What are your views on

### the government policy on seeds?

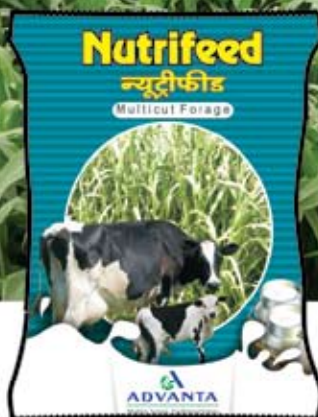
It is a pity that government is very slow in bringing growth oriented policies for seed sector. In many states, the seed industry is facing many issues due to ambiguous policies. There should be clear agricultural policies at central government level and it should be uniformly applicable to all states. Many issues can be solved if government has open and solution oriented discussion with seed industry. The Seed Bill and other related bills are still pending in the parliament. Seed Industry in India is fully committed to their role for increasing productivity and production of various crops. What is needed is clear policy environment which encourage this industry to invest more in R&D and produce high performing and better quality seeds.



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## ADVANTA FORAGES FARMERS CONFIDENCE & PROSPERITY







# BETTER SEEDS FOR BETTER YIELD

India is the second largest seed Market in the world after China, It is estimated to be Rs 15000 crore and vegetable seed Market is about 20% of the total market i.e., Rs 3000 crores. Indian seed Industry is estimated to grow at CARG of 13-14% in coming years.

Most of the vegetable growers in India are small and marginal farmers. Small and marginal holdings account for about three-fourth of the total operational holdings in the country, operating over one-fourth of the total area. Majority of small and marginal farmers cultivate mainly low value, subsistence crops. In India, almost all small farms practice multi-diversified farming and grow a number of crops even on small acreage and fragmented plots. This kind of farming does not necessarily yield enough returns for the sustenance and upward movement of small farm families. They should cultivate a few selected high yielding, high income generating crops. East West seed has been serving the small farmers already since few years in different countries including in India. It has small farmer driven business. East-West Seed clearly outperforms its peers in the Global Index of Vegetable Seed Companies. Our Company has been recognized as the Number One Company globally in Seed Index in the category of serving small farmers. East-West Seed will continue to deliver quality seeds for such small and marginal farmers. We have good varieties in the crops like Bitter gourd, Cucumber, Ridge gourd, Bottle gourd, Palak, Beans, Onion, Okra etc., which are regular income generating crops for such farmers. East-West seeds have launched value packs having required number of high quality vegetable seeds for the benefit of small farmers. East-West Seeds has created a separate function as Extension Education and it will devote its time and efforts for transferring good technology to the farmer's fields.

India has been a venue to many new technologies in the vegetable seed segment.



*Mr. Satish Joshi, General Manager,  
EAST - WEST SEED INDIA*

After cotton GM technology adoption in India, vegetable seed industry is also invested hugely for GMOs to address biotic and abiotic stress and attain the yield increases. In most of the vegetable crops, GM technology is in advanced research stage. The Double Haploid and molecular marker technology are being used to focus on target traits and their selection with accuracy in short time period. Seed is an important element of the seed industry, its quality is vital for successful crop to the farmer. Hence seed enhancement technologies like seed coating, seed encrusting, seed priming etc., are promoted. East West Seeds also does seed coating in beans, watermelon, encrusting in onion for commercial cultivation. East-West Seeds also commits better quality seeds delivery through seed health check along with seed germination and genetic purity. East-West Seeds is the first company in India who puts seed health stamps on seeds packets for commercial crops and varieties assuring better quality seeds to the farmers. Seed disinfections during seed extraction are also vital to keep seeds free from pathogenic diseases to prevent further spread.

Small countries like Pakistan, Bangladesh, Myanmar, Philippines and Vietnam are adopting GM technology to improve crop yields and reduce input costs. Indian farmers have equal right to scientific solutions that would help them

in enhancing their crop productivity, incomes and livelihoods. However, cultivation of Bt. Brinjal depends upon government policy. Hybrids generally have better disease resistance than open pollinated varieties (OPVs), give consistent uniformity and have better yield levels. The desired input as well as output traits can be built in hybrids using technology which are beneficial not only to farmers but also to traders and end consumers. Farmers have realized the incremental yields up to 3 to 5 times higher than OPVs depending on crop. Recently tomato hybrids have given yields up to 65 to 70 tonnes / ha compared to 20 to 30 tonnes / ha in OPVs.

Each country has its priority crops, their different segments and product requirements. India is also a diverse country with variety of climate and soil conditions. It also needs specific products suitable for local markets. India has big Geography which differs in customer demand and planting seasons. Introduction of single variety of a crop will not work across the country. We have to consider the requirement of the market in each state and release the variety. Prevailing regulations of different states - make seed business more challenging than other countries. All the major multinational seed companies are operating in India hence there's tough competition, climate change is emerging as new challenge for seed industry in India.

Our Founder and Chairman of East-West Seed - Dr Simon Groot has said " One good seed can change lives of millions of farmers " East-West Seeds will focus on delivering quality seeds, extension services to the farmers and help them to raise the crop yields, income and thereby socio economic condition. East-West Seeds is planning to strengthen and expand its existing and new infrastructure in R & D, Seed processing and also in Distribution channel network in different geographies in India to reach out to the farmers in the country. Dedicated efforts are planned to transfer vegetable cultivation technology through extension services to serve the farmers.

## COMPANY'S RANGE OF PRODUCTS

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- Wheat Malt Extract
- Sorghum Malt Extract
- Specialty Malt Extract

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- Sorghum Malt
- Roasted Malt
- Specialty Malt

### Flours

- Barley Flour
- Barley Malt Flour
- Wheat malt Flour
- Roasted Malt Flour



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# ‘SEED INDUSTRY IS PASSING THROUGH ONE OF ITS TOUGHEST PHASES’

ADVANTA, a Global Plant Genetics Company with a worldwide presence are committed to promoting sustainable agriculture through innovative research and technology. Globally located in six different continents, Advanta sells high quality seeds in about 25 countries. A world leader in sorghum (grain, forages and sweet), the company enjoys leadership position in many geographies in tropical corn, sunflower, canola, rice, sweet corn and vegetables. Advanta is currently embarking upon a very aggressive growth strategy in many developing countries in Africa, Asia and Latin America. In an interview with Agriculture Today, Mr. Bhupen Dubey, Chief Executive Officer, Advanta Seeds discusses India's seed sector and the challenges faced by the industry.



## How has the Indian seed industry helped in India's agricultural growth?

The Indian seed industry plays a role of an effective catalyst in the development of Indian agricultural growth. India's seeds industry is approximately USD 3 billion including organized and unorganized, as well as hybrids and varieties all put together. If we take the 2014 Indian agricultural market of USD 368 billion, for every dollar spent, the seed industry has added value to the extent of USD 122 billion. By any standard, this is very impressive return on investment for farmers.

## What are the reasons for India's poor seed replacement rate?

Overall replacement rate estimates vary from source to source but it is around 55%, which is quite significant. Of course, there is still a scope to grow. Within this broad number, if we look at subsets of the data then there are many areas where seed replacement is nearly 100%, for example in cotton, hybrid chilli, hybrid tomato, hybrid sunflower etc.

## How significant is SRR in increasing agricultural yield?

SRR is very significant factor because seeds' experts handle research centres professionally. The performance is very high on germination, vigor, as well as overall productivity. It is encouraging and noteworthy to





highlight that many state governments are accelerating SRR via different support schemes for small and medium farm holders.

### **How has alliances with technology innovation companies across the world helped Advanta Seeds in furthering its research ambitions?**

Advanta Seeds has significant investments in research and development, and therefore has been successfully generating technological innovations in core crops like sorghum, forages, corn, sunflower, and canola. Alliances with strategic partners are one of the core components of growth strategy and by and large these are mutually beneficial.

### **After joining the UPL family, has any of Advanta's primary objectives changed?**

Advanta Seeds joined the UPL family in February 2006. While the core theme remains same – TRADITIONAL VALUES AND MODERN SCIENCE – growth of business and profitability accelerated because of support and strategic engagement by the management of UPL. One important addition to the existing core business was to focus on forages because the milk industry is in need of high nutrition, high energy, and high protein sources of supplies. This strategy is being executed in many of the geographies very successfully.

### **What are the new technologies that the Indian seed industry is working on?**

Indian seed industry research and development pipeline is booming, especially in breeding areas. Some of the examples include high-density cotton, high-density corn, breeding of vegetables under protected cultivation system etc. Over the last few years, the policy makers in government are creating confusion and disheartening researchers and entrepreneurs as a result, and investment commitments

are coming down in this area, which may have a negative impact on meeting long-term goals.

### **India is still dependent on exports for its pulse requirements. Why is there a reluctance among the private players to work on pulses?**

Pulses are being imported along with oil seeds from other countries for last many years. Hardly any research is happening from the private sector. The private sector players do not see a possibility of developing profitable businesses out of these two crops under the current policy environment. Public sector institutions are engaged in improving the varieties and they keep releasing products periodically. There is scope for government to develop comprehensive programs to encourage investment in research and development of new trends in these two crop groups. Once this is achieved there will be the 'skill' and the 'will' to come out with innovative and novel products.

### **What are the challenges of the seed industry in India?**

Primarily, on the account of poor monsoons for the last 4 – 5 seasons, profitability of the farm sector is coming down. As a result, farmers are going for saved seeds or resorting to OP varieties. Another challenge is the significant increase in the cost of labor which is putting pressure on COGS. On the other side, price realization are not increasing correspondently which has made many companies unable to manage their working capital. One of the biggest segments is hybrid cotton where most of players are losing ground due to hyper-competition led by oversupply. The global seed industry consolidation also puts pressure on some of the players who are active in India. In a nutshell, the seed industry is passing through one of its toughest phases.

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# INDIAN SEED MARKET IS ROBUST AND DIVERSE

**T**he importance of seeds can be understood the saying, "As Agriculture feeds the Nation, Seeds feed Agriculture". The value of quality seeds can be understood from the fact that it is an essential pre-requisite for sustaining productivity and growth in agriculture sector. Here it is very important to understand the nature of Indian agriculture which is one of the most diversified agriculture systems existing in the world supporting the huge population of 1.27 billion of culturally diversified individuals living in the country. The Seed Industry has played a vital role in supporting agriculture to meet the needs of the not only fast growing, but also economically advancing population of the country. By and large, the Indian Seed Industry has played the role of ensuring access of affordable quality seeds of the farmers. The primary focus has always been to make agriculture cost effective and sustainable, which the seed industry has effectively delivered.

The Indian Seed Market is robust and has diversity. It has judicious mix of large and small companies. Overall, the Indian Seed Sector has grown by leaps and bounds. The International Seed Federation (ISF) ranked the Indian Seed Industry fifth globally in 2013, and valued it at \$2 billion (estimate for 2014: \$2.2 billion). Various forecasts suggest that the Indian seed industry will continue to grow at a Compound Average Growth Rate (CAGR) of 12 per cent, or twice the average for the rest of the world. Some estimates even put the CAGR as high as 17 per cent. The Indian Seed industry is growing at about 15 per cent annually, which is double the



**Dr. Kalyan Goswami,**  
*Executive Director,  
National Seed Association of India*

world's average.

However, the industry confronts certain roadblocks that decelerates its pace of growth. A recent point in case would be the back to back droughts the country has encountered last year. As many of India's Seed Companies are located in the drought affected areas of our country, their operations were bound to be affected by the drought. As you know water is indispensable for the operations of the Seed industries; hence a good year of monsoon would help Indian Seed Industry a lot. According to the predictions of Government of India this year the monsoons are expected to be more than normal which has brought cheer to the Indian Seed Industry.

On one side, when modern seeds are essential ingredient to country's success in agriculture, we cannot totally exclude traditional varieties. India is a blessed land with rich

biodiversity. Over the years, with rapid modernization few of our unique varieties have been lost. However, at the same time our members and State Level Seed Associations are collaborating with farmers for ensuring creation of Seed Banks.

Private sector companies have been helpful in supporting India's agricultural growth. But the recent royalty issue in GM technology has made many to believe that it may negatively impact the country's progress. I believe the recent GM royalty issue will have no impact on future investments in India. We need to understand that India is a Pro farmer centric country and hence the rights of farmers cannot be neglected. India, as a large market, offers great opportunity for new GM trait developers. Indian companies understand the need of Price Control Order in the current situation and are willing to work within the ambit of law. Going by the experience of the Seed Industry in India with reference of Bt cotton seed technology, NSAI also believes that all GM traits and the IPR related to them must be declared as Standard Essential Patents (SEP) and only if the technology proponents accept this kind of governance, new GM traits may be approved in our country.

The future is also replete with hope in Indian seed segment. Breeders would continue to involve in conventional breeding which will enable creation of varieties which are more adaptable to adverse biotic and abiotic shocks. Also the vast field of Nanotechnology can be applied to seed for ensuring increased seed vigour.





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# FUTURE OF SEED RESEARCH IS VERY BRIGHT

The International Crops Research Institute for the Semi-Arid Tropics (ICRISAT) is a non-profit, non-political organization that conducts agricultural research for development in the drylands of Asia and sub-Saharan Africa. ICRISAT and its partners help empower the poor people to overcome poverty, hunger and a degraded environment through better agriculture. Headquartered in Hyderabad, Telangana State, in India, with two regional hubs (Nairobi, Kenya and Bamako, Mali) and country offices in Niger, Nigeria, Zimbabwe, Malawi, Ethiopia and Mozambique, ICRISAT conducts research on five highly nutritious drought-tolerant crops: chickpea, pigeonpea, pearl millet, sorghum and groundnut. In a rendezvous with Agriculture Today, Dr. David Bergvinson – Director General, International Crops Research Institute for the Semi-Arid Tropics (ICRISAT) discussed about India's seed priorities and the direction of research.



**India has been more inclined towards developing seeds of major food crops and not the millets/coarse cereals. How will it affect India's capability as a food producer in the long run?**

Due to the chronic food deficit, the first green revolution focused on increasing production of rice and wheat in the 1960s and both continue to be the staple food for the nation. The rural sector is now more attracted to rice and wheat crops (given their increasing affordability), which has left little scope for growth of the millets and coarse grain markets. Thin profit margins for these crops mean they are less attractive to the private sector, and therefore they have no interest in exploiting this segment. So these crops are heavily dependent on public research institutions. In the long run, India needs to invest and promote millets and coarse cereals not only for their nutritional attributes, but also for the fact that these are climate smart crops and under the scenario of unpredictability of climatic conditions, they are much better adapted to drought and high temperatures.

**What is the level of research going on in India in the millets segment?**

Realizing the need for promoting millets and sorghum, several activities are currently ongoing in both research and seed production, and several good seed varieties are available. The geographical focus of pearl millet improvement program in India has been on A and B zones where strong public sector breeding programs and private sector programs have been established. Although the area under this crop fluctuates between 7-9 m ha, the production levels have remained relatively stable at around 7-8 million tonnes due to the introduction of high-yielding hybrids and a strong network of private sector participation



in the seed system. Hybrids occupy about 4.5 million ha with over 120 hybrids, mostly from the private sector. The productivity improvement has especially been remarkable during the last 15 years where pearl millet yield has improved at the rate of 7% per annum. Pearl millet research in India is conducted through the All India Coordinated Research Project of the Indian Council of Agricultural Research (ICAR). ICAR along with its partners, including ICRISAT, took up the challenge to improve pearl millet productivity to ensure food and nutritional security in rainfed regions through strategic research and genetic diversification of cultivars and its parents. At ICRISAT, the hybrid-parent diversification and dissemination is ongoing with continued support from over 30 private sector partners in India. Seed production and delivery chain is well developed in the private sector, while public-supported state seed corporations (SSC) are gradually expanding their seed production network towards the public bred cultivars.

In recent times, partnership-based breeding of high-iron and zinc cultivars are addressing the need for improved nutrition, and a first wave of high-Fe (iron) cultivar (Dhanashakti) has been adopted by over 35,000 farmers and several hybrids with higher iron are in the final stages of testing at the national level for nutritional impact. Nutri-Farm project, a pilot program of the Indian Government, has opened up opportunities for large-scale procurement of bio-fortified cultivars (grains) and possible inclusion in the PDS in millet consuming states and expected to spread across the country. This encourages private sector investment and involvement in developing high mineral dense cultivars in the near future.

### **How can we include small and marginal farmers in the next phase of India's green revolution?**

Technology dissemination and

adoption need to focus on small and marginal farmers which can bring-in change in the income levels of these farmers. The participatory approaches of these farmers in R&D can also play a crucial role in the adoption process. Specific schemes of the Government of India with focus on small and marginal farmers and its effective reach, can pull these farmers towards the 2nd green revolution. There will also be a need to link these marginal farmers to the markets so that they can be transformed from subsistence to sufficiency, thereby enhancing their incomes and ability to withstand risks. In India, most land holdings are small and therefore, small and marginal farmers will play an important role in achieving the next green revolution. Large scale encouragement through policy support for cultivation of millets, availability of quality seed of improved varieties and hybrid cultivars through an efficient seed system, mechanization of agriculture, improved extension services, and judicious use of natural resources such as irrigation water for these crops, will go a long way in achieving the next green revolution in India.

### **India hasn't made much progress in the area of pulses as we are still dependent on imports to meet our requirements. Is the lack of new varieties or research a reason behind this? How can we improve the situation?**

The UN declared 2016 the International Year of Pulses to give more visibility to these important crops that offer high levels of protein to improve human and livestock nutrition, improve soil health and offer a diversified source of income for smallholder farmers around the world. India is the largest producer (18.2 million tons), consumer (over 22 million tons) and importer (3-5 million tons per year) of pulses, thereby necessitating an urgent need to bridge this gap. The target set is for the production of 23.5 million tonnes of pulses by 2020 and 27.5 million

tonnes by 2025, while the target for an average yield has been set at 900 kg per ha by 2020 and 1,000 kg per ha by 2025 against the current average yield of 750 kg per ha. A roadmap to achieve pulses self-sufficiency for India by increasing production, yield and area under pulses and by setting up seed hubs and demonstration of best technologies was recently drawn up by the central government in consultation with national and international research institutes. The government announced the implementation of the Pulses Program, with an outlay of INR 4.05 billion (US\$ 60.44 million) over the next four years to achieve self-sufficiency in pulses. To achieve all this, besides setting up 150 seed hubs across India to produce quality seed, plans are also in place to conduct 100 clusters of demonstrations on best-bet technologies across the country, with each cluster covering an area of 100 ha. This will include crop varieties for all cropping seasons, cropping systems, mechanization, integrated crop management practices, grain processing and storage, value addition, marketing etc.

ICRISAT is well placed to support this initiative through accelerated seed production of improved varieties, facilities and model upscaling through existing partnerships with key state governments. We hope to achieve this through our work on the science of delivery and application of business intelligence platforms to coordinate on-the-ground activities and implement key performance indicators to track progress and make course corrections. Besides, ICRISAT has the additional strength to involve private sector partners to vertically integrate farmers into value chains as well as value addition and marketing through Farmer Producer Organizations (FPOs) and associations like the Self Employed Women's Association (SEWA).

With these interventions, ICRISAT, ICAR and partners expect to usher in the era of pulses self-sufficiency in India during this decade.



### What seed traits should we emphasize in today's agriculture?

Given the rapid and vast changes in weather variability associated with climate change, R&D in seeds needs to focus on extreme weather conditions and the capability to respond to changing production environments to help smallholder farmers manage risks. ICRISAT is working on the stay green technology for many of the dryland crops. Besides developing crop varieties with tolerance to abiotic constraints like drought, high temperature and salinity, there is an urgent need to develop crop varieties with sustainable resistance to various biotic constraints like insect pests, fungal pathogens and viruses. For example, developing resistance to the legume podborer, *Helicoverpa armigera* in important pulse crops like pigeonpea and chickpea is very high on the agenda, and biotechnological interventions may be the only way to develop varieties with resistance to this constraint. Enhancement of the nutritional profile of our crop plants to address the problem of malnutrition should also be high on the agenda for crop improvement. Nutritional seed quality traits such as protein, iron, zinc, calcium contents and improved amino acid profile of protein are important seed traits to emphasize in today's agriculture to make India nutritionally secure.

### What are your thoughts on commercializing cultivation of GM food crops?

While the availability of a few GM crops like soybean, corn, canola and cotton (including only cotton in India) have already established the potential of this technology in agriculture, the commercialization of important GM food crops like pigeonpea, chickpea, rice etc., especially from the public sector, will have a long lasting impact on sustainable agriculture in India. However, for this, the public sector research will have to be promoted in a mission mode. This will ensure the accessibility of

this technology to resource-poor farmers, especially in the open pollinated crops. However, to accomplish this, the public sector must develop its capabilities in taking the proof-of-concepts from GM technology all the way through to commercialization. This will require the development of adequate infrastructure, capacity building in biosafety assessments, business models for product deployment and stewardship. In line with this, with support from the Department of Biotechnology, Government of India, ICRISAT has established a Platform for Translational Research in Transgenic Crops (PTTC). The PTTC will provide an opportunity for public-sector research institutes and private sector biotechnology companies to work together for translating transgenic research into products.

### What would be the future of seed research?

The future of seed research will lie not only in continuing to develop new and improved crop cultivars, but also ensuring that good quality seeds are made available to the farmers with high adoption rates. For this, the Government of India's proposal to establish seed hubs and demonstration of best bet technologies across the country, besides modern mechanization, integrated crop management practices, grain processing and storage, value addition and marketing etc. will have to be well established and implemented. India is a vast country with a wide range of climatic conditions suitable for cultivation of a range of crops. It has well established research programs for almost all crops and with availability of skilled personnel; the future of seed (crop improvement) research is very bright as we unlock the full potential of crop diversity to empower smallholder farmers realize their full potential as they produce nutritious and safe food for all.





# 'HYBRID SEEDS HAVE REVOLUTIONIZED VEGETABLE PRODUCTION'

Noble Seeds is one of the India's fastest growing vegetable seeds company with a presence across the country almost in every state. The journey of Noble seeds started a decade back in October 2004 in India with a dedicated pursuit of innovation and excellence powered by the vision of Lakshminarasimhaiah M.N. whose contribution to agriculture has ensured a better future to the Indian Farmers spreading smiles among the farmer community. Providing gamut of holistic solutions to the farmers for instance, High yield, earliness, disease tolerance, Quality assurance, Tolerance to biotic & abiotic conditions vegetable hybrid seeds, Noble Seeds have developed into a preferred brand. In an interview with Agriculture Today, Lakshmi Narasimha, Managing Director, Noble Seeds private limited discusses the plans and vision for Noble Seeds.



## What is the market share of Noble seeds in India?

Noble Seeds Pvt Ltd is a young fastest growing company in India and has established PAN India presence with a record of 20% growth annually. We are enjoying a very good market share in many crops and regions.

## What are the quality traits that are currently available from Noble seeds? Which is the most sought after trait in the market today?

Noble Seeds Private Limited is eyeing on Value added traits in Biotic as well abiotic traits considering the Nutritional and environmental issues from Consumer as well producers' (Farmers) issues. We are working on Water stress breeding, Haploid breeding, Disease tolerance specifically Bacterial Wilt in Tomatoes, Downy mildew in Cucumbers, Powdery Mildew in Bitter gourd, Several strains of Virus resistance in major crops like Tomato. Hot peppers, Okra, Cucumbers, Watermelons and high seeding ability for more value to farmers. Super small seeds in Watermelon, High color value in Hot peppers, High Lycopenes in Tomatoes, Bitterness in Bittergourds are currently available with Noble seeds

## How have hybrid seeds influenced India's vegetable production?

It infact revolutionized the vegetable production offering a very significant

difference in yields. Vegetable cultivation all through the year is a direct evidence on how the changes have happened through Hybridisation..... with value added traits like cold tolerance, high Temperature tolerance, Long storability, High Nutritional values and more than that aesthetic design of fruits ...You can see many types of shapes in Tomatoes, hot peppers.....watermelons with more colours and sizes. The production capacities have increased enormously with each vegetable but as a thumb rule, hybrid offers at least 30% yield over any local or OP seeds.

## Is Noble seeds looking at diversifying into other crops?

Definitely. We have no second thoughts there than vegetables. In fact, we are even focussing on main crops only with our strength in Tomatoes, Hot Peppers, Watermelons, Okra, Bitter Gourds and Tropical Cauliflowers.

## What are the challenges of seed companies working in the vegetable segment?

Seed production will be big challenge in future as new generation don't like to take this profession further and availability of skilled man power. The forecast of sales is again a big challenge to any organisation due to the sudden shift in crop pattern or crop shift and climate change, the impact is huge on financials of any company. The basis is research for any Good organisation

where investment to land itself is a big task. Government can promote or support in this regard. Secondly, private and public partnership is required. we are still following old seeds law and private institutions were subjected to lot of formalities consuming most of time and energy without results. Let us make it simple and fool proof. Government must come forward to formulate standard policy, safeguarding the interests of both Farmers and Company. Last, but very important challenge is security of germplasm which will decide the fate of vegetable seed companies

## What are the future projects of Noble seeds?

Best research and Development and Innovation would be our thrust areas. We will be focusing on Trait Breeding, Pathology, DH and Marker Assisted Breeding. We strongly believe in developing hybrids through Classical breeding using Marker Assisted Breeding. We will be focussing on developing Drought Tolerance, Heat set, diseases and pest resistant hybrids. We need to work on grafted seedlings for soil borne diseases. We are working on Indoor cultivation as well as Export Market. Our future products include Nutraceuticals, Organic seeds and value added products. It is very important for any organisation to survive with the changing time and competition with the available resources and strength. Digital Marketing is our future marketing strategy for the digital India.



# 'QUALITY SEED IS THE KEY INPUT'

Seeds are central to quality agriculture. Input responsive seeds have sown the seeds of prosperity and development in the hinterlands of India. The green revolution that changed the agricultural fortunes of India had a set of technically improved seeds as its foundation. Public sector has played a stellar role in materializing the vision laid for a food secure India. Dr. J. S. Chauhan, Assistant Director General (Seed), Indian Council of Agricultural Research in an interview with Agriculture Today discusses the relevance of seeds in Indian agriculture in years to come.



## **Green revolution was made possible by HYV of wheat and rice seeds. How can we bring about a second green revolution?**

Green revolution was made possible by public policies, good services (seed, water and fertilizers), hard working and innovative Indian farmers, besides input responsive dwarf varieties of wheat and rice in sixties and seventies. These factors shall remain foremost for second green revolution too. Now, there is also a need of bridging the existing yield gaps through improved productivity using quality seeds of high yielding varieties, integrating natural resource management as well as raising the ceiling to crop productivity; sustaining the gains achieved and also extending them to new niches and area, especially eastern and north eastern parts of the country.

## **What role will be played by seeds in the next green revolution?**

Of the several factors vital for enhancing production and productivity of the crops, quality seed is the key input for realizing potential

productivity of the crop by ensuring good germination, rapid emergence and vigorous growth thereby good crop stand. Seed alone contributes about 15-20 % to the crop. Enhancing seed replacement and varietal replacement rates coupled with efficient crop management would be the key for success of next green revolution. Enabling the resource poor farmers with quality seed is still an imminent challenge that needs to be focused upon as 60 per cent of farmers use farm saved seeds. A systematic, strong and vibrant seed production system is essential for food security of the country and also driver of growth in agriculture.

## **India hasn't made much progress in the area of pulses as we are still dependent on exports to meet our requirements. Is the lack of new varieties or research a reason behind this? How can we improve the situation?**

No, this is not true. We have strong national pulses improvement programme through three All India Coordinated Research projects on pigeon pea, chickpea, MuLLaRP and

one All India Network Project on Arid legumes integrating State Agriculture Universities and ICAR- Institutes including Indian Institute of Pulses Research at Kanpur and collaboration with other international organizations such as ICRISAT and ICARDA. During the last five years (2011-15), 59 varieties of different pulses have been released and 70,104 Q breeder seeds were provided to various stakeholders both in public and private sectors to sustain effective seed chain. Use of quality seeds of recently released varieties coupled with efficient crop management including balanced use of nutrients, need based irrigation and crop protection, assured market and remunerative prices will be the drivers for pulse production. A vast untapped potential between realized and realizable yield at farmers' fields need to be harnessed by integrating research and development agencies. This has been amply demonstrated in past as pulses production increased from 14.7 million tonnes in 2009-10 to nearly 19.3 million tonnes in 2013-14. In order to boost the production of pulses in the country, Indian Council of Agricultural Research (ICAR) and Department of Agriculture, Cooperation & Farmer Welfare



(DoAC&FW) under the Ministry of Agriculture, Govt of India, have jointly prepared roadmap and action plan with two-pronged approach of productivity enhancement and increasing production through area expansion. The strategy for enhancing productivity includes promoting improved production technology, enhancing seed replacement rate, provision for life saving irrigation, ensuring availability of critical inputs and machines for agri-operations with corresponding policy support in the form of attractive MSP, procurement, credit, insurance, subsidies, etc. to protect farmers' interest. Further, to boost the overall production of pulses and oilseeds, increasing acreage under these crops in the rice fallow areas, non-traditional areas and through intercropping systems have also been considered.

### **Climate change is a major threat facing Indian agriculture today. How can seeds help in developing a climate smart agriculture?**

Yes, climate change is a reality and influencing Indian Agriculture to a great extent. The research programmes in this context have been concentrated on the development of short duration varieties of oilseeds and pulses suitable for newer cropping systems. Seeds of climate resilient varieties will be quite crucial for mitigating the challenges of climate change. Short duration, disease resistant varieties of oilseeds (mustard, groundnut) and pulses (pigeon pea, chickpea, black gram, green gram) to diversify the cereal based cropping systems have been developed. Further, over 100 drought, flood, heat, salinity and cold stress tolerant varieties of cereals, pulses, oilseeds and sugarcane were also developed during the last 10 years.

### **Many traditional varieties in India are facing extinction. How can we bring back them?**

Due to intense population pressure on land, increasing non-agricultural use of land and adoption of high yielding varieties, land races/traditional varieties face the threat of extinction. However, ICAR-National Bureau of Plant Genetic Resources (NBPGR), New Delhi and national active germplasm sites at crop based institutes are operating as Gene Banks in different states and act as a germplasm custodian. The major objectives of these centres are to collect, conserve, characterize, evaluate available germplasm including land races, wild species and traditional varieties of different crops and also make them available to other researchers for utilization in crop improvement programmes. The National Genebank at NBPGR, New Delhi has a capacity to store about 10 lakh seed accessions and presently holds about 4.20 lakhs accessions of cereals, pseudo-cereals, grain legumes, vegetables, fruits and nuts, oilseeds, ornamentals, fibres, medicinal and aromatic plants, spices/condiments and flavours, forages and agroforestry species under long-term storage for posterity.

### **What are the traits that we should be focusing on seeds for sustainable agriculture?**

Indian Council of Agricultural Research (ICAR) undertakes comprehensive assessment of crops and traits required under changing climate scenario on a regular basis as part of the ongoing programmes of the Crop Institutes and All India Coordinated Research Projects on different crops. Short duration, photo and thermo insensitive, tolerance to extremes of temperature, flood, submergence, salinity, disease and insect pests are some of the traits of importance for the seeds of new varieties to diversify the cropping system for sustainability.

### **What are your views on GM technology?**

ICAR strongly supports development

of science led technology including GM research and has already prioritized crops and traits for the research using biotechnological approaches including development of GM crops. Government of India has strict guidelines to test and evaluate the agronomic value of the GM crops so as to protect the interests of the farmers. This includes generation of relevant bio-safety information, its elaborate analysis to ensure food, feed and environmental safety. A final view on the commercialization of GM crop is taken only when there is a clear economic and technical justification besides suitability for environment and human consumption. The Government of India is following a policy of case by case approval of genetically modified (GM) crops after extensive evaluation and regulatory approval.

### **What should be the future of India's seed policy?**

Public policies are imperative for the success of any sector and seed is no more an exception. A seed policy encompassing capital infusion for infrastructural development especially in public sector to support basic and strategic research, encouragement for export of seed by providing incentives to the exporters, establishing seed hubs, production, pricing, appropriate compensation to safeguard farmers' interest to discourage trading of spurious and sub-standard seeds, transparent and enabling environment for private sector participation is vital for the success of seed sector. Presently, Indian seed sector has transformed from predominantly public until nineties to one of the mature and vibrant domains comprising both equally strong public as well as private sector since the enactment of Seed Act in 1966. Hence, harmonization of rules and regulations in consonance with international seed standards for quality assurance, seed health are imperative. Seed Bill 2004 has been under active consideration of the government.





# 'TIME TO STRESS UPON VARIETAL REPLACEMENT'

**Seed Research is a critical area that is of significance to a country like India. Considerable efforts are put forward in the of seed research front so that the quality of the seeds distributed in the country is fair and equal. In an interview with Agriculture Today, Dr. Devendra Kumar Yadava, Head, Division of Seed Science & Technology, ICAR-Indian Agricultural Research institute discusses the various facets of seed research happening in India and the future goals.**



## **What is the level of research and development taking place in Indian Seed sector?**

Research in Indian seed sector is mainly focussed on seed production, quality enhancement, quality testing, storage, entomology, pathology and processing aspects. Seed production includes standardization of seed production techniques, quality seed production through manipulation of pollination, identification of variety and hybrid specific molecular markers in field crops to maintain genetic purity, identification/characterization of crop species, DUS testing, development of technologies to mitigate the effect of elevated temperatures on seed set, yield and quality and planting windows for quality seed production of various crops in offseason. Developing models for Farmers' Participatory and Public Private Partnership Seed Production is the upcoming area for ensuring food security through seed security. In case of seed quality enhancement, major emphasis is laid on identification of seed vigour traits in various crops for establishing healthy crop stand under sub-optimal conditions, development of technologies like seed priming for assured plant stand including eco-friendly seed treatment like bio-priming and encrustation enabled direct seeding technology for small seeded crops. Seed quality testing research is

concentrated on development of seed testing protocols, seed development and maturation, precarious germination and seed dormancy. In seed storage, focus is on evaluation of pre-harvest spraying of insecticides for management of storage insects, studies on the effect of insecticidal seed treatment on seed viability during storage under ambient condition, evaluation of packaging material and methodology to store seed, effect of carbon dioxide treatment on control of storage insect pests and seed quality attributes. Seed pathology is one of the important areas involved in standardization of detection methods for seedborne pathogens of significance, monitoring of emerging new diseases of seedborne nature, evaluation of seed health status of farmers saved seeds, establishing seed certification standards for different diseases, exploring the alternatives to chemical management of seedborne infection and detection and molecular characterization of viruses. Seed processing research mainly deals with important aspects like machine and crop variables for processing efficiency, optimization of sieve size and type of screens for grading seeds of different crop varieties and hybrids and their parents, improving the seed quality through processing particularly in case of seedborne disease infected

seeds, management of mechanical damage at harvesting and threshing stage and drying and storage studies of seeds of different crops.

## **What are the challenges in the seed research in India?**

Updation of evolved infrastructure facilities with state of art facilities in seed industry in general except a few; Meeting the projected seed replacement rate and overcoming the poor conversion ratio in the seed chain ; Competing with global seed trade for increasing India's share in global seed market; ISTA Accreditation to more Seed Testing Laboratories at least one in each major seed production hub; Genomic-led purity and viability standard protocols; Strengthening appropriate quantity of fodder seed production; Seed Certification Standards for Flower and other crops; Climate smart seed production, storage facilities and vulnerability of seed of different species due to climate change; Human resource development for Maintenance/Production/Management of seed production programme and Development of young entrepreneurs; self-help groups, voluntary organizations and seed cultivators for rapid multiplication and spread of newly developed varieties are some of the challenges.



### Why is SRR and VRR important?

Seed Replacement Rate (SRR) denotes the quality seed distributed to farmers against the actual seed required for cultivation of a particular crop. Due to higher productivity through certified or labeled quality seeds, SRR is directly correlated to improved productivity. Thus, higher the SRR, higher is productivity, which leads to achieving food and nutritional security and helps in containing food price inflation. Higher seed replacement rate shows better distribution of the certified/quality seeds. Important reasons for low SRR are lack of awareness about importance of quality seeds, economic status of farmer, farm size, inadequate supply of seed, traditional way of cultivation, higher dependency on farm saved seed, higher cost of certified seeds, isolated from market services, not to the mark extension etc. Varietal replacement is very important for achieving higher productivity and production in various crops. It has been observed in many crops that very old varieties (more than 30 years) are having a major area coverage, though improved varieties with much higher yield and other desirable traits are available in such crops. Till now much emphasis has been given on seed replacement and focused efforts towards varietal replacement were not made. Now it is high time to stress upon varietal replacement so that the newly developed high yielding varieties can replace the very old low yielding varieties in minimum time frame.

### What is the relevance of traditional varieties today?

Traditional varieties have a great relevance today in conserving the genetic diversity and adaptability descriptors of crop species in location/region specific niche. These are indispensable for sourcing genetic variability and ensuring farmers' knowledge and experience into the breeding activities. Moreover, the areas where the improved varieties have not been introduced/popularized,

the traditional varieties are being planted widely by the farmers which lead to sustainable farming. The traditional varieties are treasure of very important traits of quality and tolerance to various biotic and abiotic stresses. Live examples are Kharchia Local in case of wheat which is a major source of salt tolerant trait in wheat and in case of rice Kala Namak which is a very popular short grain aromatic rice variety from Uttar Pradesh. Traditional seeds are selected and preserved *in-situ* in the conditions in which the farmer grows crops.

### How can GM technology increase yields?

Genetically modified (GM) crops have become widespread in global agriculture since their introduction in 1996. The four main crops in which GM traits have been commercialized worldwide are soybeans, maize, cotton and canola. In India, only GM cotton has been commercialized so far. International Service for the Acquisition of Agri-Biotech Applications (ISAAA) annual report detailing the adoption of biotech crops, "20th Anniversary of the Global Commercialization of Biotech Crops (1996-2015) and Biotech Crop Highlights in 2015," showcases the global increase in biotech hectareage from 1.7 million hectares in 1996 to 179.7 million hectares in 2015. It has been successfully demonstrated in case of cotton in India and in maize, soybean and canola in different countries. GM crops generally have higher productivity due to prevention of yield losses and value addition. GM traits, such as insect and herbicide tolerance, help to increase yields by protecting the genetic potential of the variety that would otherwise be lost due to insects or weeds. The degree to which a farmer enjoys increased yields because of insect and herbicide tolerance traits will in large part be determined by how effective the farmer's weed and insect control programs were before planting the crop without GM technology. In the case of insect resistance, the GM

technology has led to great savings in the pesticide usage cost

### What are the future seed traits that can be expected in seed segment in India?

The seeds are produced taking due care so that purity, viability and vigour are maintained at its maximum possible levels. It is important to assure quality of the seed by testing before planting and enhance it to harvest rich dividends. There are several research areas that are yet to be pursued. First and foremost area is to develop crop/variety specific protocols using latest physiological, biochemical, molecular and biophysical research tools and techniques for varietal purity, hybridity where relevant and trait purity testing. The biochemical and or molecular fingerprints, if developed, for each cultivar, hybrid and their parental lines would have a remarkable database of information for characterization of cultivars that could even be useful for the breeders. The easy, fast, sensitive and nondestructive detection methods e.g. measurement of ethanol production, chlorophyll fluorescence and oxygen consumption, Q2 technology, multispectral imaging etc. for estimation of viability and vigour. Based upon information, growth models could be developed for analyzing and predicting germination rate distributions within a given seed lot. Development of automated detection of the seed maturity, metabolic activity and system for scoring on different seed quality parameters would add new dimensions to seed testing. Induced physiological adaptations to storage conditions and storage packaging without causing any genetic/clonal changes in the embryo. Amenability encapsulation/coating to package a seed with resistance to diseases, pests as well as enhanced nutritional inputs. Development of micro and split seed concept to reduce seed volumes and costs without causing any variation in crop standard and crop uniformity.

# SEED CERTIFICATION

## Integral to Agriculture

**S**eed certification had been recognized as an integral part of seed quality control. The purpose of seed certification is to maintain and make available to farmers through certification, high quality seeds and planting materials of notified kind and varieties. Seed certification is also designated to achieve the prescribed Indian Minimum Seed Certification Standards. The system of labeling the sanction under Section 6 (a) and also 17 (a) of Seed Rules of Seeds Act, 1966, which provides that seed producers/traders have the option either to produce and sell labelled seed or certified seed respectively; in other words, seed certification has been made voluntary and is not compulsory.

Certification shall be completed in six broad phases:

- Receipt and scrutiny of application;
- Verification of seed source, class and other requirements of the seed used for raising the seed crop;
- Field inspections to verify conformity to the prescribed field standards;
- Supervision at post-harvest stages including processing and packing;
- Seed sampling and analysis, including genetic purity test and / or seed health test, if any, in order to verify conformity to the prescribed standards; and
- Grant of certificate and certification tags, tagging and sealing.

The National Seed Corporation (NSC) set up in 1963, became the first official seed certification agen-



**Dr. Keshavulu Kunusoth,**  
*Director,  
Telangana State Seed Certification  
Agency, Hyderabad*

cy even before enactment of Seeds Act. The Seeds Act was passed in 1966 and for the first time in the country's history, statutory support for quality control of seed was provided. Seeds Act provides that the State Government and the Central Government in consultation with the State Government by notification in the Official Gazette establishes a certification agency have been specified in clause 6 of seed rules, 1968. Thus 24 State Seed Certification Agencies/Departments of Seed Certification are functioning in the country.

In India the seed certification started with the establishment of National Seeds Corporation in 1963. A legal status was given to seed certification with the enactment of Indian Seeds Act in the year 1966 and formulation of Seed Rules in 1968. The Seed Act of 1966 provided the required impetus for the establishment of official Seed Certification Agencies by the States. As a result

several states established their state seed certification agencies. Subsequently as the certification areas increased enormously, human resources were not enough in many state seed certification agencies. Consequently, field evaluations and seed certification failed to take off as per the Central Seed Certification Standards that led to supply of low quality certified seed to the farming community.

The seed testing laboratory has significantly contributed for the formulation and standardization of seed testing protocols, developing seed standards and is actively involved in planting value evaluations to solve the practical problems in seed testing and quality assurance. The infrastructure need to be updated as per the international seed standards and their competence need to be improved. Therefore, human resources and infrastructure have to be strengthened in all state seed certification agencies and a policy have to be evolved at central level and an annual workshop have to organized at National level every year.

Importance of seed testing was realized in India during 2nd five year plan period and the Central Seed Testing Laboratory (CSTL) was established at IARI, New Delhi in 1955. Thereby, the importance of STLs has been well recognized under the section 4 (2) of the Seeds Act, 1966 which empowers the state Government to establish one or more State Seed Testing Laboratories in the state. In fact, quality control programmes are pointless unless they involve seed testing.

As per the Seeds Act, there is a provision to set up a Central Seed Testing Laboratory and State Seed



Testing Laboratory to discharge functions to test the seed quality. As on date, more than 110 Seed Testing Labs are functioning in the country. Thus, the laboratories are expected to provide service for seed certification, production of quality seed and seed law enforcement. Therefore, seed testing services are critical to gain information regarding planting value of seed lots. To carry out these responsibilities effectively, it is necessary that STLs are equipped and manned with seed technologists. During the 5th Year Plan periods, the Union Ministry of Agriculture & Cooperation, Government of India provided huge budgets for strengthening the seed industry including establishment of seed testing laboratories and referral laboratories at Varanasi and CICR, Nagpur in the country besides providing infrastructural facilities for seed testing labs.

In spite of all these efforts, the desired level of perfection in seed testing and quality control has not yet been achieved. The number of notified laboratories authorized to test seed samples to regulate the quality seed distribution varies considerably in various states of the country. In some of the states, large number of 'notified' laboratories exist which are poorly equipped with staff, while in others only 2-4 laboratories with adequate facilities are operating well but they are not updated with standard operating procedures as per ISTA or not even able



to obtain ISTA accreditation. For successful seed production or the seed law enforcement programme, it is desirable to establish one or two laboratories with adequately equipped and well-staffed in each state instead of having large numbers of ill-equipped laboratories. The state governments must consider opening additional laboratories only when the existing laboratories have been fully strengthened and utilized. If necessary, the Government should appoint a committee to examine the suitability of a particular STL before according the status of 'notified' laboratory. The committee should comprise of seed experts from SAUs/ ICAR, seed certification agencies and a representative of seed division of GoI. This committee should also be responsible to give their recommendations for the de-notification of the existing non-functional or ill-equipped 'notified' STLs. A clear-cut policy is required to be framed to retain the experienced staff in seed

testing programmes besides provision of adequate budget every year.

Another vital issue relates to the notification of the Seed Analyst. The essential requirements for granting the status of 'Notified Seed Analyst' to a person include that he/she must possess a minimum two years' experience in seed testing work or being seed technologist. It is also desirable that the analysts regularly undergo refresher courses and upgrade their competence. Analysis reports being issued by the non-notified Seed Analysts, can even be challenged in the Court of Law. Seed testing is an area of specialization and therefore, the policy makers and administrators must pay adequate attention to follow standard operating procedures for seed quality assurance in the country.

Another important issue pertains to non-updating the ISTA rules for seed quality testing and at present none of the public sector laboratories in the country have accredited to ISTA. Therefore, the laboratory competence needs to be improved by obtaining ISTA accreditation for seed quality assurance and to trade seed at international level and also for OECD seed certification purposes.

Further, the 'notified' seed testing laboratories should have full autonomy in its functioning and should follow a uniform system of administration throughout the country. Although the CSTL has initiated the steps towards the uniformity in



test results throughout the country such as comparative testing of the 5% samples, monitoring of STLs and providing capacity building, the variability in test results still persists in the country due to insufficient modern infrastructure facilities, no update of ISTA rules especially for seed testing besides non availability of technically qualified personnel as seed analyst. It is mandatory that a Seed Analyst must have necessary Technical competence as an essential qualification. The analyst may either hold a degree or diploma or certification in Seed Technology/Seed Testing to be eligible for such position. Therefore, these need to be reviewed and modified to suit our condition and for maintenance of uniformity in seed testing. In addition, standardized operating procedures are the pre-requisite for seed quality assurance programme in general and seed testing in particular. Thus, the seed production, certification, seed testing, and seed law enforcement programmes must go hand-in-hand to accomplish the task of providing quality seeds to the farmers.

Speed, accuracy and costs are important facets in seed testing methods that are being continuously refined and evolved at international level. Hence, the introduction of new methods provides accuracy in assessment of seed quality. Further, in view of the globalization of seed trade, it would be desirable to update the new methods and rules in conformity to the international level. In the recent years, new technologies have been devised by several researchers or ISTA for seed quality determinations.

Throughout the world, farmers and growers have clear demands of the seeds that they sow. Firstly, they want the variety to be consistent with what they believe they have bought. Secondly they want that seed to achieve uniform and successful establishment of a weed-free crop that will develop without the incidence of diseases that result from seed-borne

infection. Achievement of these requirements is assisted by the methodologies of seed quality testing that are developed and standardized by researchers and International Seed Testing Association.

Promising new technologies such as chlorophyll fluorescence has a very high sensitivity for determination of seed quality. This technology also helps in identification of features of the seed or radicle that can provide valuable information relating to germination and seed vigour. Multispectral imaging is an emerging non-destructive technology in seed science, which integrates the conventional vision and spectroscopy technique to attain both spatial and spectral information from target objects simultaneously. A new technology on sensor application using measurement of seed oxygen consumption (Q2) during germination showed approaches for seed testing. It provides a fast and accurate measurement of different germination aspects of a seed lot. It is a valuable tool in determination of seed quality at both single seed and seed batch levels.

Seed vigour was a concept till recent past and has emerged as a basic and suitable test for monitoring seed physiological potential during different phases of seed production and assists in a support for strategic decision making regarding the selection of high quality seed lots to meet the consumer demand. Several new methods are being researched to study the seed vigour potential such as computer image; a new methodology flow cytometry, where cellular DNA quantification is being used to relate the aspect of germination and vigour. The molecular techniques has helped in identifying vigour related genes and development of markers to link vigour which is under progress in many crops like rice, maize etc.

Seed health is another important seed quality parameter gaining popularity. The increased losses of seed quality due to seed borne diseases

is critical in several crops. An industry led platform viz., International Seed Health Initiative (ISHI) was formed to develop seed health testing methods. To enhance detection of seed-borne viruses and bacteria, flow cytometry (FCM)-based techniques were developed. Several new indirect methods started replacing traditional seed health tests which strictly require pathologists. In addition, the DNA/ RNA based PCR tests, Serological tests are gaining importance with the advent of biotechnology for several pathogens.

The use of DNA markers in seed testing e.g. variety ID, genetic purity, seed health, GMO testing and species identification has rapidly increased in recent years. However, seed testing standardization by application of molecular methods involves expensive instruments and highly specialized technical skills along with methodologies. The electrophoresis of seed or seedling proteins/isoenzyme methods have been used for seed quality assessment. Another approach is the use of iso-electrically focused gels. Further, the new methods such A-PAGE method and SDS-PAGE were introduced for verification of species and varieties, seed health and GMO testing. Among the new promising technologies some are still under development or that have recently become available. The technologies include multispectral imaging, X-ray research of seeds, chlorophyll fluorescence of dry and imbibing seeds, oxygen production, ethanol production, cytometry, genomics, proteomics and metabolomics etc. that are used for seed research, seed testing and seed health. A large number of exciting technologies are in the pipeline or recently being used in several countries and so there is a need to explore the possibilities of their use in quality control assessment in the country. Therefore, we may expect some of these new developments to be the part of standard seed testing equipment in near future.

# Seeding India's Future

India's seed industry has grown drastically and with good performance over the past four decades. Both private and public sector companies/corporations are involved with the production of seeds in India. The public sector comprises of National Seed Corporation (NSC) and State wise Seed Corporations. The private sector comprises of around 400 seed companies, which include national and multinational companies and other seed producing/selling companies. Private seed companies have been very proactive on assuring the supply of quality inputs to the farmers. Introduction of crop specific technologies and engaging in diversification of portfolio with the mix of major field crops like Cotton, Corn, Rice, Wheat and F1 hybrid vegetables and increase of seed price through value added traits are going to be key drivers to sustain double digit growth for the next ten years.

To usher the next revolution of productivity in major crops, hybridization and adoption of improved crop management practices are important factors. I feel private seed companies are going to play a critical role in delivering seeds with high genetic



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potential and quality along with technical knowhow to achieve this objective. Also, to keep up the investment in long term research and development from private seed companies, strengthening and implementation of strong PVP (Plant variety protection) is very much essential.

Hybrids have become an essential ingredient in the success of agriculture. Except for few self-pollinated pulses and oil seed crops,

hybrid segment is going to take over Open Pollinated Varieties (OPVs). Market share by value of key hybrid crops are - Sorghum – 6 %, Bajra – 8%, Maize – 8 %, Sunflower – 6 %, Cotton – 60 % and Vegetables – 12 %. Opportunity in the hybrid market lies in the conversion of large scale field crops like wheat and paddy which are traditionally self pollinated by developing and popularizing hybrids in these food crops. Now a day's big companies are focusing on the development of hybrids in these food crops to increase the market share.

Another promising area is GM technology. Currently, more than 30 per cent turnover share is from F1 Bt Cotton hybrid segment. The wide adaptability is due to the exclusive availability of insect (bollworm) resistance technology of F1 hybrids as well as quality and superiority of F1 hybrid seeds over OPV. In a country like India with 1.2 billion people to feed and 60% dependence on agriculture for livelihood, GM technology is very much essential to complement our efforts to sustain the productions in major crops.

Seed is the basic component for productive agriculture. The focus of seed industry research has been more on hybrids in crops contributing to the food, nutritional and economic security of farmers. In coming years, many innovations from private sector research in seeds will impart a positive impact on agricultural productivity. The Indian seed industry continues to strive hard to exceed the expectations of the Indian farmers by investing in state of the art R&D programs and infrastructure to develop high performing products for our farmers. It is acquiring technological strength to cater to the varietal needs of tomorrow.







## India - Emerging Market for Seed treatment and Seed Enhancement

**S**eed is starting input in any farming and there is proven direct correlation of 'Seed quality' with yield potential of any given crop. Now a days, the most important aspect is not maximum yield potential but to have 'Less cost and more output'. Quality of seed is the key to success.

There are many proven examples in global agriculture as well as in Indian agriculture, where 'Seed enhancers' have directly influenced crop yield. For example in global agriculture growing of lettuce in low freezing temperature would not have been possible without having right seed enhancement technique called priming. As Indian agriculture example, I would quote classical example of cotton seeds, where healthy &



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*Director, Incotec India Pvt. Ltd*

higher plant establishment was possible soon after sowing due to better seed treatment by Indian cotton seed companies. This also eliminated

early day's sprays for sucking pest control resulting in less cost and better plant stand. Ideally whatever you do in seed quality enhancement, it will finally results in better yield as well less cost to farmers. Benefit to farmers from seed enhancers might be in various forms as ease in sowing of seeds, higher percentage of germination, better and uniform vigor of seedlings, less mortality, lesser seed rate, synchronized maturity etc. Now a days, speciality additives are available in the market from organic and inorganic source which may influence seed quality directly when loaded on seeds in right way and in optimal proportion resulting in yield improvement from 10% to 30%.

Seed enhancers are relatively new to Indian seed sector. There are biological, organic chemicals, inor-

ganic chemicals and couple of micro nutrients available from domestic and international source in Indian market which need really thorough investigations. At Incotec, we are experts in defining application technique of all these seed enhancers (additives in our language) in safest way to seed and most efficient use or influence of it when seed start rooting and shooting. We have developed close partnerships with many leading Indian seed houses including multi national seed companies to screen out best suitable Seed enhancers (additive) for Corn, Cotton and Key vegetable crops which can really add value to seed under Indian growing conditions. Our commercial product available in market are Genius Coat, Incotec -1065 and Bioensure mainly for field crop seeds application.

If we define Seed enhancers as 'any technique which influence basic quality of embryo inside seed' then I must say it's INCOTEC only who is active in this area of seed enhancement in country and offering commercial services to all leading key vegetable seed companies in country in the form of priming, Pelleting, Upgrading and dormancy breaking techniques etc., for expensive seeds of vegetable species.

I see a huge business potential for seed enhancers in India. At the same time, it is a big challenge to incorporate into the seed sector. But we have firm belief that it will become need of day since Indian farmer is going towards better and better quality seeds in upcoming times and once 'farmer starts making demand and choice', there is no more option left except to adopting right value addition on seeds.

Another fact is that Indian seed industry is going towards better quality seeds thus responding positively towards newer technology adaptations on their seed. However, right policy framework is very much need-

ed to boost use of Seed enhancement technology in Indian seed sector.

Seed treatment has emerged as a cost-effective crop protection solution in comparison to conventional spraying as it is more efficient, less costly and less labor intensive. In seed treatment, only planting seeds are coated with treating agent; therefore, low amount of active ingredients are required for protection against a variety of fungal diseases and insect pests. Increasing prices of genetically modified (GM) seeds have fostered the need for crop protection in order to reduce risk on investment.



Furthermore, increased food requirement due to rapidly growing global population has fuelled the market growth as preferred preventive measure for crop and ultimately food protection. The world seed treatment market is expected to reach \$7.8 billion by 2021, growing at a CAGR of 8.3% from 2015 to 2021. Present global market size for such seed treatment is more than 4 billion USD and major part of it comes from Northern US. Asia pacific region is still under growth phase, where India stands very minimal market share.

I am in full favour of bringing a special policy by government on Seed Treatment as 'Norms for Seed treatment' which will directly boost adoption of right seed treatment per crop in scientific way resulting in increased plant population in farmer field which will ultimately result in

higher yield and less cost. Currently our Seed Act is very old (1960) and as such there is not any black and white provisions for various forms of seed treatment (seed coating, seed Pelleting, Seed encrusting, seed priming etc) and it's quality related minimum standards. Disclosure of given seed treatment on packet of seed is also not specified and very clear. So a lot changes are required in terms of policy related to seed quality in country and if Govt. of India place a right policy frame work for this, then I am sure it will result in quick boost in yield with minimal cost at farmer level. As per general survey, if Seed treatments are made compulsory in all kinds of seeds in the country, then it may help to save on average 5 per cent plant populations in farmer field which will give direct 5 per cent yield increment at national level.

With increasing demand for Organic food globally, there is tremendous pressure to develop 'Organic Seed Treatment'. There are organic seed disinfectant as well plant growth booster in the form of root and shoot enhancers. There are organic antifungal agents already available as seed treatment applications. But for Indian market, there is still a long way to go since concept of Organic farming is in infant stage and with increasing demand I think those organic seed treatment product and services will be available for India as well.

Indian seed industry has immense potential to grow further in seed enhancement market because of two obvious reasons. First it is still under adaptation stage for novel seed technology in current seed market and Second it's fastest growing seed market with double digit growth every year. We see India as emerging market for Seed treatment and seed enhancement.





# SWEET REVOLUTION

**S**tevia cultivation is garnering worldwide attention due to the health benefits of this miracle plant which is a zero calorie natural alternative for sugar. When the whole world is embracing this crop, India should also catch up to this trend especially when the climatic conditions of this country perfectly supports stevia cultivation. "Climate and soil of many states like Punjab, Haryana, U.P., Uttarakhand, North East region etc. are suitable to grow this crop. One acre of stevia cultivation can produce sugar equivalent to 36 acres of sugarcane. Water requirement as compared to other traditional crops is very low which is around less than 50 %. Very small quantity of pesticides or insecticides are required that too organic. They can be easily grown organically. At the minimum, they provide double the income as compared to other traditional crops like wheat and paddy. Besides, stevia sweetener is 300 to 400 time sweeter than



sugar and does not have any calories and good for diabetics and is health conscious people", says Dr RPS Gandhi, Chairman, GVS Biotech P. Ltd., who himself is a stevia farmer and pioneer in Stevia cultivation.

Stevia is endowed with many valuable medicinal properties. "It helps to maintain blood sugar level,

blood pressure, good for tooth decay, good for skin problems and most importantly it is an antioxidant. It has number of vitamins, minerals, amino acids etc According to him, there are many private companies and firms involved in propagating stevia cultivation among farmers. However, there is no accredited agency sup-





plying planting materials of stevia in India. Regarding marketing, Mr. Gandhi suggested contract farming with assured purchase with pre decided price for five years as a possible solution. Alternatively, governments can also make policies for marketing as this crop of international demand and many countries are looking towards India being an Agriculture State.

To spread awareness further, International Symposium on Stevia the Sweet revolution was held on 21st of April 2016 at Lovely Professional University (LPU) which was inaugurated by his Excellency Governor of Arunachal Pradesh, Jyoti Prasad Rajkhawa. The symposium in collaboration with Green Valley Stevia (GVS) Bio-Tech brought hundreds of leading industry, researchers, academicians, NGOs, farmers and entrepreneurs on a common platform. Scores of international delegates from different countries including the USA, Canada, Malaysia and more participated. International and national speakers discussed on present and future prospects of stevia cultivation across the globe. Addressing the delegates, students and faculty members, Hon'ble Governor Rajkhawa shared that diabetes is a great problem in India. He encouraged implementation of ancient Indian tradition not only in the country but at international level also to control the disorder. He said that different recommendations made at the symposium should be implement-



ed for the general benefit of all. He also desired that certification procedures for the growth of Stevia, from the internal agencies, should be liberalized so that it may be promoted among unemployed ones and poor farmers.

Welcoming all, LPU Chancellor Mr. Ashok Mittal referred diabetes as the mother of all other fatal diseases including kidney failures, heart attacks, hypertension, blood pressure and more. He stressed on the growth of Stevia which is natural sweetener and a great sugar substitute.

Dr. MJ Khan, Chairman, Indian Council of Food and Agriculture, who was the Guest of Honour appreciated the role of LPU in promotional endeavours of Stevia, and stressed that the farmers of Punjab should come forward to double their income through such valuable production. He also assured all that the deliberations and recommendations made at the symposium will be taken before the cen-

tral consultation committee soon.

The discussions and deliberations that evolved in this unique platform arrived at certain crucial points which would encourage Stevia cultivation in India. The forum echoed that stevia is a miracle plant and boon to the Indian society and to the world as whole. Averring that India shall be diabetic capital of world in coming years, the speakers urged to gear up for this challenge in a holistic way. It was pointed out that Punjab, the pioneer of green revolution, was suffering from a set back due to low yields and low income. Under such circumstances, stevia can be a powerful tool to gain income along with health benefits to the society. It was noted that, apart from income gains, stevia has brought a new ray of hope as an alternative and an artificial source of sugar to combat the aforesaid disease which has crept in our society because of our busy life style. Further, the speakers urged to create awareness among the students, academicians, agriculturists, pharmaceutical companies regarding health benefits of stevia. Also, it was recommended to develop collaboration between agricultural universities, industries and farmers for stevia cultivation, production and sale without the intervention of mediators to bring a win-win situation for all the stakeholders.

# NATIONAL ROUND TABLE ON FARM CRISIS AND FARMERS' DISTRESS AND DOUBLING FARM INCOMES BY 2022

30 April, 2016, India International Centre, New Delhi



In pursuance to the call of the Prime Minister Narendra Modi, Dr. M.J. Khan, Chairman of Indian Council of Food and Agriculture organised a high level meeting on April 30, 2016 at India International Centre under the chairmanship of Dr. M.S. Swaminathan with the participation from stalwarts in agriculture including directors of IARI, vice chancellors of state agriculture universities, senior scientists, farmers' organization leaders, civil society leaders and young researchers.

Dr. M.J. Khan introduced the context of the meeting explaining the challenges which Agriculture in India is facing. He referred to the Mem-

orandum of Understanding which ICFA has entered and referred on the request of the honorable home minister for a briefing on the deliberations of the meeting.



Dr. M.S. Swaminathan set the agenda rolling by stating that market and monsoon are the two major factors that influence the farmer. He said that market is also very volatile. He explained that distress is multidimensional and multidisciplinary. There is a social, economic, technological, gender and ecological of distress. He also pointed out that policy changes and framework like the pricing policy

and import export policy are also factors that influence farmers. "Agriculture progress takes place by synergy between policy and technology," said Dr. Swaminathan. He emphasised on the role of technology in agriculture and said it is the way to connect rural youth and agriculture. "If agriculture goes wrong nothing else goes right." and "Younger people will join agriculture if it is technologically driven" quoted Dr. Swaminathan.



S.K. Pattanayak, Secretary, A&C shared the role of policy and government in overcoming farmer distress and said that due to number of good poli-



cies such as Pradhan Mantri Fasal Bima Yojna, Soil Health Card programme, Pradhan Mantri Krishi Sinchai Yojna, we are able to overcome two major droughts.



JNL Srivastava, ED – IFFCO Foundation and former Secretary, Agriculture shared various points in national report on farmers and discussed the importance of role of state govt in farming policies. He said combination of multiple activities should be taken up by the farmer and a supplementary system should be there for income assurance. He opined the need of skill development program and emphasised the need of good institution along with good policies. He recommended that action should be taken at village level through ground level institutes like KVK.



Sh. Krishan Bir Chowdhary, President, Bharat Krishak Samaj strongly recommended use of natural resources in judicious way.



Dr. RB Singh Chancellor, CAU and former Member, National Commission on Farmers opined that soil and water is community's responsibility of. Every farmer should be issued a soil healthcard.

Dr. P Joshi, South Asia Director, IFPRI Chairman, APEDA was of the view that drought management should be done in non-drought season. He listed causes of distress like declining size of land holding leading to crowded and unviable agriculture. He suggested various steps like revival of RKVY, more warehouses, more cold chain, watershed development and water harvesting, ensuring drinking water to every house, adopt PPP model in canals management similar to power and road sector. He suggested bundling of insurance

products like it should cover 5 year of crops instead of 1 year. He said aggregation of farmers is important like farmer producer organisation should be promoted.



Vijay Sardana head – F&A, UPL Group said that food security plan of the country as well as of state is missing. He also said that farmer commission report is not yet implemented yet because it lacks execution plan. He stated that there is lack of leadership at every level and plan of action is lacking. He also said that private sector intervention in dairy and poultry is lacking which should be improved.



Sh. Ravi Verma, MP and Chairman ICFA Parliamentary Forum suggested that a lot has been said and discussed at various forums and sessions of parliament about condition of farmer and ways to improve it but it is not in organised form, there is a need to compile and document all discussions year wise.



Mr. Anand Bhaskar Rapolu, Member of Parliament emphasised on the need to recharge

tanks, ponds, wells and bore wells.



Sh. Salil Singhal, Chairman, PI Industries Ltd. conveyed that farmer knows what is good for him but the challenge is the sense of fear about industry involvement in agriculture. Speaking about pesticide industry he said that lack of quality input is prevailing due to excessive registration of agrochemicals. He claimed that 50000 registrations have been done last year which is leading to low quality and spurious chemicals to come up.

Sh. A.K. Sikka insisted on enhancing the preparedness this year for drought in coming years. He pointed the need to rejuvenate the existing system instead of creating new structure. He stated that area specific regionally differentiated solution is required. "Fringe forest management should be focussed to save forest area near villages and get supplies of water fuel and fodder from it," he said. Lastly, he suggested a PPP model in command water management for better coordination and convergence.

The session was followed by a National Round Table Meet on Doubling Farm Incomes by 2022.

Prof. MS Swaminathan opened the session by enlisting steps to







double farmer income like increasing marketable surplus, increasing average yields, focussing on special agriculture zone, increasing scope of women in agriculture, women empowerment and enhancing scope of improving family income by identifying new opportunities. Dr. SL Goswami, VC, Agriculture University, Banda focussed on the issue of farmer community suicide due to distress. Dr. RC Srivastava, VC, Rajendra Agriculture University emphasised on reducing cost of cultivation to increase farmer income. He said labour cost, fertiliser cost, irrigation cost can be reduced by various activities. Mr. R.P.S Gandhi, CMD, Green Valley Stevia focussed on stevia farming and its potential in increasing farm incomes. Dr. HS Gupta, Director General, BISA enlisted various ways of doubling farmer income like bringing down cost of cultivation, improving price realization, increasing efficiency of agriculture, adopting integrated farming system, value addition, inclination towards horticulture as it gives income as well nutrition to farmer family and gives buffering capacity during crisis. Dr. S Sadamate, former Advisor agriculture, Planning Commission focused on improving extension services of agri allied activities. He emphasized the need of upscaling and providing entrepreneurial backup. ShRakesh Tikait raised various issues faced by farmers and ways adopted by farmers to meet their demand. He suggested consolidation of various departments under agriculture and urged to increase production of any crop that the government should guarantee farmer a higher price. ShRajaram Tripathi said that we need to focus on untapped crops and low cost high value crops which are demanded by global market and can fetch better price. Prof. M.Moni, Chairman, ICFA Working Group on ICT suggested that strengthening of ongoing Digital Networks for Farmers (DNFs) viz., AGMARKNET, AGRISNET, NADRS, FISHNET, APHNET etc., is essential to facilitate "ICT4Ag" on a large scale in the country. Sh Vijay Sardana suggested maximum governance and minimum interference. He emphasized on the need to review all laws and policies related to agriculture and study their relevance in today's world. Mr. RG Agarwal, Chairman, Dhanuka Group said that our extension system has collapsed and technology is not reaching farmers. He said there are 5 lac agricultural input dealers in the country which can be given training and they can become extension agents and reach out to farmers. Dr. HP Singh, Chairman, Confederation

of Indian Horticulture he said there is difference in interstate yield thus scope of improving productivity and income is there. He emphasized the need of crop diversification and inclination towards horticulture.

#### **The deliberations generated recommendations which include the following:**

- Government must secure remunerative price for the produce of the farmer in order to adjust to let farmer secure profit for his business.
- Skill India programme should be aligned for building skills of the farmers and agriculture workers.
- KVKs should be tasked with the number of farmers whose income would be doubled.
- Per hectare productivity has to be increased using innovative means such as organic farming where cost of input is reduced for generating larger profit to the farmers.
- Concern for irrigation, soil health and ground water recharging is important. 100000 villages to be targeted for this is wonderful initiative of the prime minister. This needs to be achieved for all village with best natural resource management practices.
- Green manure, vermicomposting for improving soil health through reducing chemical fertilizers. For this, protection of cattle value chain for all is needed.
- Food processing organizations should be formed across the rural areas in order to let farmers produce processed good. Civil society organizations should be encouraged more for forming food processing organizations at the district level.
- Farmers should have share in the profits of their produce through remunerative price. Subsidies should reach the account of the farmers instead of going to the fertilizer companies.
- GDP growth rate in Madhya Pradesh with better irrigation needs to be replicated. Animal Husbandry should be improved through improving indigenous breeds.
- All scientists should be encouraged to adopt 5 villages each.
- Need for project mode of operation instead of programmes
- Need to generate slogans like 'Kisan Banega Crorepati'
- National Farmer Commission Report should

be implemented in full, especially the recommendations for land tenure system, establishment of village knowledge centres, attracting and retaining youth in agriculture, making marginal farmers viable through the support from CGIAR,FAO and UN System.

- Soil, moisture and water balance has to be attained nationwide through creating water preservation structures on a war footing.
- Markets for Bihar and Odhisha have to be developed with creation of all support for the markets through cold chains and warehouses.
- Management of canals should be by securing due payment for the use of water.
- Extension service has to be dynamic engaging more and more youths, women and farmers.
- Farmers need to have sense of the new agribusiness profession. Government of India should be finding innovative means for promoting farming as an agribusiness.
- Farmers' income can be increased with sustainable intensification, crop diversification, more industrial corridors
- States need to have reform in order to have funding from World Bank for programmes which are directed for realizing income enhancing goals of the farmers. Precision farming should be adopted at all India level.
- Food security plan need to be made by all states.
- Technology approval should not be linked to ICAR .ICAR should not be the body for approving technologies.
- We need to eliminate social conflicts, improving farmer and farm worker relationships.
- Farmers should be registered at Mandis.
- Village level professionals are



needed for assisting farmers with all the best practice, technologies and weather forecasting.

- Farmers are not ready to sit together and therefore, there is need to work for social cohesion and brotherhood establishing social peace.
- Need to create value chain for herbal produce documenting all herbs for securing IPR.
- Farmers need to be protected from the vagaries of the open market in order to secure long term sustainability for food and nutrition security of India.
- Gender inclusive agriculture has to be the focus in order to secure attention on women farmers.
- Ecologically compatible agriculture is the need of the hour since, we need to weather secure agriculture for food and nutrition security. Recharging of open wells, seed availability with protection of indigenous climate smart seeds and assured seed supply are important.
- Open market proposal for creating India as one food zone has been responded by 12 states. More responses would enable India being one food zone with freedom for movement of goods across the states securing one agriculture market.
- 100 per cent FDA is welcome and this should enable farmers

get more value for their produce since production would be best sourced out with zero waste for the produce.

- We need to learn from China and Israel for accelerating growth of farm produce and farm income. For this, we need to have a new vision for educating youths attracting them for generating better GDP.
- We need to eliminate spurious pesticide while promoting organic farming using biopesticides , vermi composting and organic manure.
- Democratic functioning has to improve with the cooperation of all political parties in order to generate hope, building idealism for social cohesion and peace eliminating generation of hatred among communities and castes.
- Agriculture must be promoted as an enterprises building on the marginal land holders through value addition to produce, diversification of crops, bio mass generation, peri urban agriculture, special agriculture zones, greater attention to women in agriculture, benefitting from MNREGA through creation of water preservation structures, technological empowerment of women, credit cards.
- Adoption of area specific strategies would be best for making

best out of agriculture for the farmers.

- Weather proofing agriculture for regions such as Bundelkhand would be important through contingency arrangements, precision irrigation and fertigation system, bringing glamour to agriculture through attracting and retaining youth in agriculture securing agriculture from the vagaries of monsoon through crop insurance, promoting alternatives through animal husbandry and MNREGA works creating assets for marginal small holders.
- Annavrata system is letting cows roam around destroying the crops. This is the reasons farmers need freedom to trade their cattle and traders need securing for their cattle.
- Zone with low produce, low productivity and low profits need to be attended for reducing input cost. Paddy transplantation cost could be reduced through DSR technology, targeted fertigation, and implementation of MNREGA plus Swachh Bharat Abhiyan programmes. Irrigation cost needs to be reduced through micro irrigation, land levelling, using electric equipments instead of diesel.
- New crop production could be encouraged like Stevia production.
- With the increase in carbon sequestration, we need to have success in skill India campaign with focus on agriculture based training for farmers and youth in order to supply the necessary skills required for doubling farmer's income.
- States need to be involved in promoting the cause of doubling farmer's income on war footing by promoting farm mechanization and hybrid seeds.
- Promote solar energy generation ,use of solar pumps , renewable energy, creation of renewable energy infrastructure assisting the farmers through programmes and project engaging civil society organization for disseminating the best combination of the programmes using mobile technology.
- Need to have low hanging fruit through cold chains aggregating high value production.
- Technology mapping for socio economic groups in order to deliver the best set of technologies to farmers, focused and segregated training programme, research and input services, Integrated pest management, Integrated nutrient management and climate change technologies.
- Timely payments for sugarcane produce for the farmers.
- Check dam on the rivers for retaining water in order to irrigate land.
- Farmer Happiness Index should be developed for measurement and suitable corrective action.
- Roads, power, IT and Highways should be secured for enhancing the income of the farmers.
- ICAR research methods should be revamped like CSIR and universities should be publishing their findings in all languages such as Hindi, Urdu reaching niche linguistic groups in the preferred languages in the form of usable knowledge.
- Use of social media and youth groups.
- Appropriate laws protecting land leasing business securing ownership to land owners.
- Precision farming and provision of real time data for farmers.
- Target setting for water harvesting , sustainable agriculture production system
- AMUL like cooperatives to be promoted in all states.
- Ease of doing agriculture business should be the new focus for government and all stakeholders.
- Price and weather forecasting should be undertaken
- Removal of slaughter ban in order to reduce the population of stray cattle responsible for destroying crops. Alternatively sexing semen so that only female calves are born.
- Poultry should be promoted through provision of eggs in the schools for children.
- Quality control of the nursery and breeder farms.
- Data based management of agriculture operations for widening access to information eliminating uncertainties of the farmers.
- Use of community radio stations, folk medium for disseminating information on the means for enhancing income of the farmers with proactive and inclusive functioning of the panchayats.
- Review of the laws which are outdated modifying EPMC rules or changing them for securing income enhancement of the farmers.
- Revival of the extension system with compulsory training using cluster based approach.
- Formation of food processing organization securing best training of the farmers engaging more organizations in delivering the same with end to end hand holding and support.
- Agriculture should be on the concurrent list
- Securing participation of the farmers' organization in policy building and implementation.

Dr. Ashok Dalwai, Additional Secretary, Government of India responded to the recommendations through expressing the earnest desire of the government for moving forward with the steps needed for doubling the farmer's income. Dr. MJ Khan suggested that a small group would be meeting the Prime Minister for sharing the recommendations.



## Spurring Self Sufficiency

K.P. Mohanan, Kerala's Minister for Agriculture was able to make inroads into the dwindling farmlands of Kerala. His interventions could improve the state's resources in agriculture. Smitten by the 'Anand Model', he was keen to evolve a similar model in increasing the milk production in the state. His efforts constantly stirred the state towards attaining self sufficiency in vegetables. Safe to Eat food was his dream and the state is close to achieving this fete.



**K**.P.Mohanan, Kerala's Minister for Agriculture, Animal Husbandry, Printing and Stationery had assumed the position in 2011 in Oommen Chandy cabinet. A member of Socialist Janata (Democratic) Party (SJD) based in Kerala, Shri Mohanan joined the ruling coalition, Congress-led United Democratic Front after the elections. As a minister, K. P. Mohanan handles portfolios of Agriculture, Soil Conservation, Soil Survey, Warehousing Corporation, Agricultural University, Animal Husbandry, Veterinary University, Printing and Stationery.

Born to Kerala's former Minister Late Shri. P. R. Kurup and Late Smt. K.P. Leelavathy Amma in Puthoor in Kannur district of Kerala on 3 March 1950, Mohanan completed his studies from Nehru College, Coimbatore. Holding an Aeronautical Engineering Diploma, he worked as Editor-in-chief for 'Padayani Daily', a National Socialist evening newspaper in Malayalam. Interested in photography, Mohanan also had a brief term in his career in the field of Photography, Film processing and sales in the colour Labs named as Vegas and Salam Studio & Stores in Qatar.

Mohanan's political career was a progression of his family lineage. He followed the footsteps of his father, P.R. Kurup, who was a prominent politician of his times. Mohanan's political choices were a bit different from that of his father's. He started his political career as a member of ISO, the Student's Organization of socialist party and went on to be the state treasurer of ISO. He was an active participant of many students' movements and agitations. He became the member of Janatha party when it was formed, and was elected as the Kannur District Secretary of Yuva Janatha. He became the member of National Working Committee of Janatha Dal and Janatha Dal State committee.

K.P Mohanan became the MLA of Peringalam in the year 2001 and 2006 on board of Left Democratic Front (LDF), a coalition of left leaning political parties in the state of Kerala. Later, owing to differences with the LDF, K.P Mohan along with Virendra Kumar left the coalition and competed in Kuthuparambu constituency in Kerala assembly election held in 2011, where he defeated LDF independent candidate S.A Puthiyavalappil with 3303 votes.

Following the formation of new ministry, K.P Mohanan became the Agricultural Minister of Kerala in 2011. He is also the State Parliamentary Board President and State Committee Member of Socialist Janatha party.

The Minister as soon as he assumed the power initiated many progressive reforms in the field of agriculture. The Kerala State Agriculture Department had set a one-month deadline to complete a series of agri-reforms programmes initiated by the government in 2012. The projects included generating farm related employment at Panchayat level, implementation of mechanization process, high-tech farming and setting agri-kiosks across all districts in the state.

K. P. Mohanan had also maintained a non-tolerance policy on the issue of conversion of farm-lands, "We will not allow anything that will harm the progress of the agriculture sector in the state," he had warned. Moreover, he was instrumental in increasing the land under agriculture in Kerala, a state which has been witnessing a rapid decline in area under agriculture. In the year 2012, the state was able to increase cultivation in 400 hectares of farm lands that were lying barren. The agriculture sector in the State had registered a Gross State Domestic Product growth of 5.26 per cent in 2014. The production of paddy went up to 5.376 lakh tonnes. The productivity of other crops such as coconut, cassava, mango, pineapple and other fruits and spices, including pepper, ginger, and turmeric, also registered an impressive growth. The domestic vegetable production had gone up to 11.9 metric tonnes.

He is also a proponent of organic agriculture and he nursed the ambitious plan of transforming the state into organic by 2016. He was also involved in a drive to promote processing of agricultural products under the "Safe to Eat" brand. The falling Rubber prices was another challenge that he faced which was effectively circumvented by the timely intervention of the department. With subsidy and procurement policies, the rubber growers fears were allayed.

His achievements as a minister and MLA were impressive which won him the first award instituted by Kerala NRI centre state committee for "People's MLA".

**“The government must take immediate action to prepare a good weather code to optimise the benefits of good rainfall”**

**MS SWAMINATHAN**

Founder, MS Swaminathan Research Foundation



**“Climate change is a real episode and most likely it can inflict tremendous losses in a number of cases. South Asia is one of the most sensitive regions in the world in terms of natural calamities”**

**RADHA MOHAN SINGH**

Agriculture Minister



**“Indian market is not a perfect market and prices in the country may not move in the same way as international prices”**

**SHOBHANA PATTANAYAK**

Agriculture Secretary



**“We need to realise that India is already under water stressed conditions where per capita availability of water is 1,545 metre cube per person per year as per the 2011 census, down from 1,820 metre cube in 2001. Most of the basin in western part and peninsular India where water is scarce have per capita availability of less than 1,000 metre cube per person per year”**

**GS JHA**

Chairman, Central Water Commission