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A. Rehman

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DESIGN

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E-mail: editor@agriculturetoday.in  
info@agriculturetoday.in

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## Celebrating the SEED!

While growing up in an engineering college staff campus on the outskirts of Prayagraj, we had the luxury of living amidst luscious greenery and a riot of brightly coloured flora... Right from flaming red Gulmohar trees to sunshine-spreading sunflowers and heavenly fragrant mogra.

Little was I aware that the fascination of running behind silky hairy seeds of Madaar floating in the wind, sticking xanthium seeds on friends' sweaters, hanging tiger nail seeds on our pets, gently rolling balsam pods between fingers to burst them... and the thrill of watching a plumule and radical sprout from bean and gram seeds on soaked cotton would lead to a graduation in agriculture and later to agriculture journalism.

Adding several interesting, intellectual and professional dimensions to this origin of food, we feel delighted in presenting the November edition on SEEDS.

Seed is the basic and most critical input for sustainable agriculture. The response of all other inputs depends on quality of seeds to a large extent. It is estimated that the direct contribution of quality seed alone to the total production is about 15-20%, depending upon the crop. It can be further raised up to 45% with efficient management of other inputs.

The developments in the seed industry in India, particularly in the last three decades have been very significant. A major re-structuring of the seed industry was carried out by the government through the National Seed Project Phase-I (1977-78), Phase-II (1978-79) and Phase-III (1990-1991), which strengthened the seed infrastructure. This could undoubtedly be termed as the first turning point in the shaping of the organized seed industry.

The private sector has started playing a significant role during the last few years. Almost 500 small, medium and big groups are engaged in the seed business.

Their main focus has been on the high-value, low-volume seeds like Maize, Rice, Wheat, Sunflower and Cotton. The market for low-value, high-volume seeds of cereals, pulses and oilseeds is still dominated by the public sector seed corporations.

We applaud Indian scientists and farmers who are also working towards developing new varieties and painstakingly preserving the traditional ones. Agriculture Today Group is delighted to announce the first ever **INDIA SEED AWARDS 2020** to recognize excellence in the domain of SEEDS. These awards shall be conferred to celebrate efforts that have made significant contributions in the sector and positively impacted lives of millions of farmers.

Please follow us on <https://www.agriculturetoday.in/isa/> for details and updates.

Happy Reading

*Mamta*



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# Unlocking the Potential of Trade and Agribusiness

## New Agri Legislations to Power Growth

**P**owered by the newly passed legislations and sitting on the sentiments of buoyancy with 3.4% growth during first quarter of Covid19, India's farm sector is set to unlock its potential and unleash an array of agribusinesses, benefitting all stakeholders in the agri ecosystem. By posting a positive growth agriculture during the Covid19 period when the overall economy is down by 24%, has created a sort of record by a sector, which has often been termed as laggard on the Indian economy for long.

Indian agriculture has over the years grown to enter into the phase of sufficiency and surplus from the situation of deficit in most agri produce, in the last one decade. This warranted shift in our overall policies from production to post production, which required primarily the reforms in our market policies to unleash the potential of trade to deliver for the farmer. However the continuing production centric and regulated market policies resulted into the evolution of the exploitative systems, causing great sufferings of farmers in most parts of the country.

The three legislations aim at opening up the markets, creating choices for the farmers as well as the trade and giving reasonable assurances for conducting business. When all the three legislations looked at holistically and in unison, show great promise for correcting the market distortions and giving choices to farmers to sell with the existing Mandis, contract with corporate or choose to relate and rely on the emerging institution of FPOs. While all other sectors are enjoying the fruits of liberalisation and market reforms since 1991, agriculture had to wait for almost 30 long years. Compared with China, which did agri marketing reforms under President Deng in 1980, India is late in reforming its farm sector and delivering its fruits to farmers by 40 years.

It is time that all key stakeholders come together to accelerate efforts and make up for the time lost by creating more FPOs and agri startups, speedily entering into partnerships and investing into value chain and logistics infrastructure for increased value addition and efficient supply chain to power the trade and agribusinesses. Towards this end and with the objective to bring in proactive cooperation and coordination across all the stake holders in agriculture, Indian Chamber of Food and Agriculture has launched India Agri Export Council.

IAEC aims to serve as a common platform for exporters and other key stakeholders to discuss their challenges that may arise out of domestic policies or global instabilities, and formulate appropriate strategies and action plans. IAEC will take up the issues of the Indian exporters to a larger audience, facilitating a collective bargaining potential and exploring newer opportunities. The Council also seeks to work with farmers in helping improve cost and quality, provide with GAP certifications and connect them with exporters. We hope these measures will push India to achieve its target of reaching 60 billion USD by 2022 and 100 billion USD by 2025, as per the target set by Prime Minister Shri Narendra Modi.

**The author is Chairman of Indian Chamber of Food and Agriculture and can be reached at [chairman@icfa.org.in](mailto:chairman@icfa.org.in)**

**DR. MJ KHAN**

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# FROM THE EXECUTIVE EDITOR'S DESK

FROM THE EXECUTIVE EDITOR'S DESK



RAJNI SHALEEN  
CHOPRA

## Farmer leaders must not stall Centre's efforts to stem stubble burning

**I**t is a matter of deep concern that opposition of farmer bodies towards the new farm bills is impeding efforts to stem stubble burning.

In newspaper reports over the last many years, farmers who gave up stubble burning admitted to significant improvement in farm yield. Better yields came with adoption of stubble management techniques, and acted as a powerful incentive for more and more farmers.

Farmers who choose to give up stubble burning harvest paddy with a combine harvester equipped with a 'Super SMS' (straw management system). This cuts the stubble in half and scatters it on the field. Farmers use mulcher machines and rotavators to mix the stubble with the soil. Thereafter, wheat is sown with a zero till drill machine. Farmers are hiring machines from cooperative societies or custom hiring centers. The major expense is on diesel because all these machines are tractor-mounted. It costs the farmers Rs 1,500-2000 to manage every acre of stubble. Since fields are not parched by burning, the need for irrigation is less, saving on water and diesel cost.

Various studies have acknowledged that farm fires aggravate pollution in north India and also in the National Capital Region. It is dismaying that leaders of farmer organizations who are opposing the farm bills have decided to oppose the Centre on its move to control the pollution caused by stubble burning.

In media reports, farmer leaders are still insisting that there is no solution to stubble burning. It is confusing how they are making this claim, while farmers who wanted to give up burning stubble found workable and rewarding solutions.

According to a report in The Indian Express on October 30, Punjab recorded 23,177 stubble fires till October 29. It is a matter of concern that there has been a 38 per cent increase in the cases of stubble burning as compared to last year. Farm fires recorded till October 29, 2019, numbered 16,734.

Amritsar broke its five-year record of maximum stubble fires in a season by recording 2,035 field burning incidents till October 29, 2020. The previous high was 1,788, which was set by the district in 2016. This was the time when Punjab Remote Sensing Centre started recording the stubble fires through satellite. Over the previous high recorded in 2016, this year saw a 14 per cent increase in farm fires. The maximum stubble fires in the state this season have been recorded in Tarn Taran (3,561).

It is understandable that farmers are opposing the farm bills driven by the fear that the practice of MSP for select crops shall be discontinued. But farmer leaders must lend their support to the initiatives to control stubble burning, and not stall it.



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# SEED QUALITY ASSURANCE BOOST CAPACITY BUILDING, TESTING



Government of India has been emphasising on strengthening the seed testing infrastructure in the country. The government has introduced several progressive schemes like Sub-Mission on Seed and Planting Material since 2005-06. As part of these schemes, the government is providing financial support for strengthening and modernizing infrastructure for seed production, storage, certification including seed testing and encouraging labs to obtain ISTA accreditation by improving technical competency. In addition, many SAUs and ICAR research institutes have developed own seed testing labs to test the basic planting material under the various schemes of the government.

Financial assistance is provided to state governments / union territories to obtain the membership of International Organization of Seed Testing (ISTA) in order to strengthen the seed industry, seed certification agencies and promote the export of seeds. The primary purpose of ISTA is to develop adopt and public standard procedure for sampling, testing seeds certification, and to promote a uniform application of these procedures are obligation for the seeds moving in international trade. GOI has been providing financial assistance to state governments as grant in aid to obtain ISTA membership, accreditation and also to equip with the required men and material.

The private sector is also investing more on seed testing infrastructure. Most companies have developed in-house

## ABOUT THE AUTHOR

Dr. K. Keshavulu, Director, Telangana State Seed and Organic Certification Authority and Managing Director, Telangana State Seeds Development Corporation, Department of Agriculture and Cooperation, Government of Telangana, Hyderabad has been elected as Vice-President of ISTA for the first time from Asian continent.



seed testing facilities. About 20 seed companies (national & multinational) have advanced seed testing facilities to meet quality requirements of the global seed market. Despite these, we need to improve the efficiency of our laboratories in terms of uniformity of results, technical competency, build-up of skilled and qualified human resource, policy changes etc. The following are some steps that can be taken in this regard.

**1. Strengthening and modernising seed testing infrastructure:** The number of notified laboratories authorized to test seed samples to regulate the quality of seed distribution varies considerably in different states. For successful seed production or the seed law enforcement programmes, it is desirable to establish one or two laboratories with modern facilities and well-trained staff in each state. It is necessary that STLs are maintained with good infrastructural facilities as per ISTA guidelines and standards. At least one STL in each state should be developed as a model lab to specialize in advanced testing methods apart from routine seed testing.

**2. Widening the scope of seed testing labs:** Apart from routine tests, STLs have to be made competent to carry out additional and advanced seed testing requirements of the modern seed

industry like a seed vigour, health, phytosanitary facilities, PCRs, electrophoresis etc. STLs in the country need to be updated with regard to methodologies and well equipped as per the needs of the modern-day seed industry.

**3. Vision of Uniformity in Seed Testing:** NSRTC Varanasi has been making efforts towards achieving uniformity in test results throughout the country such as comparative testing of the 5% samples, monitoring of STLs and providing capacity building. These efforts should be intensified. Some policy decisions need to be taken such as no transfers of technical staff in labs to other departments, mandatory regular update to ISTA rules especially for advanced seed testing methods and promotion of seed technology education to ensure availability of technically qualified personnel as seed analysts. To achieve this, there is need to work closely with all state laboratories both in public and private sector and assist in the adoption of ISTA rules. For this purpose, a separate entity may be created or NSRTC Varanasi may be given the new role of coordinating seed testing activities in both public and private sector to achieve uniformity in seed testing.

**4. Technical audit system for STLs:** There is a need to have a mecha-

nism/system for auditing the STLs functioning in the country by the experts. This needs to be done with respect to seed testing procedures and documentation as per international (ISTA) procedures to improve infrastructure facilities and human resources. It should be done annually. The status of seed testing labs and their functioning in the country must be assessed annually.

**5. Revision and updating of seed testing handbook:** There have been incredible changes in the field of seed testing in particular and the seed industry in general. There is a need to revise existing seed testing handbook in accordance with global changes. The tests and protocols recommended need to be updated with modern testing methods, as per the needs of the modern seed industry.

**6. ISTA Accreditation:** India has only six laboratories accredited to ISTA. There is need to improve our competence in assessing seed quality testing through ISTA accreditations. Efforts must be made to obtain ISTA membership and accreditation for at least one laboratory in each state to cater to the needs of the seed industry and international seed trade. The accredited laboratories can act as referral laboratories for facilitating seed exports and also to encourage the OECD seed certification in the country.

**7. Regular capacity building programmes:** Seed testing is a systematic and highly technical job in ensuring the genetic, physical and physiological integrity of the seeds delivered to farmers. Therefore, well-trained stewardship is required in quality assessment. ISTA is evaluating new technologies for determination of seed quality and need to gear up our capabilities in validation and use of these technologies to improve quality seed supply and international seed trade. In this regard, there is need to have regular capacity building activities on seed testing aspects to update the knowledge, skills and to build-up technically competent human resource in testing. These shall lead to improvement in quality seed production and supply systems in the country.

# PROTECTION OF PLANT VARIETIES HIGHER CROP PRODUCTIVITY, VALUE OF SEED TRADE

Any crop variety is propagated for its multiplication as a means of production of the seed or seeding material. This represents the variety genotypically and descriptively in its form and performance. Thus, it is essential that the protection of the seed or seeding material is within the control of the plant breeder. It is also vital to recognize and acknowledge the tradition of efforts of farmers, to maintain as their heritage some varieties of crop species which either originated or were introduced during the formative years of modern India.

The involvement of intellectual property rights was non-existent in India till we joined the World Trade Organization (WTO). After signing the membership document of WTO, India acceded to the need to acknowledge IPR as an essential requirement for innovation-led growth of the country. Varieties in commerce became part of the same.

During the discussions and agreement formulation of the establishment of WTO at Marrakesh, Morocco, the Trade-Related aspects of Intellectual Property Rights (TRIPS) Agreement as Annexure 1C was signed as the Marrakesh Agreement on April 15, 1994. Article 27 of the TRIPS Agreement was to be complied by all member countries for the establishment of an effective system for protection of



plant varieties, the rights of farmers and plant breeders. The purpose was to encourage the breeders to grow economically through competitive development of new varieties of plants. It was also important to protect the farmers' interests and their rights on the seed they procure, without losing on any of the advantages they enjoyed traditionally.

A Statutory Authority was set up in compliance to TRIPS in 2005 by India, by the enactment of the Protection of Plant Varieties and Farmers' Rights (PPV&FR) Act in 2001 (53 of 2001) under the sui generis system. Globally, PPVFRA (2001) is the only Act and the only Authority that gives farmers their right on the material they have conserved or bred, in addition to the plant breeder's rights, which is equivalent to plant breeder's rights elsewhere and more. PPVFRA also recognizes the access and benefit sharing inclusive of the farmers' rights on the plant varieties. This precedes the treaty known as International Treaty on Plant Genetic Resources for Food and Agriculture (ITPGRFA). PPVFRA is the only legislation globally which fully respects the farmers' rights and benefit sharing as required in the Treaty while protecting the varieties and Plant Breeders' Rights at the same time.

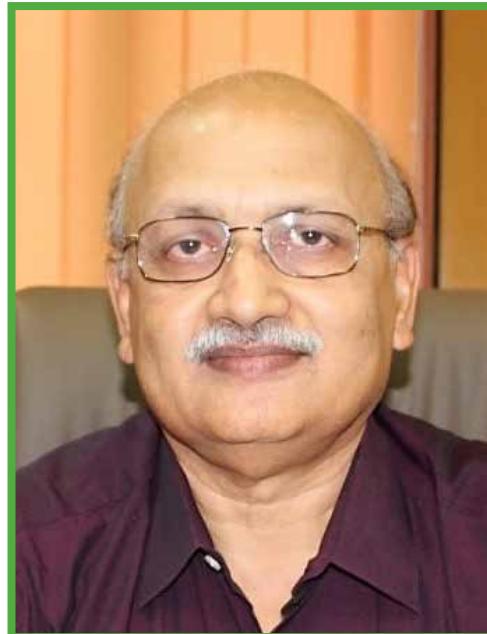
### Objectives of the Authority

- To establish an effective system for plant varieties, rights of farmers and plant breeders; to encourage development of new plant varieties
- To recognize and protect rights of farmers in respect of their contribution made at any time in conserving, improving and making available plant genetic resources for development of new plant varieties
- To protect plant breeders' rights to stimulate investment for research and development in public and private sector for development of new plant varieties
- To facilitate growth of seed industry, ensure availability of high quality seed and planting material for farmers

### Activities of the Authority

The Authority promotes and encourages development of new varieties of plants. It provides the scope for claiming performance-based commercial value of the variety

### ABOUT THE AUTHORS



**Dr KV Prabhu, Chairperson, Protection of Plant Varieties and Farmers' Rights Authority (PPVFRA), Ministry of Agriculture & Farmers' Welfare, GOI**



**Dr TK Nagarathna**  
Registrar, PPVFRA



**Mr Dipal Choudhury**  
Joint Registrar PPVFRA



**Mr Raj Ganesh**  
Legal Advisor PPVFRA

**fun FACT**



**While working, Dr Prabhu is plugged to earphones playing Hindustani Classical Music, especially Bharat Ratna Pandit Bhimsen Joshi so that he is not distracted other routine disturbances and is able to concentrate without losing rhythm and pace (as the raga rendition moves rhythmically from vilambit ek taal to dhrut teen tal!!) While documenting serious subject matter, music works like a background score in a climax scene where split second decisions match with the crescendo, especially when Panditji is accompanied by Ustad Zakir Hussain on tabla!!**

by enabling plant breeders to protect their intellectual efforts in developing new varieties. The Authority comprises a Registry for the registration of new and extant varieties. This is done after notification of the crop species and developing the Distinctiveness, Uniformity and Stability (DUS) guidelines. The guidelines are based on morphological or measurable specific traits, characterization and documentation of varieties registered, cataloguing of farmers' varieties and other varieties known. It also takes the responsibility of ensuring that seeds of varieties registered under this Act are available to farmers at reasonable rates. When required, the Authority can compulsorily license the registered variety if the breeder, assignee, agent or licensee of such variety does not arrange for production and sale of

the seed at reasonable price and in time. The Authority also takes the responsibility of maintenance of a National Register of the registered varieties.

### **Commercial and Productivity Enhancement**

Every novel invention or technology enables organized and strategic planning of focused profits due to the novelty-based value addition to the product that is exclusively marketed by only licensees. Similarly, every plant variety protected will enable the producer breeder and the consumer farmer to ensure higher value returns. This is because the new variety seed will be made available only by chosen authorized producers and sellers by the right holder breeder. This ensures that every seed packet sold is genuine and contains authentic seed. Each local seller also knows that he would be supplied with the goods by the registered right holder breeder only after a licensing agreement. The seed can be sold exclusively by the authorized entity as per the agreement in the concerned market.

The authorized entity can advertise as exclusive seller of a novel variety, whose performance failure has compensatory backup support possibility to the farmer. Similarly, the farmer can look forward to quality seed, and shall be encouraged to buy seed from authentic source with assured quality as well as guaranteed performance as given in the literature on the packet. Even if the farmer pays a little more than the open market seed of other varieties, he knows that he is buying new variety seed with performance guarantee compensation, and that he can reuse the seed at least once more if the performance is competitively better.

This way, the farmer shall attain improved productivity. Experienced farmers buy fresh seed each time rather than reuse their own. They know that compensatory support is only on fresh seed purchased and not self-saved seed produced from last harvest. This activity has to be harnessed by public and private plant breeders by strategically pricing their protected variety, and distributing these in

agronomies compatible with the variety's performance.

### **Registry Branches**

PPV&FRA is headquartered at New Delhi. Ease of registration is facilitated through five branch offices of the Registry in the country. These are at Pune (Maharashtra), Shivamogga (Karnataka), Palampur (Himachal Pradesh), Ranchi (Jharkhand) and Guwahati (Assam). One more needs to be opened for the Northwest UP and UP/MP at either Lucknow or Varanasi, that the Authority may set up in consultation with the Ministry.

demand among farmers is bound to rise. Thereafter, producers and distributors shall be eager to sign agreements with the plant breeder to expand their market presence by supplying the seed of the variety.

To ensure consistent decision making for every notified crop species, the Authority has set up about 130 DUS test centres with adequate project staff for different crops. Their mandate is to test the applicants' variety for protection, maintaining and multiplication of reference collection, with total confidentiality. Each candidate variety and its comparator



Each branch is notified with its jurisdiction of geopolitical region comprising specific States and/or Union Territories. PPV&FRA is also a quasi-judicial authority.

### **Market Access, Reach of Variety**

DUS testing is carried out to verify the Distinctiveness (D), while remaining pure genetically uniform (U) and genetically stable (S) over two seasons. This gives the variety tremendous strength and value by getting declared as a variety distinct from any other existing variety in trade or public domain. That alone is a unique powerbase in a competitive market where registered seed sellers, producers or distributors invest easily and liberally. Each one will be the exclusively empowered agency related to trading with the variety.

If the variety has some unique value in the form of a trait expression or productivity above the existing average,

is double-coded, that is beyond the knowledge of the registrar as well as the test centre. Every citizen of India including competing plant breeders are enabled to look at the entire profile of varieties under test for their range of morphological features or variability potential in the crop for coming years. This option can be used for effectively organizing one's own breeding programme with an eye on focussing for novelty and trait value. Therefore registration for protection will trigger the potential for enhanced trade value development for the variety registered.

### **Significance of the Authority**

It has been seen globally that wherever plant variety protection has been put in place protecting the IPR of plant breeders, the country's agriculture and farm incomes have gone up. More plant breeding companies have established

## Duration of Protection of Varieties in India

Category	Period of Protection (No. of years)		
	Total	Initial	Extended
Trees & Vines	18 from date of registration	9 from date of registration	9 more years from the initial period of protection
Other Crops	15 from date of registration	6 from date of registration	9 more years from the initial period of protection
Extant Notified varieties	15 from date of notification of variety under the Seeds Act, 1966 by the Central Govt.		

their presence with increased investment in R&D. In many developed nations where the seed business is generally in the hands of private sector, the seed industry is vibrant with high annual returns and consequential investment on R&D to produce new varieties. In India, even though the Seeds Act (1966) facilitated a mechanism for variety notification in India, it was with the perspective of notifying the variety as suitable and for setting up seed quality and standards. There was no provision for protection of the ownership of the varieties till 2001 when the PPVFR Act came up.

According to industry information, approximately US \$ 45 billion worth seed business is handled by developing countries. Developed countries have an upper hand in terms of advanced variety improvement technology investments and products. These advantages can be easily transferred to developing countries like India for value addition to existing crop species for the trait improvement, without having to reinvent or invest to the same extent. This is possible by registering varieties compatible to Indian agronomic conditions directly for plant breeders' rights in India and commercializing it.

If the variety background is not suitable for Indian production systems or conditions, the trait can be transferred after protection of the variety in India. This can be done with the help of Researcher's rights with appropriate benefit sharing with the original plant breeder. The breeder has the right on the variety carrying the trait or in the case of hybrids, use of the variety as one of the parents or source for developing the parent carrying the value-added trait under licensing agreement.

Several such instances are available elsewhere such as the dramatic success in the Netherlands in ornamentals and flower crop varieties commercialization. This became a leading business where both seeding materials and commercial products volume grew hand in hand with the protection systems.

In USA, Australia and most developed countries of Europe, farmers have mega farm holdings. These countries saw major contributions in varietal development by national or multinational seed companies, and found it convenient for compliance to TRIPS Agreement to join the existing intergovernmental mechanism of breeders rights protection system that existed since 1961, at least three decades before WTO and TRIPS came into existence. The system is known as UPOV (International Union for Protection of New Plant Varieties, Geneva set up under UPOV convention by the World Intellectual Property Organization, Geneva).

India could have joined UPOV as a member without having to enact the PPVFR Act, but for the only reason of non-inclusion of the rights of farmers or minimal rights of farmers in the UPOV.

For India, denial of farmers' rights of necessary subsistence or imposing impractical restrictions for them would be a big concern, since agriculture is our single largest source of livelihood. Also, farmers are the most natural and directly participating group in vouching for a variety's suitability given a chance to plant new varieties. It is the farmers' right to save, multiply, share their seeds and even sell as harvested farm produce. Every farmer who has the means to purchase would like to buy fresh seed available

every time. This mechanism never hurts a company unless it is driven by malicious exploitation of farmers. The latter activities are covered well under infringement in PPVFR Act, and where the farmers' rights do not operate have been clarified by the Authority's FAQ.

Because of this seemingly obvious conflict of interest between plant breeders and farmers, India decided to opt for sui generis system. India set up its own protection of varieties system through a legislation integrating formal and informal plant breeding efforts of the population.

## Status of Applications and Registration of Varieties

The application for registration of plant varieties in India was begun in 2007. Till September 2020, 17011 applications have been received for registration of varieties. Of these, 11,052 belong to farmers and 5959 belong to plant breeders (3906 of which are from private industries). A total of 4202 have been granted registration, of which 2451 varieties are owned by Plant Breeders and 1751 varieties by farmers.

It is firmly ascertained that through this Act, there is national commitment to recognise the need to protect plant breeders' rights and to stimulate investment for research and development, both in the public and private sector. There is commitment for the development of new plant varieties without compromising on the traditional rights enjoyed by farmers in maintaining seed, selecting for differences of expression of important traits to constitute a new variety or even breed, using their wisdom to identify desired phenotypic expression.

PPVFRA (2001), in a significant large departure from UPOV, integrates the traditional heritage maintaining actions of farmers with the modern plant breeders' application of the science of genetics including biotechnological tools in breeding new varieties. This protects the interests of both farmers and breeders in a harmonious and symbiotic manner. This is a win-win endpoint for farmers and the industry representing public or private enterprises.

# ASIA VEGETABLE INDUSTRY CHALLENGES IN 2020, WAY FORWARD



The Asia and Pacific region includes major seed-trading countries such as China, India, Japan, South Korea and Australia. The compound annual growth rate (CAGR) of Asian seed market is approximately 10 – 12% (source : Phillips Mc Dougal Seed Service). More than US\$ 3.4 billion (bn), or \$1.43bn in exports and \$2.04bn worth of imports for seed sowing purposes was traded in the region in 2019 reported by UNCTAD/WTO (ITC). This equates to about 15.7% of the global seed trade in 2019. The global seed market was to the tune of US\$ 69.8 billion in 2019 and is expected to rise to US\$ 86 billion by 2023. Field crops (cotton, corn and soybean) account for most of this value; but the vegetable seed market has grown the fastest in the past 5 years. Therefore, considering overall growth, this region is one of the fastest growing markets compared to other regions mainly due to the increasing consumption of animal fodder and need for commodities.

#### International trade in sowing seed, quarterly 2017-2019.

Analyzed data included most types of commercially-traded sowing seed logged by the International Trade Commission (ITC), with some exceptions and omissions

In term of landscape, farmers in the Asia and Pacific region have an average landholding of 1 hectare which

#### ABOUT THE AUTHORS

##### Dr. Kanokwan Chodchoey

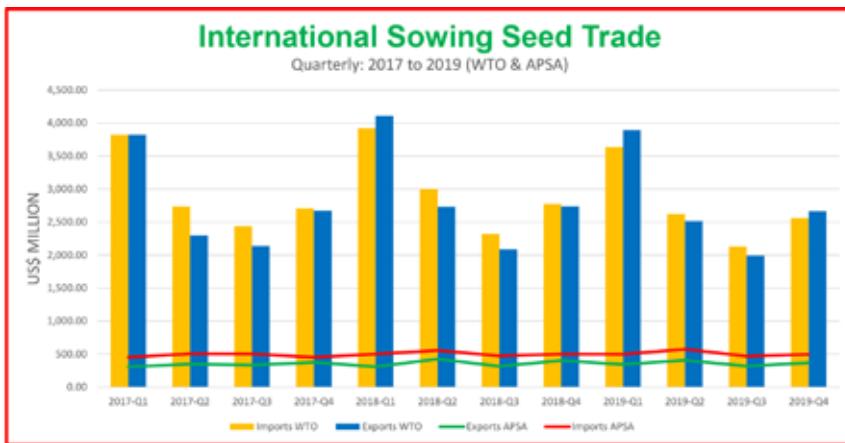
Executive Director, The Asia and Pacific Seed Association (APSA)



Mr Steven Layne,  
Communications Manager,  
APSA



Dr. Pepijn Schreinemachers,  
Agricultural Economist, World  
Vegetable Center, Thailand



The graph shows how seed trade values in the APSA region during a recent three-year or 12-quarter period have been relatively stable when compared to trade by all WTO countries, which has fluctuated. Source: International Trade Centre of the UNCTAD/WTO (ITC).

is the smallest of all regions in the world (FAOSTAT). Seed quality and well-performing varieties that can withstand the stress environment and diseases are important factors for farmers. The report of Enabling the Business of Agriculture (EBA) conducted by World Bank in 2017 stressed the importance of plant breeding, variety registration and seed quality control as an indicator of seed systems strength and used to rank countries. Among the 62 countries analyzed in the EBA, Korea was ranked 8, followed by Philippines ranked 11. India ranked at 21. Most of countries in Asia were ranked from 21-59.

When the World Health Organization declared the COVID-19 outbreak a pandemic on 11 March 2020, few expected that containment measures would cause long-term havoc. Strict lockdowns in the early phase of pandemic had a strong effect on food and agriculture, but measures were subsequently relaxed in many countries and the broader effects from the economic downturn became more prominent. Still, as the final quarter of 2020 nears, international traffic in the Asia and Pacific region remains severely restricted. This particularly affects the transport of sowing seed, which relies on an efficient system of production, inspection, and delivery to distributors. This ultimately impacts the farmers, whose sowing period is limited

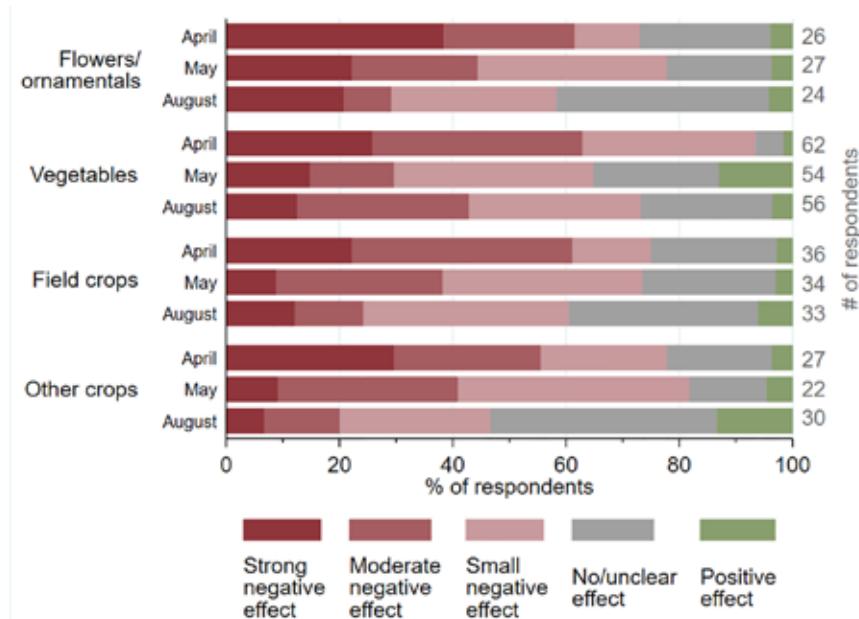
to specific windows dictated by seasons and resource availability. Disruptions to this system can potentially have severe consequences to food and nutrition security. Therefore, a study was conducted to gauge the effects of COVID-19 on the seed sector in the Asia-Pacific region, monitor for changes and trends so as to anticipate outstanding challenges, and thus devise coping strategies moving forward.

APSA and World Vegetable Center conducted an online survey of seed companies that are members of APSA and with operations in the region. Surveys were conducted in April, May and August 2020. Results for the

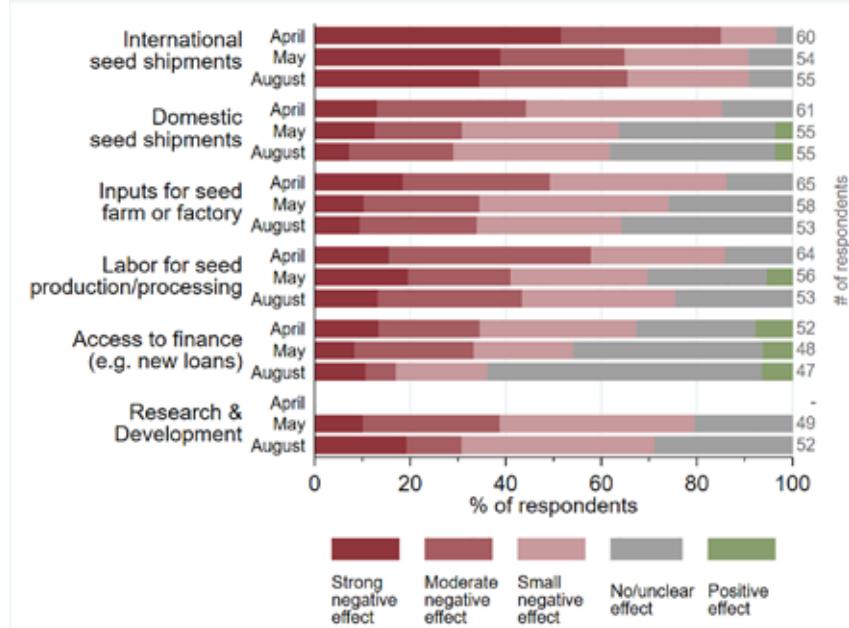
earlier surveys were reported by APSA and World Vegetable Center. The third round collected responses from 73 seed company executives, 59 of whom represent seed companies with main operations in the Asia-Pacific region and 14 are from outside the region. Of the respondents, 64% represented companies with less than 100 employees. The questions in the third round were recommended by ISF and OECD seed scheme to get a deeper understanding of the challenges faced in the Asia and Pacific region in order to review the plan for seed sector development moving forward.

Of the respondents from the Asia and Pacific region, 58% reported a negative effect on the demand for seed for flowers and ornamentals, 73% for vegetable seed, 61% for field crop seed, and 47% for seed of other crops. Hence, there continues to be a negative effect on the demand for sowing seed. When we asked responders to give the view on the impact of COVID19 on the business operations of seed companies, the results from 3 rounds showed that the situation had improved in May with fewer companies reporting moderate-to-strong negative effects. A noticeable improvement is in the access to finance with 36% of respondents reporting this as a problem in August.





**Effect of COVID-19 on the demand/sales of sowing seed for major crop categories during April, May and August 2020 as reported by APSA members in the Asia-Pacific region**



**Figure 3. Effects of COVID-19 on seed company business operations during April, May and August 2020 as reported by APSA members in the Asia-Pacific region**

The figures stood at 54% in May and 67% in April. In terms of research and development, 71% of respondents reported difficulties in August while 80% had reported problems back in May.

Among all factors seed companies are facing, the international seed movement showed strongest negative

impact. Key constraints to seed exports are finding freight solutions (58% of respondents) as international air traffic remains very limited in the Asia-Pacific region, costs have increased and transport is unreliable. Courier services, needed to get the paperwork at the destination on time, also continue to be a key bottleneck as reported by



53% of respondents. Other important constraints reported by over a quarter of respondents include difficulties in the preparation of seed shipments (a problem reported by 29% of respondents), acquiring import permits (34%), getting customs clearance at the port of entry (39%), seed distribution in the destination country (31%), and other problems (27%) (Figure 4).

The third round of the survey added several open-ended questions to allow respondents to provide more details about challenges as well as to suggest medium- and long-term coping strategies and solutions. Challenges expressed in the latest round generally echoed those noted in the first two rounds. Both logistical and administrative delays continue to fuel concerns about increased costs, and delays in getting seed to market. There are best practices the companies have been implemented as a short-term solution to cope with this situation.

Moving forward, public-private partnerships, private-private partnerships and cross-sector cooperation (consumer, farmer, seed producers, seed company, food processors) will be critical to shoring up agro-food and input supply chains, especially through more efficient platforms and standardized systems through the seed supply chain. This is emphasized in FAO's new COVID-19

Response and Recovery Program, which calls for \$1.2 billion in initial investment in several key priority areas.

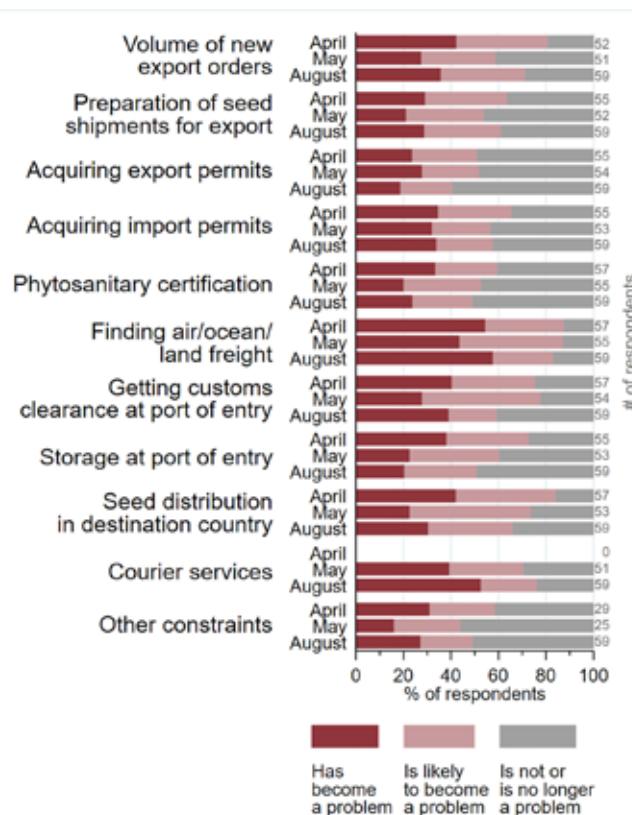
Among them are improving data for decision making; bolstering trade and food safety standards; boosting smallholder resilience for recovery, and triggering food systems transformation. The importance of harmonized standards and digital tools was also highlighted in APSA's 6th Expert Consultation on Phytosanitary Collaboration in the Asia-Pacific, held on August 26.

During this online meeting, there was overwhelming consensus and support among industry representatives and officers of National Plant Protection Organizations (NPPOs) for the need to implement electronic phytosanitary

## Recommendations for Covid Response in Seed Sector

The following are the recommendations shared by responders and National Seed Associations (FSII, SAP, ASF, PSIA, CNSTA, ASTA and ANPROS):

- Give higher importance of digital platforms
- Create awareness among the growers about the right crops to be planted which can give them sure sales. Link the growers with retail and food chain companies
- Promote advertisements on the importance of seed in life and necessity for future generations to encourage seed producers and our customers
- Focus on internal systems improvements, staff training, financial focus on stock control, customer analysis, so usual business functions that you can control, so we are ready to face a post Covid cycle
- Ephyto certificates and on-line forward clearance is important to adopt internationally. Also, there should be global harmonization of phytosanitary regulations for seed borne diseases
- Global, regional and national cooperation will be critical in assuring food and nutritional security
- The seed industry should continue to push their governments to recognize seed as part of the critical infrastructure
- Policies and regulations should not hamper the movement of seeds. Government should provide green channel for agricultural inputs
- Transparency and information sharing regarding any human and plant health issues
- Investment in infrastructure for adequate and safe storage of agriculture product and agriculture related inputs at trading ports



certification systems (ePhyto), utilize third-party lab-testing accreditation models, and adopt a Systems Approach with regard to ISPM 38 on the international movement of seed. There is also still a need to ensure the new innovative breeding tools can be unlocked through a science-based policy so the yield and nutrition can be increased as more food is required to reduce hunger. Indeed, such initiatives have not only helped to ensure seed supply for many companies and countries during the pandemic, but promise to improve the lives and livelihoods of millions to overcome other challenges (agriculture land reduction, less water resources, climate change, new emerged diseases, increase of poverty and hunger etc.).

Figure 4. Effect of COVID-19 on the international seed trade during April, May and August 2020 as reported by APSA members in the Asia-Pacific region

# BRAND INDIA EMERGING GLOBAL SEED PRODUCTION HUB

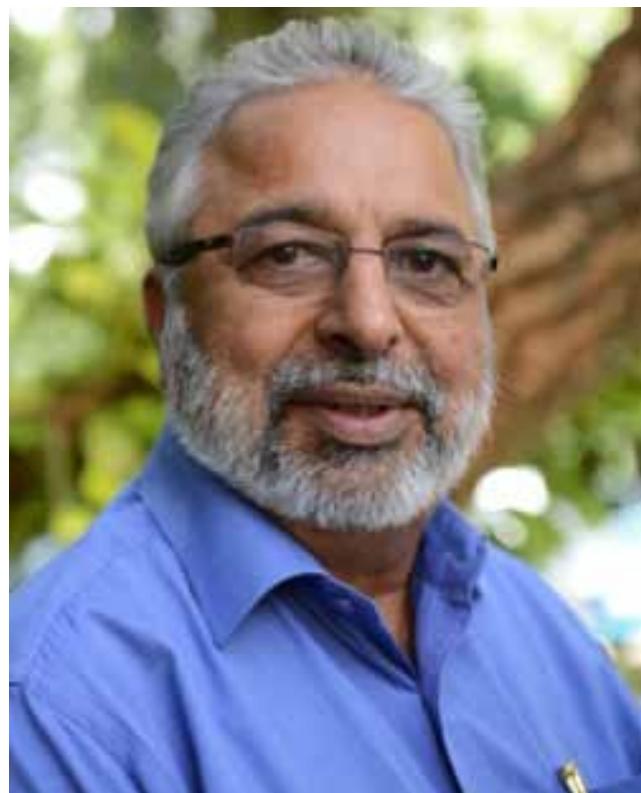
**T**he Indian seed industry is mature and vibrant, and ranks high among the global seed economies. It was valued at USD 4.8 billion in 2019, having grown in the last five years with a double digit CAGR. In contrast, the global seed industry worth around USD 60 billion has been reported to be growing at a CAGR of around 7%.

The Indian private seed sector has focused on collection and utilization of an enhanced breeding base due to improved access to the global germplasm wealth of the MNCs and the various technology partners. Creation of crop specific consortia platforms by International Rice Research Institute (IRRI), International Crop Research Institute for Semi Arid Tropics (ICRISAT) for pearl millet and World Vegetable Center (earlier AVRDC) for vegetable crops has further broadened the

germplasm base. With such germplasm strength, Indian seed industry is now equipped to develop seeds suited to meet any crop production requirement anywhere.

Indian seed industry, both public and private, has laid stress on production of quality seeds. The private sector particularly has invested heavily in building international standard seed infrastructure facilities for processing and storage. There are more than 100 seed testing laboratories in the country. These include six laboratories with accreditation by International Seed Testing Association (ISTA) including five in the private sector, and ensure effective quality assurance. India's membership of the Organization for Economic Cooperation & Development (OECD) seed schemes since 2008 has enabled us to enlist our varieties in OECD list of varieties for international business. Exports under OECD started in 2018 to Middle East, Africa, Russia and South East Asia.

Indian farmers have established the credibility of the products of Indian technologies. Their adoption of the Bt cotton hybrids, with the technology covering nearly 95% of cotton and emerging as the second largest exporter of cotton (a significant change from being a net importer) or doubling of maize production in ten years period (2001-2011) through use of single cross hybrids, are examples of the value of Indian products. Recognising that seeds represent the most critical investment, the introduction of Okra Assurance Scheme as insurance against yellow vein mosaic virus and Okra leaf curl virus, clearly establish the farmers' confidence in products offered by Indian seed companies. The availability of several advanced GM lines for insect resistance in vegetables like brinjal, cabbage, cauliflower,



## ABOUT THE AUTHOR

**Dr Narendra Kumar Dadlani** is a horticulture expert with more than three and a half decades of professional experience in research and development. He has worked as a Floriculture Scientist at Indian Agricultural Research Institute, New Delhi. He has also been a freelance consultant serving both national and international (UN-FAO, UNDP & ADB) programs, as International floriculture/ horticulture expert in India, Bangladesh, Myanmar, Vietnam, and Lao PDR



okra, besides corn, rice and for important diseases in tomato, groundnut etc., which have potential markets in countries where production of GM crops is permitted.

### Low share in global trade

While India is at a high rank in the seed sector globally, its share in international trade is still low. Various reports put the figure between 1-4 % of the global trade worth USD 14 billion. In recent years, the balance of seed exports and imports has changed. Now the seed exports are higher than imports. The reduced imports may be regarded as import substitution. They add to our trade value for exports. India has been a dominant player in the SAARC seed market.

India can become a hub for seed exports with its achieved expertise in seed production and established value of products. Establishment of R&D facilities and seed production facilities by several world leading vegetable seed companies in Karnataka, Maharashtra etc., indicate the suitability of India for vegetable seed production and exports.

In the Access to Seeds Index 2019 Report for South & South East India, out of the ten top seed companies of the region, four Indian companies were contributing significantly to the efforts to support smallholder farmer productivity. They have also developed breeding programs to suit the preferences and needs of this important group.

There are two avenues for seed

### fun FACT



**My stress busters are gardening and listening to old Hindi songs.**

**The lockdown provided me the time to indulge in these after a long break. Playing Santa Claus to my grand-daughter is another favourite pastime**

exports, through custom production of seeds and exports of cultivars suited for crop production in other countries with similar climates.

Custom production of seeds in India started long back when a leading American seed company contracted a new Indian seed company to multiply and produce their flower seeds for North America and European markets. Many companies located outside India give production orders to Indian seed companies and supply parent seed. The Indian company exports the production back to the foreign company. This can pick up well if the Indian regulatory system permits movement of parental lines and the produced seeds removing the present restrictions on registrations, etc. based on separate documentation. This would be required more in case of custom production of GM seeds, which are not permitted for commercial

production in the country.

### Policy support essential

India has been exporting seeds for production to AARC and other countries with similar climates for some time. Its exports of seeds to Bangladesh, Nepal, Pakistan, Sri Lanka, Myanmar etc., both formal and informal, has increased in recent years. India's exports of vegetable seeds to some African nations have constituted significant portion of those countries' imports. These exports can pick up fast if we streamline export formalities and speed up clearance approvals from National Biodiversity Authority (NBA). Also, we need to encourage vegetable seed exporters to build up protected seed production facilities (under greenhouses) by providing financial assistance. Construction of dry ports facilities closer to production centres like Bengaluru, Hyderabad, Aurangabad, etc. shall facilitate quick movement of seed.

India has the potential, as also recognized by the Access to Seeds Index (2019) report for South & Southeast Asia. We need appropriate policy framework in place to support such activity. Creation of a National Seed Export Promotion Council, as also recommended by a National Seed Stakeholders Meeting early this year, would help accelerate the process. The Council can coordinate with relevant agencies for policy changes and formulations of required processes and protocols.

# ENHANCING SEED TRADE FUTURE OPPORTUNITIES

Indian seed industry is a vibrant sector with reasonable levels of scientific temper and technical competence. But 60-65 % of seed in use are farm-saved or unlabelled. Hence there is immense scope for growth.

The gains from the five decades of experience in starting and managing sound seed programs should be properly applied and extended to launch and successfully run seed programs in newer crop groups.

In India's tribal and agro-biodiversity rich hilly regions, farmers' varieties are still popular. This may be due to excellent quality, therapeutic value, resistance to biotic and abiotic stresses, climate resilience etc. These varieties are the products of a dynamic natural evolution in the eco-system and are well adapted to the region, but they are not in the seed chain. Community Seed Banks (CSBs) to promote local varieties and Community Nursery Banks (CNBs) for planting materials of tree species are vital to promote materials preserved by farmers.

Our public research systems have generated a large number of varieties, especially for difficult situations such as problem soils with salinity/alkalinity, abiotic-stresses, floods, water-logging,

submergence, drought, erratic monsoon, heat etc. These must be brought into the seed chain in a consistent manner.

### **Immense export potential**

Countries with tropical and sub-tropical climates similar to India are our natural market, viz the SAARC region. Kenya, Zambia, South Africa, Zimbabwe, Tanzania, Ethiopia and other African countries are promising export destinations for sorghum, bajra, maize, paddy, cotton, sunflower, pulses and wide range of vegetables.

Since October 2008, India is a member of OECD (Organisation of Economic Cooperation and Development). This provides an international framework for certification

of agriculture seed in international trade. India has enlisted over 160 varieties in 37 crops under five OECD schemes. Scope for seed export of several of these varieties need to be explored.

Soil erosion due to rains weakens the slopes and bunds along railway tracks, bridges etc, especially in the Western Ghats, hill regions, mountain slopes along the roadways etc. Short plants species with good soil binding root systems or self-seeding plants will minimize erosion. The seed sector may identify such plants, estimate the seed quantity needed and make it available for broadcasting in areas of need, in coordination with the concerned departments.

Dhaincha, Sunhemp, Pillipesera,





## ABOUT THE AUTHOR

**Mr Vinod Kumar Gaur is Chairman and Managing Director (CMD) of the National Seeds Corporation since June 2013. He was earlier the CMD of State Farms Corporation of India. Dr Gaur has work experience of about 36 years in the fertilizer and seed industry**

Sesbania etc are our major green manure products. Green manure application is practised on about 6.7 m ha under rice, wheat, sugarcane, potato etc. Even at a modest average rate of 50 kg seed/ha, the total green manure seed used is about 33.60 lakh quintals. There is no reliable and consistent arrangement for assured and timely availability of quality green manure seed. Assuming even 10% requirement to be met by the organised sector, about 3.4 lakh quintals are needed.

Millets are climate-resilient and nutrition-rich. The key to millet promotion lies in a strong seed chain.

### Medicinal plants

India is the home for Ayurveda, herbal medicines and local health traditions. But there is no significant seed program for medicinal plants. Any seed program must have backup support of a strong crop improvement program. Superior genotypes for commercial user are available with National Research Centre on Medicinal & Aromatic Plants, Anand; National Botanical Research Institute, Lucknow; Central Drugs Research Institute, Lucknow; Central Institute for Medicinal & Aromatic Plants, Lucknow; Indian Institute of Integrative Medicine, Jammu; Tropical Botanical Gardens

**In India's tribal and agro-biodiversity rich hilly regions, farmers' varieties are popular, but they are not in the seed chain.**

**Community Seed Banks to promote local varieties and Community Nursery Banks for planting materials of tree species are vital to promote materials preserved by farmers**

& Research Institute, Trivandrum, Forest Research Institute, Dehradun, several traditional universities and many State Agricultural Universities etc. Suitable tie-up between the seed and pharma sectors will be mutually helpful. The seed program can start with seed-propagated medicinal plants such as Ashwagandha, Chandrachur, Isbgol, Kalmegh, Muskdahna, Sanai/Sonemukhi, Satavar, Tulsi etc.

With the awareness for consuming organically produced foods, organic crop production is gaining momentum.

The seed input must be organically produced. This is a major area of growth. In order to provide cattle with balanced nutrition, pastures- grazing lands can be sown with suitable combinations of grain-legume seed mixtures. Grass-legume mixtures are common in developed seed industries abroad.

Mixed cropping can be followed in suitable areas. Quality crop seed mixtures can be provided for the purpose. The merit of using Tissue Culture Plantlets is known, but their commercial crop production has not progressed much. This is an area of growth.

Farmers now prefer buying quality seedlings for direct transplanting. This practice is catching up. Specialisation in seedlings is a high potential area.

With increasing environment consciousness, use of bio-pesticides is catching up. This calls for growing such species that are involved in pesticide formulations. Quality seed of superior genotypes shall be favoured. A survey by the seed sector shall reveal the scope for trade in this area.

The organised seed sector is yet to handle seeds of flowers, gum guar, buckwheat, grain amaranth etc, and vegetative propagating materials of horticulture species. This is an area for attention.

## INDIAN SEED INDUSTRY

# WAY FORWARD: GM, MULTIPLE MODERN TECHNOLOGIES

The organized commercially traded seed industry in India is estimated to be Rs. 18000 crore approximately. This is no authentic estimate of the market size. These are estimates made by some members of the industry. This excludes the value of the informally traded and exchanged seeds. The Indian seed market stands at the fifth position in the world today with well developed breeding, production and marketing infrastructure and capabilities.

The public sector units, viz. National Seeds Corporation, Seeds Corporations of various states and others take care of the bulk of the supply of public varieties in essentially open pollinated crops like Soybean, Ground Nut, Rice, Wheat, Mustard, Pulses, Jowar and Vegetables. The private sector invested more in the development of hybrids in crops like Cotton, Maize, Sorghum, Pearl Millet, Rice, Vegetables and others. Private sector has more than 70% of the value share of the market. Both these sectors contribute to the food security of the country by catering to the needs of different sets of farmers.

Cotton and Maize account for about 16% each of the seed market. Vegetables are the largest segment with 35% share in the market. The Rice market consisting of hybrids and research varieties contributes to about 12% of the Indian seed market. Southern, western and north-western parts of the country are well developed seed markets. Bihar surprised everyone in the seed industry by becoming the most valuable market for Hybrid Maize. Hybrid Rice development happened



Gene editing has the potential to solve multiple challenges quickly. The information and know-how from various plants can be applied to make crop plants climate resilient, low input consuming, pest resistant and sustainable for the environment. Devastating diseases can be addressed using editing. Crops can be improved to yield better with lesser fertilizer and water inputs and withstand extreme climate conditions

more in traditionally low-yielding states in north and eastern parts of the country. Seed Replacement Rates have been going up rapidly in the last ten years in crops like Rice, Wheat, Soybean and Mustard.

### Technology and Research Landscape

Entry of GM technology and the passage of PPV&FR Act, coincidentally both happening in 2002, paved the way for a major change. Bt Cotton has transformed the cotton story of India. It has doubling the yield, tripled production and made India the largest cotton producer and exporter in the world. Protection of plant varieties has given the confidence to corporates to invest more in research. Despite this, our research investment is considerably lower at 4% of revenue compared to the International benchmark of 10-12% and needs to be stepped up.

Climate Change, preserving natural resources, increasing labour cost and stagnant yields will be the challenges of this decade. Research and innovation are the key to bringing cutting edge varieties and technologies to help the farmer in facing these challenges. The industry has to increase research investment to at least 8% of revenue by the end of this decade. The onus also lies on the government to provide a supportive implementation and enforcement of PPV&FR towards this end.

The seed industry must play a critical role in making research investments in some of the following areas, which, in turn, will drive the growth of the sector.

- a) Labour availability and cost issues have already increased the need for mechanization of farming. Varieties with suitable plant architecture for mechanization need to be developed.
- b) There is an urgent need to stop flood irrigation and move into large scale use of micro irrigation systems like Drip, Hose Reel, etc. Crop varieties suitable to such irrigation systems need to be developed to get the best results.
- c) Varieties suitable for new agronomic practices like Direct Seeded Rice, Minimum Tillage cultivation, High Density Planting Systems, have to be developed by the industry.
- d) We import significant amount of vegetable seeds for green house cultivation. There is need to bring a broad portfolio of veg crops for cultivation in greenhouses by developing suitable varieties through research efforts.
- e) Nutrition-enhanced foods will be in demand as the global population shifts to plant based nutrition in this decade. The new agri reforms that promote contract cultivation will help in ensuring an identity preserved supply chain system for crops produced with such output traits. The Industry must work on the development of such varieties.
- f) Special attention must be paid to oilseed crops to increase yields and enhance the country's edible oil production for import substitution.
- g) Improve the grain quality of hybrid rice, which should help in greater penetration of hybrids in rice. This will be critical to improving our rice yields to that of China and others.

GM technology provides solutions like Water

### fun FACT



- Loves the dhaba food along the GT Road. Especially the stuffed parathas. Makhan Maarke!
- Favourite city in the world: Paris
- Played Cricket. Pace bowling all-rounder!

Use Efficiency, Fertilizer (Nitrogen, Phosphorus) Use Efficiency, Insect Resistance and Herbicide Tolerance traits. These solutions save water and soils, reduce chemical pesticide use and provide better weed management systems. By efficiently handling these stresses, the crops shall be empowered to improve their yields. A combination of multiple modern technologies including GM is the way forward.

Besides identifying and collecting germplasm with variation, breeders have been generating random variations using chemical and radiation mutagenesis. In the recent years, gene editing (SDN1 type) has also been used to generate variations at a target genetic region. Double haploid technology is another way of characterizing variations. Post identification of variants, they are crossed and a population is generated for selection. Molecular techniques like MAS (Marker assisted selection) and GWAS (Genome Wide Association Study) help in bringing down the time, cost and effort in the selection process. In spite of all these technological advances the basics of breeding remain the same, with the requirement of multiple back crosses to remove the unwanted background traits.

Gene editing has the potential to solve multiple challenges quickly. The information and k n o w - h o w



Mr Ram Kaundinya is the Director General of Federation of Seed Industry of India



from various plants can be applied to make crop plants climate resilient, low input consuming, pest resistant and sustainable for the environment. Devastating diseases can be addressed using editing e.g greening disease of oranges, panama disease of banana, viral disease of tomato, nematode infections of soybean, etc. Crops can be improved to yield better with lesser fertilizer and water inputs and withstand extreme climate conditions. The first gene edited crops that are in the market carry improved consumer traits like better quality soybean oil and non-browning mushroom. Many other crops with enhanced consumer traits are in the pipeline, including low gluten wheat, high fibre wheat, tomatoes with enhanced flavour, berries without seeds and thorns, non-browning apples and potatoes etc.

If we want to be at the cutting edge of technology, we should invest in the above technologies. The regulatory regime has to support new technology introduction with predictable and science-based decision making. If we do not put this in place our farmer will be the ultimate loser, as it has happened with GM technology in the last ten years.

Research is driven by size. Large

investments are required to obtain good results from research programmes. A fragmented industry structure does not help this cause. The following measures can be taken urgently to achieve this:

- a) Research collaborations with other research organizations and corporates in India and globally
- b) Providing policy support for them to come and invest in India
- c) Intellectual Property protection
- d) Facilitative provisions in the Biodiversity Law

### Future Scenario

We are expected to maintain a CAGR of 10% through this decade, taking our seed market size to Rs. 50,000 crore approximately by 2030. Increasing hybridization, Seed/Variety Replacement and adoption of modern technology are expected to drive this growth. The new Seed Act will make varietal registration mandatory. This should improve the quality of varieties available in the market.

India should also aim for a 10% share in the global seed trade by following a specific strategy to build the country as a seed export hub which can deliver an export of Rs. 10,000 crore by 2030.

The industry should pay attention to seed production in order to meet future demand. Diversification of seed production areas and adopting modern technology in seed production will be very important. Modern seed treatment systems and seed enhancement technologies have to be brought in. International quality seed production for both domestic and export markets should be high on agenda. Respecting IP in seed production fields must become a part of our culture and enforcement mechanism.

Digitization of operations of seed companies will be required on a large scale during this decade. Seed traceability systems should be put in place to help in increasing exports of agricultural produce, processed foods and seeds. Human Resource development is another key area of focus to develop our organizations to be modern, ethical, legally compliant and farmer-centric.

The future cannot be an extension of the past. We have to think transformational to visualize a seed industry of the next level which will be confident and will deal with the world on equal terms.

# How do we feed a growing world population?

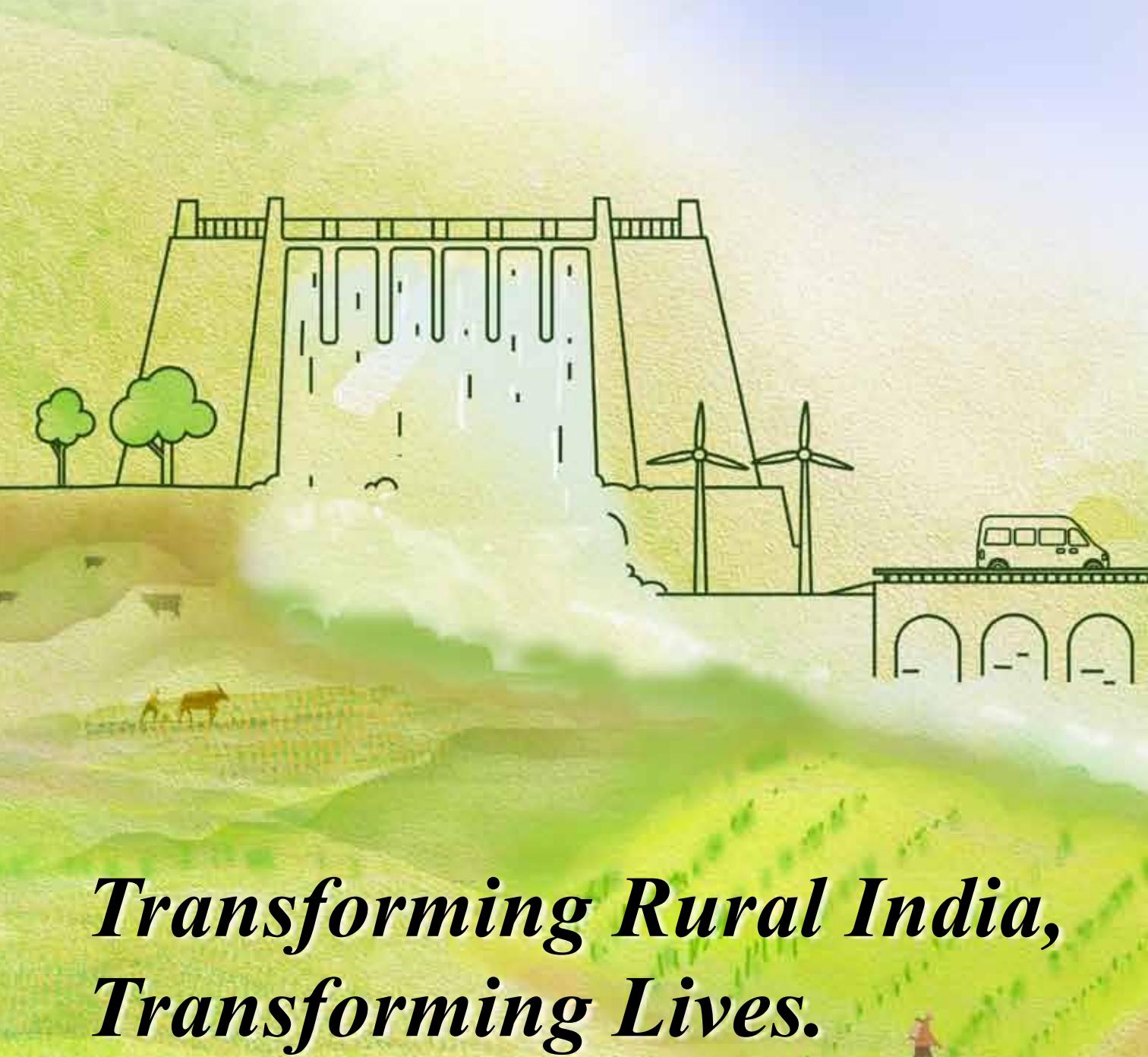


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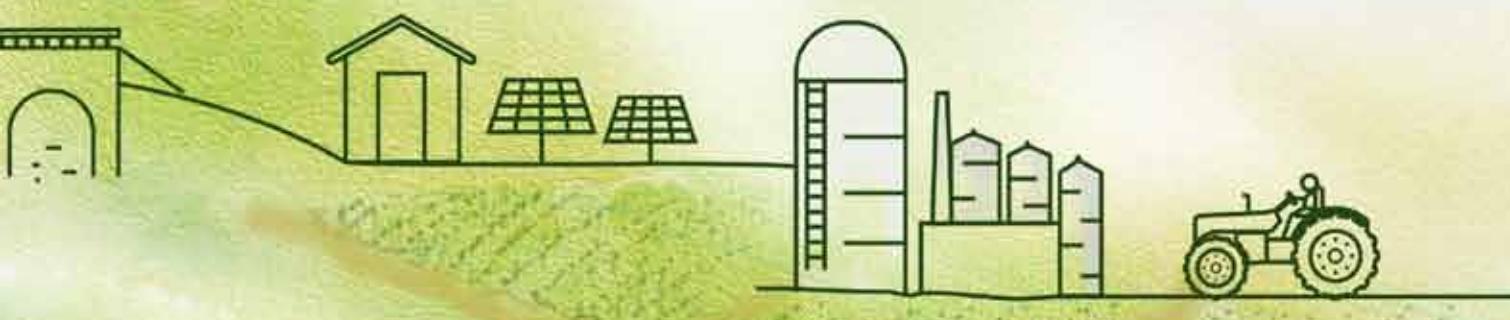
The world needs more food. By 2050, there will be another 2 billion people on our planet. How do we provide enough high-quality food and preserve our environment? At Syngenta, we believe the answer lies in the boundless potential of plants. We develop new, higher yielding seeds and better ways to protect crops from insects, weeds and disease. So farmers can get more from existing farmland and take less new land into cultivation. It's just one way in which we're helping growers around the world to meet the challenge of the future: to grow more from less. To find out more, please visit us at [www.growmorefromless.com](http://www.growmorefromless.com)



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# NAFED TO EXPAND SEED BUSINESS AIMS TO PROVIDE HIGH YIELDING QUALITY SEEDS TO FARMERS

**S**eed is the progenitor of the next generation for plants. For the farmer, seed is an invaluable asset for getting a good harvest. Indian philosophers and sages placed great importance on seed quality for a good harvest and prosperity. Quality seeds ensure strong germination, rapid growth and robust yield. Seed industry today is market driven and set to work with a 'farmer centric' approach. Following traditional methods, most farmers use leftover produce of the previous year's crop as seed for succeeding crop. Seeds often lose genetic purity and vigour after three to four generations which results in poor yield even after all the standard agronomic practices are meticulously adopted. The high cost and poor availability of certified seeds is a challenge

for farmers.

NAFED, the apex cooperative federation owned by the farmers of India through primary cooperative societies across the country, puts the requirements of farmers on the top of the priority list of its charter of activities. NAFED is one of the Central Seed Agencies of DAC&FW, GOI and has been undertaking distribution of certified seed mini-kits of pulses and oilseeds under the National Food Security Mission (NFSM)-Pulses and NFSM-OS&OP scheme of DAC&FW, GOI, with the overall aim of providing high yielding good quality seeds to the farmers.

## Key Seed Crops of NAFED

The key seed crops of NAFED are Groundnut, Soybean, Mustard, Linseed, Sesamum and Nigerseed for oilseeds;

Gram, Moong, Urad, Lentil, Peas and Arhar for pulses and Wheat, Barley & Paddy for foodgrains

## Seed production infrastructure

In order to augment its seeds business, NAFED has developed necessary infrastructure for production of seeds which includes seed processing plants and machineries for seed cleaning, grading, treatment, packing and godowns for storage. These are vital components for post-harvest operations to ensure maximum seed viability, vigour and health. There are plans for expansion of the facilities to meet the growing demand for quality seeds in India and across the world.

## Breeder to Foundation Seed Program

The seed production process gener-



Glimpses of Farmers' field under NAFED's seed production programme





**NAFED's Seed Mini-kits: (Linseed - 2 kg, Grams - 16 kg, Lentils - 8 kg)**

ally involves three generations, namely breeder, foundation and certified seeds. NAFED takes adequate safeguards for quality assurance in the seed multiplication chain to maintain purity of the variety as it flows from the breeder to the farmer. Breeder seed of recently notified seed varieties is purchased directly from ICAR institutions, Agriculture Universities, National seeds Corporation and other reliable sources. The allocation is done by DAC&FW, GOI, on the Seed Net Portal ([www.seednet.gov.in](http://www.seednet.gov.in)). This is a national initiative for information on quality seed. The purchased breeder seed is further multiplied into foundation seed through National Horticultural Research and Development Foundation (NHRDF), the sponsored organization and the research arm of NAFED. Empanelled seed producers of NAFED across the country are also engaged for this purpose.

### **Foundation to Certified Seed Program**

NAFED undertakes certified seed production program as part of the National Food Security Mission with respect to oilseeds and pulses. DAC&FW, Govt. of India provides financial assistance for the same. Around 75% of the assistance is meant for beneficiary farmers. For 2020-21 (Kharif/Rabi/Summer) seasons, DAC&FW has conveyed the administrative approval of Rs 7.80 crore

**NAFED is one of the Central Seed Agencies of DAC&FW, GOI. The Federation has been undertaking distribution of certified seed mini-kits of pulses and oilseeds as part of the National Food Security Mission (NFSM)-Pulses and NFSM-OS&OP scheme of DAC&FW, GOI, for the benefit of farming community and ensuring supply of quality seeds for better yields**

to NAFED as financial assistance for production of 15600 quintals of certified seed for pulses and Rs 3.95 crore for production of 15579.66 quintals of certified seeds of oilseeds.

### **Seed Mini-kits Supply Program**

In order to promote spread of new varieties of seeds of oilseeds and pulses among farmers, NAFED supplies seed mini-kits as part of Seed Mini-kits Distribution Scheme under NFSM-Pulses & NFSM-OS&OP of DAC&FW. Using the available infrastructure, NAFED aims to improve farmers' access to seeds, thereby leading to better yields and higher income of farmers. During Kharif & Rabi 2020, NAFED supplied 5122.04 quintals of oilseed mini-kits of soybean, Sesame, Mustard & Linseed. During Rabi and Summer 2020-21, around 1748 quintals of pulses certified seed minikits were supplied. Around 11 states, namely-UP, MP, AP, Gujarat, Haryana, Jharkhand,

CG, Odisha, Tamil Nadu, Punjab and Rajasthan are covered under the seed mini-kits distribution scheme of 2020-21.

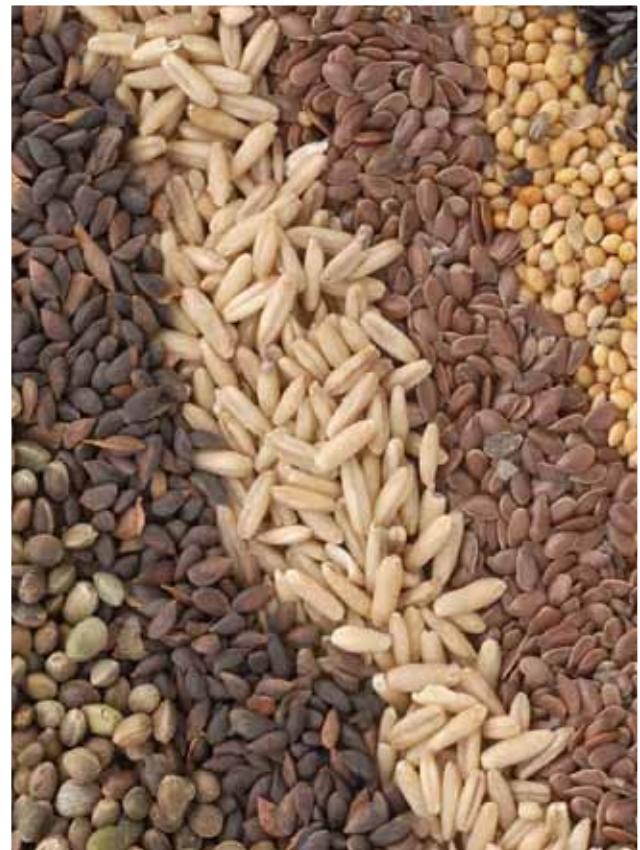
**Direct supply to state governments:**  
After contributing to the Seed Mini-kits Distribution Scheme of DAC&FW, NAFED supplies residual seed to state governments under general supplies through tenders and direct orders.

### **New Initiatives and Future plan: Seeds for Vegetables, Fodder, Green Manure**

NAFED is actively involved in the supply of seeds to government institutions and is in the process of expanding and strengthening the distribution network through empanelment of seeds producers and suppliers across the country. The Federation is also strengthening its seed production infrastructure. Recently NAFED has started marketing seeds of vegetables (Hybrids & OPV), barseem and green manure like Dhaincha.

## INDIAN SEED SECTOR

# POLICY INITIATIVES TO BOOST GROWTH



**Q**uality seed is the basic and most critical input for sustainable agriculture. The developments in the seed industry in India, particularly in the last 30 years, are very significant. It all started with the High Yielding Varieties (HYVs) programme for crop yield improvement followed by creation of national and state-level seed corporations, seed certification systems, seed legislation in the form of Seeds Act, 1966.

The National Seed Project Phase-I (1977-78), Phase-II (1978-79) and Phase-III (1990-1991) enabled the restructuring of the seed industry. The introduction of New Seed Development Policy (1988-1989) was yet another significant milestone for the Indian seed industry. This gave Indian farmers access to the best of vegetable and fruit seed and planting material available globally. The policy stimulated private and corporate investment in our seed sector. The seed companies laid emphasis on

high value hybrids of cereals, vegetables and hi-tech products such as Bt. Cotton. This gave farmers a wide product choice. Today, the seed industry is set to work with a farmer-centric approach and is market driven.

## MAJOR POLICY INITIATIVES

The following policy initiatives were taken by GOI for the seed sector:

- Grow More Food campaign
- High yielding varieties program
- Enactment of Seeds Act 1966
- Seed Review Team-SRT (1968)
- National Commission on Agriculture's Seed Group (1972)
- Launching of the World Bank-aided National Seeds Programme (NSP) (1975-85) in three phases leading to the creation of State Seeds Corporations, State Seed Certification Agencies, State Seed Testing Laboratories, financial support to private seed companies, Breeder Seed Programmes etc
- Seed Control Order (1983)
- Creation of Technology Mission on Oilseeds & Pulses (TMOP) in 1986, now called The Integrated Scheme of Oilseeds, Pulses, Oil Palm and Maize (ISOPOM).
- Production and distribution subsidy for seeds
- Distribution of seed mini-kits
- Seed Transport Subsidy Scheme (1987)
- New Policy on Seed Development (1988)
- Seed Bank Scheme (2000)
- The PPVFR Act 2001
- National Seeds Policy (2002)
- Formulation of National Seed Plan (2005)
- National Food Security Mission (2007)
- Rashtriya Krishi Vikas Yojna (2007)
- Revision of Seed Policy 2011
- Cotton Seeds Price Control (Order), 2015



## ABOUT THE AUTHOR

**Mr R K Trivedi** is Executive Director, National Seed Association of India. He has four distinct post graduations in Plant Breeding & Genetics, Seed Science & Technology, Law and Management. He was a topper in Plant Breeding & Genetics in JNKVV Jabalpur and in Seed Science and Technology at Massey University, New Zealand. He has worked as Registrar, PPV&FRA, Director, National Seed Research and Training Centre, GOI, Varanasi; Deputy Commissioner (Seed Quality Control, Ministry of Agriculture, Expert Agronomist in UN-FAO and International Seed Certification specialist in Royal Government of Cambodia. He is the author of many books and publications like Indian Minimum Seed Certification, Compendium of Seed Legislations, Compendium of Notified Plant Varieties etc. He has travelled to more than 50 countries

## POLICY INITIATIVES REQUIRED

As present, less than 50% seeds demand of farmers is met through the organised seed sector. New and concrete initiatives must be taken by policy makers and regulators to strengthen the production and marketing of seeds to meet the domestic and international demand. The following initiatives may be taken.

### Availability of Funds for Seed Sector

This may be in the form of subsidy or soft loan, especially for medium and small seed companies for investment in R&D. The purpose is to strengthen the development of a nation-wide standards-driven uniform variety evaluation system, development of global standards for seed supply chain infrastructure including seed processing, packing, quality testing and storage. This shall also meet the working capital requirement of seed companies with special provisions in line with risks and uncertainties linked to agriculture operations for seed production. It shall also enable plant breeding R&D and strengthen the nation-wide seed-quality regulation mechanism.

### National Seed Management

Essential for implementation of strategic interventions in the seed sector with clearly-defined milestones and deliverables.

### Regulation of FDI

Companies from all over the world are allowed to operate in India. But we don't have the same opportunities to set up subsidiaries of Indian companies in countries like China, Indonesia, Thailand etc. As a result, our biodiversity is freely going out of country while we don't get it from these countries which are also rich in natural biodiversity. While India can accept FDI in R&D only for seed production and distribution, we should allow FDI capped at 49% for China, Indonesia etc. This shall ensure the development of Indian companies and also encourage the Make in India campaign.

The following measures are also essential.

- \* Uniform implementation of Seed Control order 1983 by all states/UTs for hassle-free operation of seed companies
- \* Enactment of Seed Bill 2004 for compulsory registration of seed varieties, enhancement of penalties for seed quality offences and complete assurance for seed quality
- \* ICAR and state agricultural universities must play an active role in development of high yielding varieties. Public sector research institutions can reach new varieties to the farmers by collaborating with the private sector
- \* Effective implementation of plant

varieties and farmers rights legislations by fully operationalizing provisions like benefit sharing, utilization of gene fund, time-bound registration of varieties, rationalizing annual/renewal fees, encouragement to breeders for development of new varieties for protecting breeders rights, unrestricted availability of seeds of protected variety to farmers by ensuring farmers rights

There is an urgent need for State Seed Corporations to transform themselves in tune with the industry in terms of infrastructure, technologies, approach and management culture to be able to survive in the competitive market. They shall also be able to enhance their contribution in the national endeavour of increasing food production to attain food and nutritional security.

### Huge Potential

India has potential to emerge as major seed trading hub in the global seed market. The seed sector shall emerge as a major driver of the agriculture sector in the country. To achieve this potential, a harmonization framework considering different needs of the stakeholders may be worked out for compliance with necessary standards for production, quality and trade of seeds, IPR, conservation of biodiversity, etc for healthy growth of the Indian seed industry.

## CRITICAL ROLE OF ICAR

# MAKING INDIA THE GLOBAL SEED HUB

**S**ince May 2014, National Agricultural Research System (NARS) under the leadership of Indian Council of Agricultural Research (ICAR) has released and notified 1406 varieties of different field crops viz., cereals (707), oilseeds (206), pulses (219), forages (94), commercial crops (175) and other (5). These have been developed under All India Coordinated Research Projects (AICRP) of different crops, where both public and private sector contribute their material. Public and private sector share in the development of varieties has been around 89% (ICAR, SAUs) and 11% (private sector).

The contribution of All India Coordinated Research Project on National Seed Project (Crops) has been phenomenal for this effort. It led to sea change in the seed sector. From meager breeder seed production of 3,914 quintals during 1981-82, India reached a level of 115712 quintals during 2019-20. Among field crops, as per ideal level



of Seed Replacement Rate (SRR) i.e. 35-50 pc in self and cross pollinated crops, breeder seed requirement is around 77245 quintals. The breeder seed produced in India is adequate for production foundation and certified to achieve the delineated level of SRR through downstream seed multiplication.

With the aim to produce seeds of highest quality, very strong linkages exist

between various stakeholders of India's seed production and supply chain. ICAR along with various Central and State Agricultural Universities under NARS shoulders the responsibility of breeder seed production. Various public and private seed industries are involved in production and distribution of foundation and certified seed.

In field crops, the public system engaged in quality seed production includes 28 Institutes of Crop Sciences Division of ICAR, 50 SAUs/CAUs, 721 Krishi Vigyan Kendras (KVKs), 210 Seed Hubs of pulses, oilseeds and millets; Farmers Participatory Seed Production Programme (FPSPP), National Seed Corporation (NSC), 17 State Seed Corporations, Seed Village Scheme of Ministry of Agriculture and Farmers Welfare, 25 State Seed Certification Agencies and 132 Seed Testing Laboratories in states, and one national-level Seed Testing Laboratory.

ICAR has taken several measures in instituting the requisite framework for sustenance of seed chain per se.

One such big leap by ICAR was the launch of AICRP-NSP (Crops) during 1979-80. ICAR entrusted it with the responsibility of coordinating breeder seed production in field crops in the country. A total of 43 centers in different SAUs/CAUs and ICAR Institutes are entrusted with breeder seed (41 centres) and seed technology research (24 centres). During 2005-06, ICAR launched 'Seed Project - Seed Production in Agricultural Crops'. This is operating through 63 centres of NARS. The objective is to utilize the capabilities of varied ICAR institutes and SAUs in developing self-sustaining models of seed production and rapid transfer of improved techniques/varieties/hybrids at farmers' field,

The contribution of private seed sector to total quality seed production in the country was approximately 57 pc during 2018-19. The key strategies required to focused on the revival of seed research in India for sustained quality seed production are as follows:

1. Production research: Strong programs comprising basic and applied aspects on climate resilient seed production should be initiated by involving AICRP centres in various agro-climatic zones.
2. Research on seed marketing: Strong seed marketing research and advocacy in public sector organizations in collaboration with private sector.
3. Harmonization of rules and guidelines at national level to mitigate huge variation between the states and to overcome existing discrepancies and complications responsible for slow adoptions.
4. New standards: Development of seed and field standards for medicinal, forage, ornamental and horticultural crops.
5. Revision of existing standards: Field and seed standards of various field crops were developed long back. To meet the current requirement of international seed trade, testing procedures need to be refined to have neutrality.
6. Research on new technologies: Chlorophyll fluorescence, flowcytometry, hyper spectral imaging etc. for rapid vigour assessment.
7. Maintenance breeding: Strong emphasis on maintenance breeding of all varieties under seed chain and scrupulous quality maintenance of nucleus seed using reliable modern molecular tools.
8. Revision of Seed Multiplication Ratios (SMR): SMR based on unwavering scientific data and by incorporating latest varieties and updated production technology through AICRP centres across various agro-climatic zones is needed.
9. Organic seed: Development of seed production research program on organic seed along with development of exclusive seed standards is required.
10. Deployment of molecular tools: Use of dependable modern molecular tools for genetic purity and seed health testing to replace Grow Out Test.
11. GM seeds: Research on identification of GM seeds, their standards, suitable protocols, through designated laboratories.
12. Coating and Pelleting: Critical research on seed coating and pelleting packages to mitigate climatic vulnerabilities during germination and early growth, for enhanced seed health and increased tolerance to biotic and abiotic stresses is essential.
13. Reaching the unreached: North-Eastern states need special attention and integration in the mainstream of seed production and quality assurance.
14. Human resource development for complete seed value chain and leadership and also for working exposure to modern molecular tools in seed programmes.
15. Private sector needs to be encouraged to take up participatory collaborative research involving cutting edge technologies by investing in R&D with public sector R&D institutions.
16. National Seed Consortium for various crops must be developed with both public and private sectors as partners. Thus, public sector seed research should refocus its priorities and crystallize targeted research in collaboration with private sector. There is immediate requirement of large-scale funding for upliftment of seed research facilities to rejuvenate public funded seed research and seed production programmes to achieve future projections.

## ABOUT THE AUTHORS



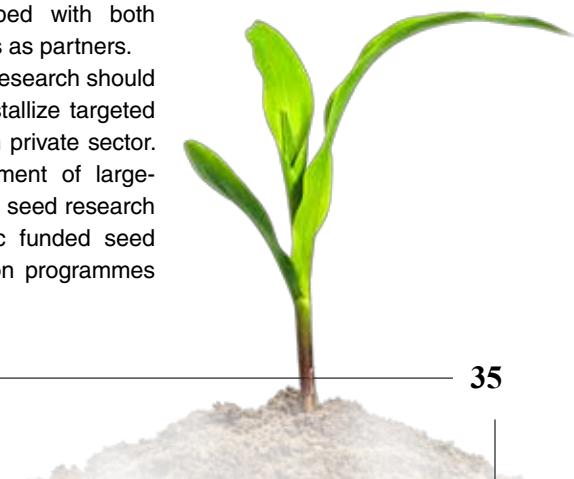
**Dr. Devendra Kumar Yadava** is Head, Division of Seed Science and Technology & Principal Scientist (Brassica Breeding), Division of Genetics, ICAR and Assistant Director General (Seed), ICAR.



**Dr Sripathy KV** is Scientist, ICAR



**Dr PR Chaudhury** is Principal Scientist, ICAR.



## NATIONAL BUREAU OF PLANT GENETIC RESOURCES

# GENETIC DIVERSITY CONSERVATION AND UTILIZATION



CAR-NBPG (National Bureau of Plant Genetic Resources) hosts the second largest genebank in the world. The operations of the bureau are in the areas of Plant Exploration and Germplasm Collection, Germplasm Evaluation, Germplasm Conservation, Genomic Resources and Plant Quarantine in addition to the units of germ-plasm exchange, tissue culture and cryopreservation. It has the network of 10 regional stations covering different agro-climatic zones to carry out PGR activities.

The institute has undertaken 2644 explorations and collected about 2.67 lakhs accessions of crop species and their wild relatives. Priority was given to crop wild relatives (CWR), which resulted

in collection of 576 unique accessions. This resulted in a significant increase in the share of wild species (32%) in the total collection.

ICAR-NBPG is instrumental in



the introduction of several new crops in India such as soybean, sunflower, kiwi, tree tomato, oil palm, jojoba, guayule, hops etc. and aromatic plants like rose geranium. It helped researchers to access germplasm from other countries and has given valuable genetic resources to the world. The entire rice crop of Indonesia was threatened some decades ago by a growth-stunting virus. A gene transferred from *Oryza nivavra* from Odhisa saved Indonesia's rice crop against the virus. A single gene from India for downy mildew resistance saved the muskmelon crop in the US. Another gene from India enabled American sorghum to resist the green bug insect, saving millions of dollars. Dr William Saunders of Canada used wheat variety Hard Red Calcutta and released new series of wheat later called Marquis A and B which were early and resistant to rust. Recently in rice, Sub1A (from

**Table 1: Status of Base Collection National Genebank (-18°C) as on August 31, 2020.**

Crop / Crop Group	No. of accessions conserved
Cereals	1,66,156
Millets	59,525
Forages	7,270
Pseudo-Cereals	7,820
Legumes	67,101
Oilseeds	60,496
Fibre	15,912
Vegetables	27,132
Fruits & Nuts	291
Medicinal & Aromatic Plants & Narcotics	8,344
Ornamental	669
Spices & Condiments	3,261
Agroforestry	1,653
Safety Duplicates (Lentil, Pigeonpea)	10,235
Trail Material (Wheat, Barley)	10,771
<b>Total</b>	<b>4,46,636*</b>

\* The figure includes 5,034 Released Varieties and 4,316 Genetic Stocks; No. of Crop Species conserved: 1,762. Source: <http://www.nbpgr.ernet.in> accessed on 21.9.2020

### Germplasm in in vitro and Cryo-preservation facility as on 31 August, 2020

Crop / Crop Group	No. of Accessions
<b>In vitro bank</b>	
1. Tropical fruits	443
2. Temperate and minor tropical fruits	360
3. Tuber crops	520
4. Bulbous crops	171
5. Medicinal & aromatic plants	181
6. Spices and industrial crops	227
<b>TOTAL</b>	<b>1, 902</b>
Safety Duplicates (Lentil, Pigeonpea)	10,235
<b>Cryobank</b>	
1. Recalcitrant	0
2. Intermediate	6,948
3. Orthodox	3,911
4. Dormant bud	389
5. Pollen (Mango)	591
<b>TOTAL</b>	<b>11,839</b>
DNA	2,194

(Source: <http://www.nbpgr.ernet.in> accessed on 21.9.2020)

FR13A) and PSTOL1 (from Kasalath) are being used globally to save rice from losses due to flooding and improving P use efficiency.

The Indian National Genebank (NGB) was established at ICAR-NBPG to conserve the PGR for posterity in the form of seeds, vegetative propagules, in vitro cultures, budwoods, embryos/embryonic axes, genomic resources and pollen. The NGB has four kinds of facilities, namely, Seed Genebank (18°C), Cryo genebank (-170°C to -196°C), In vitro Genebank



### ABOUT THE AUTHORS



**Dr Kuldeep Singh** is Director, ICAR-National Bureau of Plant Genetic Resources. He is the recipient of SciGenom Research Foundation Excellence in Science award 2018 and the Borlaug Global Rust Initiative Gene Stewardship Award 2018



**Dr Kavita Gupta** is Principal Scientist & Nodal Officer of PME (Priority Setting, Monitoring & Evaluation) Cell, ICAR-NBPG



**Dr Rajkumar** is Senior Scientist, Division of Genomic Resources, ICAR-NBPG. He specializes in cytogenetics and molecular genetics



A glimpse of variability in germplasm

(25°C), and Field Genebank, to cater to long-term as well as medium-term conservation. The NGB with a capacity to conserve about one million germplasm in the form of seeds is currently conserving about 0.44 million accessions belonging to nearly 1,800 species. Over 12,000 samples of seed, dormant buds, and pollen are cryopreserved and about 1,900 accessions are conserved in the in vitro genebank. The NGB is supported by active partnership of other institutions designated as the NAGS. The NAGS are responsible for maintaining, evaluating and distributing germplasm from their active collections to NGB and other user scientists. The present status of collections in the Seed Genebank is given in Table 1.

The Bureau has supplied germplasm, collected indigenously or from exotic sources, to breeders and other researchers in the country. The germplasm supplied by ICAR-NBPGGR to various breeders have been used in varietal development. Several indigenously supplied germplasm accessions have helped to develop improved varieties in various national programmes.

A PGR portal has been hosted on NBPGGR website, which is a gateway to

information on plant genetic resources conserved. The portal contains information on about 0.4 million accessions belonging to about 1800 species. NBPGGR has developed mobile apps Genebank and PGR map in PGR Informatics which can accessed through NBPGGR web pages, genebank.nbpggr.ernet.in and <http://pgrinformatics.nbpggr.ernet.in/pgrmap/>

Two mobile apps *Genebank* and *PGR Map* have been developed to enhance access to PGR information with an easy user interface. The apps have been hosted on Google Play and App Store. *Genebank* provides a dashboard view of indigenous collections (state-wise), exotic collections (country-wise), addition of accessions to genebank, etc. The app helps generate routine genebank reports. It uses databases live on the backend and hence provides updated information.

*PGR Map App* offers three benefits. What's around me helps the user to obtain quickly the accessions that have been collected and conserved in the genebank from a particular location in India where the user is located at the moment. Search the map helps the user to list the accessions that have been collected and conserved in the genebank

from any selected location in India. *Search for species* helps the user to map the collection sites of a crop species.

**Establishment of geo-informatics portal in PGR:** A study to link germplasm to changing climatic regimes was carried out with the funding of the CGIAR Research Program on Climate Change, Agriculture and Food Security (CCAFS). A web interface named PGR CLIM was developed to access information ([www.nbpggr.ernet.in:8080/climate](http://www.nbpggr.ernet.in:8080/climate)).

### Germplasm Registration:

Recognizing the importance of PGR with novel, unique, distinct and high heritability traits of value that could be used in crop improvement, and to facilitate flow of germplasm to users. ICAR-NBPGGR plays a vital role in germplasm registration. More than 900 potentially valuable germplasm of over 120 species of various crops are registered. To facilitate smooth registration process, a fully online system of filing registration applications, their scrutiny, review and communications at every stage has been developed (<http://www.nbpggr.ernet.in:8080/registration/>). Details of the registered germplasm can be accessed at <http://www.nbpggr.ernet.in:8080/ircg/index.htm>.

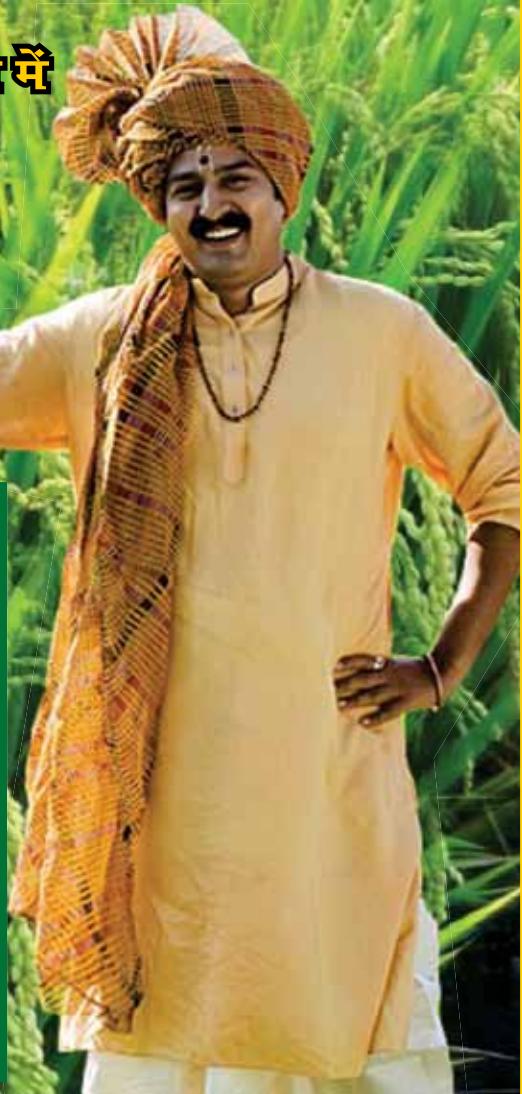
# खुशहाली के बीज

## 57 वर्षों से भारतीय किसानों की सेवा में



भारत में अनाज, तिलहन और दलहन के सबसे बड़े बीज उत्पादक के रूप में राष्ट्रीय बीज निगम 1963 से गुणवत्ता वाले बीजों के भरोसेमंद आपूर्तिकर्ता के रूप में अपनी प्रतिष्ठा को कायम रखे हुए है और देशभर में ऐसे बीजों के जरिए संपन्नता फैला रहा है, जो कि :-

- ▶ राष्ट्रीय बीज निगम के फार्मों और 12500 से अधिक पंजीकृत बीज उत्पादकों द्वारा आदर्श कृषि जलवायु परिस्थितियों में उपजाए जाते हैं;
- ▶ व्यापक श्रेणी में उपलब्ध हैं, जिनमें खदान, तिलहन, दलहन, चारा और रेशे तथा सब्जियों सहित 60 से अधिक फसलों की लगभग 600 प्रजाति/संकर किस्में शामिल हैं;
- ▶ स्वतंत्र बीज प्रमाणीकरण एजेंसियों द्वारा प्रमाणित हैं और
- ▶ देशभर में 11 क्षेत्रीय कार्यालयों, 8 फार्म, 48 प्रक्षेत्र तथा 107 विपणन केन्द्र के विभिन्न जिला क्षेत्रों में कार्यालयों/उप इकाइयों के अंतर्गत लगभग 3200 डीलर/वितरक हैं।



## राष्ट्रीय बीज निगम लिमिटेड

(भारत सरकार का उपक्रम-“मिनी रत्न” कम्पनी)

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बीज भवन, पूसा परिसर, नई दिल्ली-110 012

टूर्नामेंट: 011-25846292, 25846295, 25842383, 25842672

वेबसाइट : [www.indiaseeds.com](http://www.indiaseeds.com) ईमेल: [nsc@indiaseeds.com](mailto:nsc@indiaseeds.com)



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**HERALDING INDIA'S FRUIT REVOLUTION**

# INTRODUCTION OF NEW GENETICS ESSENTIAL

Fruits and vegetables are critical components of our daily diet. Realization of their importance in immunity enhancement has deepened significantly during the recent months of the global pandemic. It is expected that with increasing health awareness and improving economic status of the population, the demand for fruits and vegetables will continue to increase in the coming years in India. In terms of supplies, we are the largest producer of fruits globally, with the volume of production exceeding 97 mil MT for last year.

India's fruits production has more than doubled during last two decades. At the beginning of the millennium, it stood at 42 mil MT approximately. Even though we rank number one globally in fruit production, we imported nearly one million MT of fresh fruits during last year, amounting to foreign exchange

outgo of USD 1993 Mil (Rs 14,141 crore). In fact, our imports of fresh fruits have been growing during last ten years. There has been manifold increase in imports since 2009/10, when it was only USD 600 Mil (Rs 2843 crore). Imports largely consist of apple, dates, kiwifruit, guava, oranges, pears, plums, peaches, cherry, grapes, avocado etc. An important reason for the growing demand for the imports of fruits is the marked difference in quality, taste, appearance, juiciness, crispiness, etc compared to ones available locally.

Fruits are high value crops, generally yielding greater income per unit area of land compared to most field crops. Fortunately, India is endowed with varying agricultural climate enabling production of a variety of tropical and temperate fruits. It is a matter of concern that our average productivity of the fruit crops is significantly lower than leading fruit

growing countries. For instance, in apple, our productivity per hectare is 9.1 MT, while that of leading producers like USA and China is 35.6 MT and 18.6 MT respectively. In case of oranges, our per hectare yield is 12.98 MT, compared to 26.18 MT and 23.12 MT in Brazil and USA respectively. Bridging the yield and quality gaps requires introduction of new genetics, suitable agronomy package including newer trellising systems, high density planting etc with modern post-harvest management and marketing support. There are number of examples of such new planting material introductions ushering in fruit revolutions in some of the countries. Given below are a couple of such examples of transformative changes due to introduction of new genetics, etc.

## **Introduction of new genetics essential**

The global fresh pineapple's export



## There is increasing demand for fruits with attributes of high productivity, quality and nutritive value. India must actively encourage the introduction of new genetics along with a package of supportive practices and robust marketing mechanism

market went through a metamorphosis with manifold increase in size after the introduction of hybrid MD2 hybrid by Del Monte Corporation in mid 90s, replacing the popular Smooth cayenne variety due to its processing traits, sweeter taste, non-seasonality, shelf life and other attributes, and commanding a significant price premium. Another example of transformative change to global apple market has been through the introduction of Fuji apple. This apple variety due to its fruit attributes of crispness, juiciness and shelf life commands 50 percent plus market share in Japan and China. It is a leading apple variety in USA even after many decades of its introduction.

We have the example of green revolution in India. Introduction of new genetics, with a suitable agronomy package of practices and marketing mechanism made India self sufficient and even surplus in production. We have seen similar examples in introduction of single cross hybrids in corn, hybrids in vegetables where the above-mentioned package has transformed production and productivity of respective crops. This has led to a significant increase in farmers' incomes.

There is increasing demand for fruits with attributes of high productiv-

ity, quality and nutritive value. India must actively encourage the introduction of new genetics along with a package of supportive practices and robust marketing mechanism in fruits crops like apple, guava, orange, lemon, mango, etc. Apart from the domestic market for fresh fruits, India can play a major role in the international markets where our current share is less than one percent. We can raise our share by achieving competitiveness in quality and productivity. This will make us cost-competitive too.

The breeding of fruit crops in India is largely lead by public institutions, unlike vegetable crops where our production has grown rapidly during two decades. The private sector led hybridization in vegetable crops, making improved genetics available to Indian farmers in the last two to three decades, assuring better quality and productivity. As recommended by multiple studies, involvement of the private sector shall help to expedite the progress in getting new fruit genetics/improved package of practices to Indian fruit farmers.

The breeding program in fruit crops, particularly perennial fruits crops involves far greater resources, time and skills. It would also take a significantly long time to popularize the new genetics amongst target customers. This is



ABOUT THE AUTHOR

**Mr. Rajendra Barwale** is the Chairman of Mahyco Grow, a leading agricultural corporate in India

because the results of the new genetics would take a long time to authenticate.

Given such long gestation periods, the risks involved in such programs would be significantly higher. Such high risk projects coupled with large financial investments in R&D shall require the right policy environment supporting intellectual property rights for attracting investments. In addition, market based pricing is critical for the private investor to recoup investments. A stable policy environment incorporating these elements of encouragement for the private sector can potentially revolutionize fruit production in India in the next couple of decades.



RABI 2020-21

# EMERGING OPPORTUNITIES FOR HYBRID SEEDS

**T**he Indian seeds market is estimated at around Rs.18000 to Rs.20000 cr, with the share of hybrid seeds estimated between Rs.9000 and Rs.10000 cr. The principal crops for the hybrid seed market are Cotton, Corn, Paddy, Bajra and Vegetables. Accordingly, the hybrid seed market has always been skewed towards the Kharif season.

Till recently, the hybrid seeds market in Rabi was largely limited to Corn and vegetables. Success has been elusive in other major field crops during the season. Due to inherent complexities involved in development of suitable and value-adding hybrids for Wheat, Rice



## ABOUT THE AUTHOR

**Mr Sreekanth Chundi is President & Deputy Business Head, Shriram Bioseed Genetics (Division of DCM Shriram Ltd). With over 21 years of rich and insightful industry experience, he has developed a niche in the agri inputs sector-commodity as well as specialty**

and Mustard, the focus has been revolving around improved certified / selection varieties in these crops. But the sharp rise in seed replacement ratio in the last decade across all these crops indicates that the Indian farmer is con-

stantly looking for better value and is willing to adopt products that have the potential to generate higher income.

For the Indian hybrid seeds industry, this poses both a challenge as well as an immense opportunity to develop



new markets and play a more important role in the improvement of farm income. Broadly, the opportunities are on two fronts – development of suitable hybrids for crops where there is little hybridisation and development of hybrids with improved value in crops that are already hybridised. The improved value may come from either higher yield potential or from specific attributes like disease resistance, stress tolerance, product quality attributes etc.

Shriram Bioseed Genetics (BIOSEED), one of the oldest and well-established research-based hybrid seeds organisations of the country, has always emphasised on developing superior products that add significant value to the farmers. Traditionally known for its Corn and Cotton seed products, Bioseed has been particularly active in Rabi markets on both fronts of developing hybrids for non-hybrid markets and developing improved value hybrids.

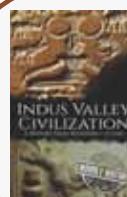
### **Hybridisation in Mustard: Witnessing exponential growth**

Hybridisation in Mustard has taken the industry by storm. In a relatively short span of time, the share of hybrids has increased from zero to nearly 20% and has attained a volume of over 3000 tons. An internal farmer survey conducted by Shriram Bioseed Genetics in the large mustard growing areas indicates that over two-third of the farmers are evincing interest in cultivating hybrid mustard in the next two years. The farmer is willing to convert to hybrid directly from use of own seed. The conversion from selection seeds to hybrids will further add to the growth.

Last year, Bioseed introduced two Mustard Hybrids – Bioseed 208 and Bioseed Dhaakad, which have performed extremely well in the Mustard heartlands of Rajasthan, UP and Haryana. With a couple of more products in the R&D pipeline, we are quite optimistic of becoming one of the major players in the Hybrid Mustard market.

### **Hybridisation of Paddy: Major**

**fun  
FACT**



**Mr Chundi is a self-declared student of ancient civilizations. He finds reading and researching them intellectually stimulating and also relaxing**

### **potential**

Hybridization of paddy in southern states is almost negligible due to poor grain quality of initial hybrids introduced by the industry. Now this market is poised for growth with the introduction of a few promising hybrids, particularly in the Rabi season, by Bioseed. First introduced in Telangana five years ago, Bioseed Hybrid Paddy products, led by 799, command a share of over 60% of the emerging hybrid market. Built on the value proposition of a potential Rs. 10000 per acre additional income, these products are being well received in Rabi across Telangana, Odisha, West Bengal and Assam. Given that these 3 states alone have over 20 lakh hectares under Paddy, the real challenge is maximising the showcasing and communicating the value proposition of Bioseed's hybrid paddy portfolio to farmers.

### **Long Shelf Life of Vegetables**

Over 30% of horticulture production is lost at the post-harvest stage due to challenging storage and transport conditions. Long Shelf Life feature is a major need for all vegetable crops.

A breakthrough has been recently achieved in this area with the introduction of Flexi Harvest Technology for Tomatoes by Bioseed. Developed through international collaboration and intensive research, Flexi Harvest Hybrid Tomato seeds gives farmers freedom to choose the time of harvesting

and ability to transport over longer distances, thereby significantly enhancing the potential for higher income. The first hybrid Tomato using this technology, Bioseed Flexi Harvest 4, was launched this year for cultivation. Bioseed Flexi Harvest 4 Hybrid Tomato can stay fresh on the plant for a period of 15 days after ripening and has a longer shelf life after harvesting.

### **Early Maturity: An emerging demand**

This assumes higher significance in vegetable crops. A crop which reaches the harvest/first picking early potentially increases the farmer's ability to realise better income. This will emerge as a big differentiator soon and is a focus area for the industry.

Fodder is also increasingly assuming significance. With increasing growth of cattle, the deficit between demand and supply is widening. This is an opportunity for the seed industry. Even here, the share of Kharif is higher. With regional and seasonal imbalances on the rise, growing fodder-oriented crops in Rabi has become important. While Sorghum Sudan Grass has long been established as a fodder crop in Rabi, cultivation of corn for fodder/ silage is increasing in certain regions.

The mother of all opportunities would be hybridisation of Wheat. A breakthrough here would create potentially an opportunity larger than the value of the total Indian seeds industry!

The focus of the industry was largely on hybrid-friendly crops and hence, naturally skewed towards Kharif. With the extent of hybridisation achieved in Cotton, Corn, Vegetables etc, the volume growth of these crops is plateauing. This raises multiple challenges for the industry, the principal amongst them being the identification of new crops or segments where significantly higher value can be delivered to farmers through development of better products. The Rabi season will emerge as a significant market for the Indian hybrid seeds industry.

# SEED INDUSTRY NEEDS ACCREDITATION SYSTEM

The current size of the seed industry is close to \$3.8 bn. It is growing at around 5-6% CAGR. There is mix of Indian corporates and MNCs in the sector occupying leading positions for different crops. The investment in R&D varies from 8-15% of the turnover, depending on breeding and technologies interventions. Market share of the private sector is more than 70% by value in most of the crops where hybridisation is established.

The performing and new seeds are regularly delivered to the farmers by these companies. Since there are no entry barriers to establish a seed company, many fly by night players entered the market with products from other companies and sell products with poor quality. The seed industry needs a system of checking these players by an accreditation system. All R&D-based and trading companies should be registered under set parameters.

The seed industry must have predictable policies which will encourage them to invest. Most of the seed laws presently prevailing are old. They do not address the issues faced by the present-day seed industry. New tech-

nologies and methods are emerging. We must have revisions and creating new laws to handle these new situations.

The new Seed Bill 2020 is the revised version of the seed bill framed in 2004. This bill addresses most of the issues. Some of the suggestions offered by seed industry are also being considered. The public sector and also the private sector have the same objective of providing good seed to the farmers. There should be trust in each other while handling issues of the farmers.

Sometimes a wrong notion is created that private sector is for profit only. Profit is not a bad word, provided you assure value of seed to the farmer. In the

**fun FACT**



I love cooking (Asian cuisine veg & non veg) and I am cleaning freak. I keep my home spic and span and I do this myself

name of profit, we are creating wealth which invested and re-invested in R&D to create new innovations. Private sector has created good infrastructure for not only R&D but also for production, processing & packing, quality checks and delivery of seed in good and viable condition. So we are reliable partners in the growth of agriculture in India.

We also have to improve our IP laws to facilitate innovators to protect their innovations and recover value for their investment.

## Complicated bio-diversity laws

Our biodiversity laws are complicated and add no value for the agri-biodiversity. India is a signatory of ITPGRFA and there are 64 crops under Annex 1 of the treaty. The germplasm of these crops are shared under the multi-lateral system with SMTA. The seed industry is willing to share benefits under the subscription model offered internationally. All R&D based companies are creating diversity in breeding by crossing and selection, and present day selection pressure. We are equally concerned about the loss of biodiversity. So we have to segregate bio-prospecting from agri-biodiversity and encourage open exchange of germplasm through systems created under ITPGRFA.

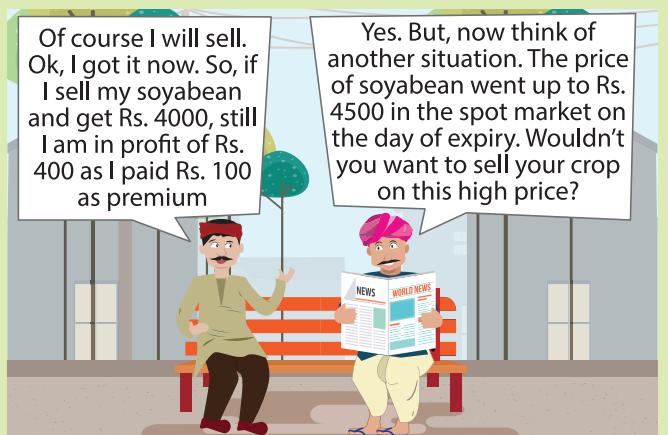
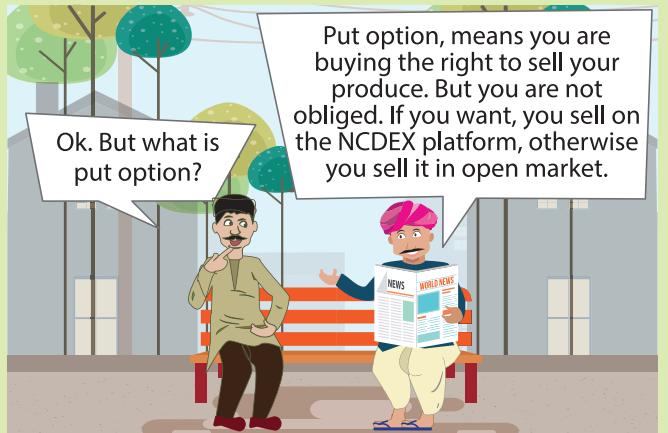
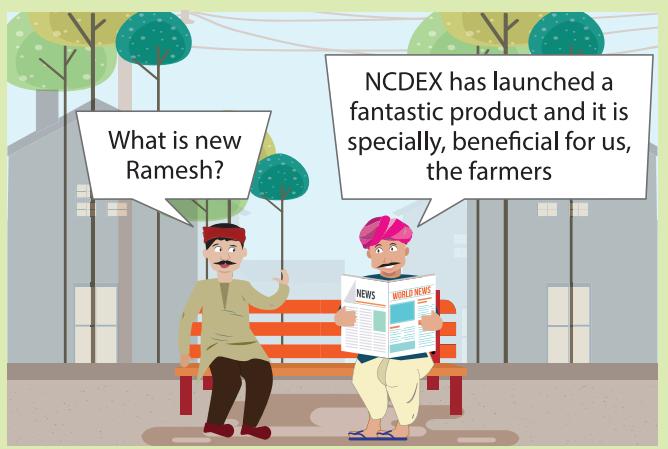
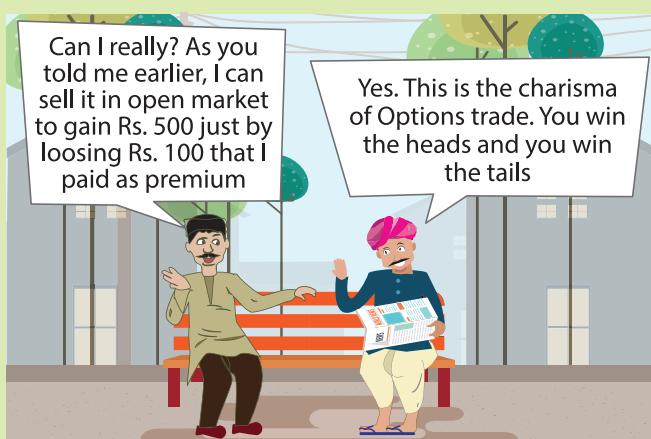
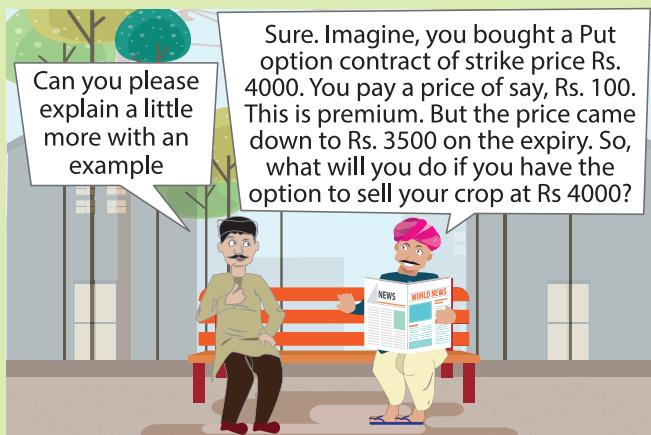
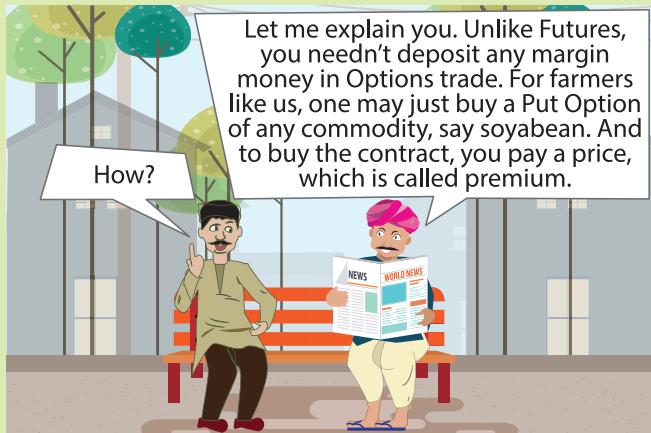
The seed industry is ready to face the challenges of climate changes or shifts and also biotic factors. If conducive policy environment is created, seed companies can increase their investments for R&D to deliver stable and performing products for the future.



## ABOUT THE AUTHOR

**Dr Arvind Kapur** is Managing Director, Acsen HyVeg Pvt Ltd. His journey from Pioneer, Proagro, Proagro-PGS joint venture, Nunhems and now Acsen HyVeg has been full of challenges and achievements. He calls himself a People Manager, and develops and creates performing teams to build the business.

## Choosing the best OPTION



**INDIA MERGING WITH BHARAT**

# AGRI-TECH START-UPS SHALL CHANGE FACE OF INDIAN AGRICULTURE



This year has established a milestone in the history of Indian agriculture with Kharif being a great beginning. Kharif sowing during this year up to September 11 has been 111.3 million hectares. This is 46 lakh hectares more than normal sowing area. India's food grain production in 2019-20 was 3.7 pc higher than in 2018-19. Kharif crop productivity to increase by more than 3 pc with adequate water availability during critical crop growth stages has led the output to reach a record high, with an expected 5-6 pc increase on year.

The procurement of rabi wheat in 2020-21 was 12.6 pc higher than in 2019-20. This indicates the resilience in the agricultural sector. Food inflation

in the Q1 of 2020-21, at 9.2 pc, was higher than in the previous year due to "sustained demand for food". This shows a shift in terms of trade in favour of agriculture. The area under Kharif sowing in 2020-21 was 14 pc higher than in 2019-20. Higher Kharif sowing accompanied by higher tractor and fertilizer sales bodes well for economic recovery. All India seasonal rainfall this year was third highest; 2019 and 2020 are the two consecutive years with above normal monsoon rainfall.

Timely supplies of agricultural inputs along with government advisories at district and state level through farmers WhatsApp groups, mKisan ICT platform, telephone, SMS, radio and TV coverage etc. helped farmers to cope during the lockdown period.

To obviate the immediate concerns of scarcity of farm labour, policies facilitating easy availability of machinery through state entities, Farmer Producer Organizations (FPOs) or custom hiring centres (CHCs) with suitable incentives have lessened the monetary burden on the farmer, while ensuring wage employment to landless labourers and workers. Institutional lending of crop loans facilitated the smooth and sufficient flow of credit to borrowing farmers. The private sector played a significant role in providing agri-inputs – seeds, fertilizers, agro-chemicals, etc. along with the state and centre government playing a facilitating role.

Structural reforms such as land leasing, contract farming and private agricultural markets, etc. have long

been advocated to bring enhanced investments into the agriculture sector and to push its growth. The good news is that GOI has increased its focus on nutrition security (besides food) and raising farmers' income (rather than enhancing farm productivity). Changing consumer behaviour with suitable programs and incentives is on the agenda.

The announcement of long-overdue big market reforms by GOI will benefit both farmers and consumers. The reforms, if implemented in letter and spirit, will make agriculture profitable and aspirational to attain the objective of doubling farmers' income.

The Industry is willing to experiment, try new models and resolve long-pending issues. With India merging with Bharat, a raft of agri-tech start-ups is set to change the face of Indian agriculture. Increased mobile/internet penetration, increased awareness among farmers about technology, mainstream VC funds showing interest in agri sector, and high quality of entrepreneurs wanting to start agri-tech business are making AgTech popular. These start-ups will play a dominant role in disseminating information to farmers and maximizing their profits in the near future.

The enabling environment with easing of Lockdown and Unlock 5.0 will boost the economy. The opening up of restaurants, food chains and home delivery channels going full throttle will see a significant uptick in vegetables.

### Record production

The first estimates of Kharif production are coming to a record level. Buoyed by ample rains, production of Kharif food grains is likely to touch a record 144.5 million tonnes. The estimated production is marginally higher than the 143.4 million tonnes produced during the Kharif season of 2019-20. The increase in food grain production is mostly due to higher estimated production of pulses at 9.3 million tonnes. Production of rice is estimated at 102.4 million tonnes,



### ABOUT THE AUTHOR

**Mr Venkatram Vasantavada** is Managing Director and CEO, SeedWorks. He is a senior agri professional with nearly three decades of leadership experience in the Seed, Crop Protection and Crop Nutrition Industry in India, Asia-pacific & Africa region with leading MNCs including Monsanto, Dupont Pioneer, Advanta-UPL and Deepak Fertilisers and Petrochemical Corporation Ltd. Mr Vasantavada has demonstrated his expertise in successfully building and managing commercial organizations with sustained growth in revenue, profitability, market share gains and geographical expansion

## Major market reforms by GOI will benefit farmers and consumers, make agriculture profitable and aspirational to attain the objective of doubling farmers' income

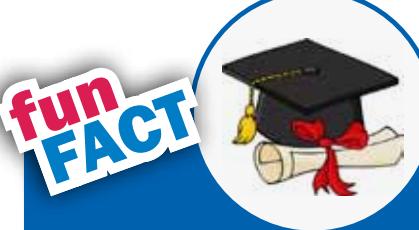
marginally higher than last year. Among non-food crops, Production of oilseeds is estimated at 25.7 million tonnes, an increase of 15 pc. Production of soybean is estimated to increase 21 pc to 13.6 million tonnes. Production of groundnuts is likely at 9.5 million tonnes, an increase of 14.5 pc. Among other Kharif crops, sugarcane production estimated to increase by 12 pc to 400 million tonnes.

Cotton production is likely at 37.1 million bales, an increase of 4.5 pc.

The government has hiked the MSP of Rabi crops to increase cultivation. Due to above-average rain, production of most crops is expected to be higher than normal or five-year-averages. Higher soil moisture has raised the prospect for rabi planting for Wheat, Mustard, Corn, Paddy etc. The Rabi first advance estimates set a target of 301 million tonnes of food grains production for 2020-21 which includes 119, 108, 5, 9.5, 29 and 47.8 million tonnes of rice, wheat, Jowar, bajra, maize and coarse cereals, respectively.

### Labour migration

The large-scale reverse migration and availability of labour in the countryside will not be an issue. GOI's economic package for agriculture — as part of the Rs 20 lakh crore Atmanirbhar Bharat package — will further position agriculture as the engine of revival. There is clear focus on enhancing investments in agricultural infrastructure, bridging gaps in the agricultural value chain and creation of an enabling environment for animal husbandry, fisheries, dairy and other allied activities. All these are aimed at enhancing farmers' income. The Covid challenge has been converted into an opportunity to rectify long-standing problems of Indian agriculture. These measures will sustain farmers in the short run and revive agriculture in the long run.



**Mr Vasantavada is pursuing his PhD in Business Management. He is "very fussy" about his organising his things and personal stuff, and takes keen interest in housekeeping**

# MORE BENEFITS, NEW MARKETS FOR FARMERS

The newly enacted farm bills have been termed as a 'watershed moment' for Indian agriculture by several agri experts. Right from the introduction of the bills to the assent by the President, much has been written and termed as "historic" by the proponents. Opposition groups, on the other hand, have termed the bills as "death warrant" for farmers. The issues of contention include removal of commission agents, entry of private players, absence of price fixation mechanism among others.

For decades, the majority of our farmers have been living under abject poverty due to a range of complex problems. Low productivity and subsequent inadequate farm remuneration are the crucial reasons. Farmers struggled to get remunerative prices even for those agriculture commodities for which Minimum Support Prices (MSP) were declared by the government.

Therefore it was imperative for farmers to have different options. The new farm laws provide the required platform to fetch the right remunerative to any buyer they want to sell their produce. Through the laws, the government has enabled farmers and given them the independence to sell their produce to whoever and wherever they want. Indian agriculture will witness a massive transformation. With changing farm dynamics, farmers will have to harness new technology, remain updated of market information, pool their lands.

## Small landholdings pose challenge

Quality of produce and output are major concerns when it comes to Indian agriculture. Our farmers are still stuck with the traditional farming practices, and smaller landholdings appears to be one of the major factors. Over 86 percent of farmers own not more than 2 ha land

while the average landholding keeps shrinking. It reduced to 1.1 ha in 2015-16 from 1.16 ha three years ago. Small landholdings bring limitations on farmers' capacity to invest in better crop inputs and access advanced machinery.

Challenges of small landholdings, finding the right buyer and right price and issues with transportation made farmers vulnerable and over-dependent on middlemen. With the new laws, farmers have a free hand to choose their buyer, who they want to have the contract with, and what they want to grow. APMC mandis will still be operational. Therefore farmers have multiple options to sell their produce.

The Farmers (Empowerment and Protection) Agreement on Price Assurance and Farm Services Act 2020, facilitates farmers to enter into farming





**Farmers shall have to ensure what they produce is of optimum quality and meets prescribed standards. They shall have to choose good quality seeds for healthy, nutritional crops. This will open new avenues for them to trade their commodities and attract more investment**

contracts with FMCG companies, large-retailers, wholesalers, agri-food businesses for farm services and sale of future agri produce at the pre-fixed rates. Though on small scale, India has seen successful contract farming examples in the recent past. Now farmers can expect protection from the vagaries of daily price changes in the local markets. This will also create an ecosystem for agri start-ups to flourish. Until now, there has been a staggered growth limited to pilots. AI can now be used to provide crop intelligence, grade and for quality check, therefore using it to full potential.

The government's decision to free India's agricultural market – a long pending reform – is expected to revive India's weak agriculture sector and private investment. Big corporate-owned entities can now procure directly from farmers and be motivated to build cold storages, warehouse, food processing units.

Farmers will now have to ensure what they produce is of optimum quality

and meets the prescribed standards. It will be pertinent for farmers to choose good quality seeds, so they cultivate healthy and nutritional crops. This will open new avenues for them to trade their commodities and attract more investment.

#### **Financial stability essential**

Under the concept of land pooling, different farmers can come together and join hands with private companies to cultivate a particular crop on a consolidated land area. It shall increase crop productivity through operational efficiency using technological solutions and scientific methods of farming. Mobile technology has reached almost every corner of the country and many farmers use smart phones. It offers farmers resources to analyse trends in agriculture markets, decide on crops to be cultivated and choose markets where prices are best. The Rs 1 lakh crore Agriculture Infrastructure Fund (AIF) launched by GOI can be utilised to facilitate the



**ABOUT THE AUTHOR**

**Dr Shivendra Bajaj is Executive Director, Federation of Seed Industry of India (FSII)**

development of farmgate infrastructure for collection centres and pre-processing facilities etc.

The country needs financial sustainability for farmers, which will result in making agriculture a success. It is laudable that government has retained all –APMC, open market and MSP. This shall create competitiveness, with consumers realising quality food and farmers their profit. The government must clear the doubts of the farmers and give them assurance regarding the new set-up. Sceptics will always remain when new policies, technologies, innovations are introduced. The new farm laws, if implemented appropriately, can herald a new era for Indian agriculture.

## STAKEHOLDERS' DIALOGUE

# WAY FORWARD FOR INDIAN SEED SECTOR

**W**ith fast changing climate scenario, seed will be the key to unlock the potential of new advanced technologies to meet the challenges of both abiotic and biotic stresses. The Indian seed industry is valued at USD 3.6 billion (4.4% share of the global trade). It has emerged as the fifth largest seed market across the globe. For boosting Indian seed sector,

innovative technologies, enabling policy support, cost-effective production of high quality seeds and seedlings and efficient delivery services are critical. Despite emergence of strong seed system, the informal seed sector still meets 39 per cent of total seed demand (e.g. 31% in oilseeds, 36.4% in cereals, 55.5% in pulses, etc.). The need to improve the existing seed production and quality system is quite obvious for which strong technological, institutional and policy

support is paramount. Besides the internal market, India also has great potential to emerge as an important player in the global seed market.

In view of the above, a "Stakeholders Dialogue on Way Forward for the Indian Seed Sector" was jointly organized by the Trust for Advancement in Agricultural Sciences (TAAS), a neutral Think Tank for strengthening agricultural research and innovation for development (ARI4D), and the Indian Society of Seed Technology



Eminent experts attending the Stakeholders Dialogue on Way Forward for the Indian Seed Sector held at NASC Complex, Pusa, New Delhi on 22 February, 2020

(ISST) at New Delhi on February 22, 2020 in which 65 eminent seed experts, senior research managers, government officials, administrators, policy planners, seed industry stakeholders and farmers participated. The objectives of the Dialogue were: i) to discuss major constraints and find possible solutions for faster growth of Indian seed sector, ii) to seek views of different stakeholders on the revised draft 'Seed Bill 2020', iii) to suggest measures to strengthen seed health and quality assurance system in the country, and iv) to review options for promoting seed export from India.

During the dialogue, the discussion centered around global perspective for Indian seed sector, role of research institutions and public seed system, private sector perspective, future of seed sector in Asia and the Pacific region, and the regulatory reforms required for the growth of Indian seed sector. The private seed sector will continue to make significant contributions to Indian agriculture for which stronger partnership with public research institutions will be needed. Also, all out efforts are needed to increase India's share in global seed export market through partnerships and enabling policy environment.

### The Road Map

To ensure faster growth and harness full potential of the seed sector, the following Road Map emerged through an effective dialogue:

#### I. Policies and Regulatory Framework

1. The regulatory system along the seed value chain needs to be effectively implemented to ensure availability of quality seed and planting material to farmers at reasonable price. Regulatory system needs to be efficient and foolproof and implemented judiciously both at central and state levels.

2. The proposed registration of varieties/hybrids in the New Seed Bill 2020 is a welcome step. The process has to be efficient and time bound. For this, a "National Seed Registration and



Dr RS Paroda speaking at the Stakeholders Dialogue

Export Promotion Council" needs to be created. The test period for value for cultivation and use (VCU) should not be more than one year using multi-location testing under defined agro-ecological conditions (2 years testing under exceptional cases), using accredited facilities created by both public and private R&D institutions/companies.

3. The New Seed Bill 2020 proposes only fruit nurseries for registration. The word 'fruit nursery' should be replaced by 'plant nursery' so as to include also the vegetable and other crops.

4. The recognition of national level seed companies with R&D capabilities, variety evaluation system, seed production, testing and storage facilities is missing from the New Seed Bill 2020 which need to be included. Unique identification number (UIN) could be assigned under the National Registry System. All related information of seed production, quality assessment and performance be recorded at the national level and shared with the state organizations.

5. The current provision of truthfully labeled (TFL) seed should be permitted in the Act. Provision of safeguards is needed in the New Seed Bill 2020 to reduce the footprints of poor quality seeds sold by dubious firms. As per

Section 30 (1) of the proposed New Seed Bill 2020, seed certification may be voluntary, but the provisions in the guidelines are necessary for self-declaration and accountability. The quality assured TFL should also qualify to get seed subsidy and linked to area coverage under new HYVs/hybrids.

6. The New Seed Bill 2020 should be based mainly on science-led evidences. The legislation should give broad framework and its implementation be based on mutual trust and data verification. Self-regulation should be the key element of New Seed Bill 2020 – laws need to be liberal with strict enforcement.

7. The practice of seed price control adopted by GOI needs to be re-examined. It should be implemented only in exceptional situations under well defined guidelines, and not individually by states.

8. Under the Protection of Plant Varieties and Farmers' Rights (PPV&FR) Act, if a registered variety fails in its performance, farmers can file claims for compensation before the PPV&FR Authority, which is not included in the New Seed Bill 2020. This should be revisited. Disputes on compensation should not be decided as per the 'Consumer Protection Act 1986'. Powers



Inaugural Session of the Stakeholders Dialogue on Way Forward for the Indian Seed Sector

to regulate seed price in emergent situations (such as seed shortage, abnormal increase in price, monopolistic approach, profiteering, etc.) should remain only at the discretion of GOI, not states. The mechanisms of addressing farmers' grievances should be simple, accessible and time bound.

9. Criminalization of violations and imprisonment may be categorized as major/ minor penalty. Clear guidelines should be defined for proper understanding by the government and all concerned. Deliberate violations with intent to cheat the farmers may be categorized as an offence with heavy penalties. There must be provision for compensation to farmers once proved through an assessment by an expert committee constituted for the purpose. Criminal penalties which impose imprisonment and fines need to be revisited.

10. The seeds of varieties imported for commercial use will have to be registered. The New Seed Bill 2020 does not make any provision for phytosanitary standards for the import of large quantity of seeds after pest risk analysis

(PRA). This needs to be specified in the guidelines after the New Seed Bill 2020 is passed by the Parliament.

11. 'Farmer' includes the farmer himself or another person engaged in cultivation on behalf of the farmer. In New Seed Bill 2020, definition limits the 'farmers' only to land owners. 'Any other category' is rather discretionary. Clarification needs to be provided.

12. Under the Central Seed Committee (Section 4-viii), the Director, ICAR-Directorate of Medicinal and Aromatic Plants Research (DMAPR) is proposed to be a member. This is not necessary since both Deputy Director Generals (Crop Sciences & Horticulture Sciences) are already included as members. Instead, ADG (Seeds) who coordinates the production of Breeder Seed may be included.

13. The New Seed Bill 2020 is silent on crop diversification. The Bill must ensure varietal as well as crop diversity, check the trend towards monopolization and provide space to different seed players to grow.

## II. Seed Research, Production and

### Quality Assurance Systems

14. The national seed system must ensure smooth and timely flow of quality, genetically improved, healthy, safe, and need-based seed in adequate quantity from breeders' plots to farmers' fields.

15. There is need to intensify research on seed quality enhancement technologies, including the seed priming, coating, pelleting, treatments with nano-molecules, micronutrients, plant growth regulators, biologicals and seed biomes; and identifying substitutes for micro-plastics in polymer coating.

16. In the entire seed chain, varietal purity plays a critical role which needs priority attention for maintenance breeding.

17. Reliable database is the necessity of hour. Effective seed plan for the next decade using Big Data Analytics tools need to be prepared and implemented. Data need to be generated for actual availability and use of seeds by different public and private sector organizations.

18. A full-fledged 'National Mission on Seeds' to accelerate quality seed production, strengthen seed technology research, for maintenance breeding

and capacity building should be in place. Incubators in all state agricultural universities (SAUs) and accredited Seed Testing Laboratories in each district need to be provided which would ensure seed-oriented entrepreneurship as well as attract and retain youth in agriculture. Qualified Seed Technologists should also be provided in each of the Krishi Vigyan Kendras (KVKs) to undertake and promote quality seed production and availability.

19. Most suitable/alternate areas for high quality seed production may be selected in the changing climate scenario. The Indian Minimum Seed Certification Standards (IMSCS) also need to be revisited particularly in case of vegetables, flowers and medicinal plants based on scientific data from multilocations. Seed testing protocols must be upgraded based on international protocols. Use of biochemical and molecular markers be made for establishing the distinctiveness of varieties, particularly the essentially derived varieties (EDVs), and lab based tests to supplement the Grow Out Test (GOT) for genetic purity.

20. User-friendly molecular detection kits for fast and accurate identification of varieties, hybrids, pathogens and

GMOs should be in place. Research on seed certification, traceability, isolation distance from non-GM crops and cost effective kits for detection of trans-genes by using micro-array chips and proteomic approaches has to be carried out. Fiscal incentives like tax exemptions, advancing credit on soft terms, duty free import of equipments and infrastructure development through PPP may be ensured.

### **III. Accelerating Seed Export**

21. There is an urgent need for conducting 'scoping study' which would provide useful guidance to both public and private sectors to identify most potential export destinations. This in turn, will help in identifying crops and country specific SPS requirements thus enabling an ease in seed exports.

22. Good quality seeds/planting materials matching international standards need to be developed. National seed companies need to be recognized by granting National Seed License which simultaneously eliminates present need for obtaining licenses from each state. The manufacturing license for processing and packing of seeds from respective states could continue.

23. ICAR and its institutes or GoI

are presently not responsible for testing seed samples of private companies meant exclusively for export except a few internationally/nationally accredited laboratories to cater to this requirement. There is an urgent need for competent persons for crop inspection, especially for the export related seed production in defined zones.

24. Well-defined seed testing protocols shall help in promoting a forward looking, long-term seed export policy. An enabling policy environment needs to be created through a single-window system of clearance of export related proposals.

25. Seed export to various countries needs to be promoted, especially in South Asia and Africa. The current contribution of India (1%) to the global seed market could easily be enhanced to 5 per cent in the next one decade provided a long-term export policy is put in place. For ease of doing business, varieties meant exclusively for export and not to be grown for commercial purpose within India could be exempted from the registration process. India needs dry port with all modern warehouses, good seed testing laboratories and efficient processing and packaging facilities including robust guidelines for export.

26. There is need to ensure: i) variety registration process in a time bound and scientific manner, ii) efficient seed certification system through accredited laboratories, iii) promoting use of seed of improved varieties while increasing the seed replacement rate (SRR), iv) building effective public-private partnerships, and iv) regulating smooth quality seed movement both within and outside India. For accelerating the seed and other agricultural exports, the position of Agricultural Counselor needs to be created in selected Indian Embassies abroad.

(Source: *The Trust for Advancement of Agricultural Sciences (TAAS), New Delhi*)



Participants attending the Stakeholders Dialogue

# NEW DRIVERS FOR VEGETABLES SEED INDUSTRY

India is the second largest grower of vegetables in the world after China. Private sector research & seed supply management has resulted in meeting ninety percent of the market in crops where hybrid vigour was possible, viz. tomato, peppers, okra, cucumber, watermelon, melons, bittergourd, cauliflower, cabbage, sweet corn etc. Research input in crops where hybrids aren't possible has remained mainly with the public sector, viz. beans, cowpeas, peas, dolichos and other leguminous vegetables. The private sector has not invested into open pollinated variety research for fear of weak IP protection. This can change as India's IPR regime becomes stronger.

Let us look at the new drivers that are beneficial and sustainable.

## Short term drivers

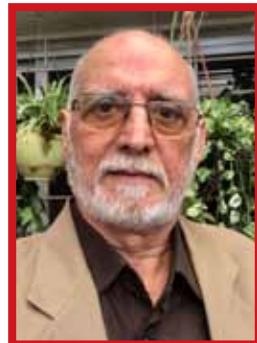
Improved average yields in India through

widening reach of extension: Our best farmers harvest as much yield as best in China/ USA. Knowledge transfer of best cultivation practices must reach small farmers who are 85 percent of the total in India and produce 80 percent of our food. We need Plant Doctors on call for our farmers. This can be as an AI-based mobile app that responds on receiving pictures of a problem from the farmer. Alternately, the farmer can interact with trained Plant Doctors on phone. They can visit the site if the problem is more serious. Creating a skilled force to address this should be Drive Number 1.

There are other important areas that can help this goal of higher productivity.

## Professional Seedling Raisers

They can grow seedlings under sanitized conditions to produce disease & insect free healthy seedlings that minimize early patho-



**ABOUT THE AUTHOR**

**Dr Surinder K Tikoo is Co-Founder & Director, Tierra Seed Science Pvt Ltd, Hyderabad**

**Fig 1: Tomato and Hot Pepper Area and Productivity in India vs China & USA -1990 -2018**

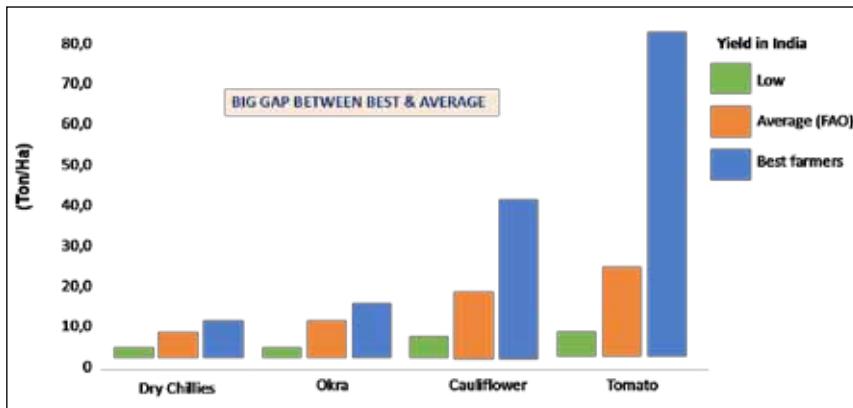


**fun  
FACT**



I am fond of photography and especially love to capture sunrise, sunset with birds in the frame, and also the moon. I have taken pics of places I have visited over the last 50 years and of course of my plants. I have over 22,000 pics on my phone (no extra zeros there). I also love listening to light classical and classical songs everyday for an hour during my walk, again on my phone

**Fig 2: Relative low & high yields of key crops (Personal data) vs average (FAO Stats)**



gen/virus load which is otherwise a serious problem of transplanted crops. This should be Drive Number 2.

### Protected Cultivation

To obtain very high yields with least disease pressures, the cultivation of tomato, sweet pepper, cucumber etc in poly-house, greenhouse or net-house is increasing. This needs knowledge transfer so that a small percentage of farmers can move to this form of cultivation and increase their incomes. The Indo-Israel Centre of excellence at Gharaunda, Karnal is one such training centre. We need more of them. This is Drive Number 3.

### Water conservation

Vegetables need a lot of water for successful cultivation and high yields. Drip irrigation must be made mandatory in the country to help conserve water and still obtain better yields. This can be Drive Number 4.

### Farm automation

Farm Automation for the small holders is the need of the hour. This should be Drive Number 5 so that availability is country wide.

### New counter season seed production

Most of seed production in India happens in a single cycle in the Sep/March period. With the opening up of Ladakh as a union territory, it is an excellent opportunity to add a counter season of seed

production in India in the April/August period. It adds another production season. It allows assured farm income in that region to the farmers. It is a new skill development opportunity. It has the potential to develop the region as a global contract seed production of vegetables, especially brassicas where most of the temperate types of seeds are imported. This is Drive Number 6.

### Marketing

There are two ways to address this. One is to strengthen our industries for processing and freezing. During glut season, 50 percent produce can be utilized thus. The new farm bill is a step in the right direction. Fixing these two areas is Drive Number 7.

### Need for Improved Sustainability

**Crop Improvement:** Besides continuing the breeding effort on disease resistance, the following areas will need specific attention.

### Breeding for abiotic stress tolerance, more resilient crops

High heat tolerance in spring-summer, foliage disease tolerance in rainy season and virus resistance throughout the year. Most of these traits are complex and are available in native wild relatives. This will require sustained big investment for inter-disciplinary collaborations – excellent for developing projects under PPP. Besides using molecular breeding and genetic engineering as tools for

precision breeding, speed breeding is an important tool to reduce time to deliver new products. This should be Drive Number 8.

### Diversifying vegetable consumption, Breeding for nutritional quality

To improve our intake of natural beneficial chemicals that are present in abundance in vegetables, our range of consumption must increase. Watermelons, melons, pumpkins, gourds, plethora of leafy vegetables like amaranth, kales, collards, turnip, radish, vegetable soya consumption in Indian diet is not even one fourth of what is consumed in Far East countries. Their longevity and lower disease index is being linked to their dietary preferences. Popularizing more vegetable consumption and the breeding for more nutrient content is essential. Drive Number 9.

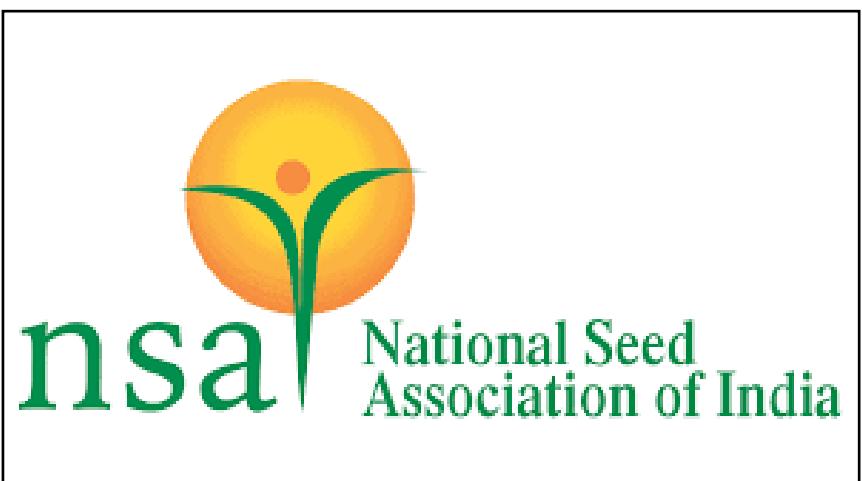
### Fertilizer use efficiency

Breeding for fertilizer-use efficient genotypes is an area that is not in focus. Genotypic differences for nitrogen use efficiency in tomato, beans have been reported. Drive number 10.

It is hoped that all stakeholders will deliberate on these ten ideas and take appropriate decisions to move forward.

# NATIONAL SEED ASSOCIATION OF INDIA

National Seed Association of India (NSAI) is the apex body representing the seed industry of India – the world's fifth largest seed economy. NSAI is playing a leadership role by engaging with the national and state governments for pursuing its main agenda of working towards providing an enabling and favourable policy environment for the growth of the seed industry. The continued patronage by its members encourages NSAI to work harder for ensuring an inclusive growth for all stakeholders. The enhanced effectiveness of NSAI is visible in the various en-





gagements with the policy makers, who not only appreciate the role of NSAI, but also respect the opinions expressed in various meetings.

Indian Seed Congress, the flagship event of NSAI, is now a much-awaited event in the seed industry calendar, due to the rich scientific contents of the conference and business generation in the B2B sessions. The visibility for NSAI has grown over the years and the request for our logo to be displayed at various agri-exhibitions and conferences is increasing.

### **Our Vision**

The vision of NSAI is to create "A dynamic, innovative, internationally competitive, research-based industry producing high performance, high quality seeds and planting materials which benefit farmers and significantly contribute to the sustainable growth of Indian Agriculture". The Association is also working towards the responsible use of biotechnology for modernizing Indian agriculture and enhancing the livelihood of Indian farmers. Increasing the general awareness about

crop biotechnology amongst the many stakeholders, technology upgradation and engaging in a continuous dialogue with regulators for the establishment of a transparent, fair and equitable regulatory system, are some of the other activities of NSAI.

### **Our Mission**

The mission of NSAI is to encourage investment in the state of the art R&D to bring to the Indian farmer superior genetics and technologies, which are high performance and adapted to a wide range of agro-climatic zones. It actively contributes to seed industry policy development with the concerned government to ensure that the policies and regulations create an enabling environment including public acceptance so that the industry is globally competitive.

### **Brief About NSAI Achievements**

NSAI has more than 500 members companies spread across India. At NSAI we have worked towards addressing the major issues pertaining to members through representations to concerned

ministries. Some of the issues on which we have worked on are OECD; breeder Seed availability to private seed producer; awareness regarding spurious seeds presence in the market; ease in doing business during lockdown; revalidation of seeds, pricing & GST; IPR, enhancing and encouraging export of seeds, etc. We have also concentrated our efforts for bringing out quality publications from time to time in the form of Seed Times. Our website too has played a significant part in our outreach to members. The website displays important government notifications and representations made by NSAI to Government.

Our interactions with the government have earned us regular representations in various forums and meetings. The NSAI Secretariat is continuously working for enhancing the visibility of the association, while simultaneously making sustained efforts for brand building, strong source of information exchange and engagement in social initiatives of Seed Donation programs. This has been possible due to the excellent support provided by NSAI's members.

# FSII VISION – INDIA A GLOBAL SEED HUB ROBUST POLICY FRAMEWORK, FINANCIAL INCENTIVE, IP PROTECTION VITAL



The Federation of Seed Industry of India (FSII) is a 39-member led association of R&D-based plant science industry. Member companies are engaged in the production of high-performance quality seeds for food, feed and fibre in the country. They are focused on research-based breeding applications and seed technologies, enabling farmers to adopt

technology-driven farming solutions to improve agricultural productivity in a sustainable manner, minimizing pre- and post-harvest losses. FSII is affiliated to International associations including International Seed Federation (ISF), The Asia Pacific Seed Association (APSA), Croplife Asia (CLA) and Asia-Pacific Association of Agricultural Research Institutions (APAARI).

FSII members are driven by the fun-

damental values of respecting research and intellectual property rights of associate members and companies committed to the seed business, IP creation and IP protection while working for the welfare of Indian agriculture at large. The activities of member companies of FSII are based on fair dealings, mutual trust, respect for each other's intellectual property and honouring contractual obligations.

FSII and its member companies collaborate with multiple stakeholders to

engage closely with farmers, seed companies, rural communities, regulatory authorities, policy makers, government officials, scientific community, grower organizations, NGOs and other stakeholders to create an enabling environment for the growth of research-based seed industry.

Our members represent about 56% market share and approximately 70% of the R&D spend of the seed industry in India.

Every year FSII founding members spend about Rs 500 crores approximately on seed R&D, while closely engaging with nearly 900 highly qualified trained breeders, scientists and technologists.

Through seed research, seed commercialization and working closely with Indian farmers, FSII members aim to contribute towards realizing the vision of doubling the farmers' income, as envisioned by the Hon'ble Prime Minister.

The objective of FSII is to help its members and other stakeholders holistically understand seed issues, advocate the seed industry position for the benefit of farmers and agriculture as a whole, awareness of member companies on trends and innovations globally and propagate the success stories of farmers and innovations of member companies for the betterment of science, farmers and agriculture sector.

FSII's vision for the Indian seed market is to see the industry become self-reliant by increasing R&D in India, make India a global seed export hub, acceptance of new innovation and technology and make it a robust industry with strong IP rights.

Climate change, biotic and abiotic stress, sluggish yields are challenges faced globally. Significant investment is needed to develop varieties that can adapt to this change. The seed industry can be encouraged to increase investment from the current 3 pc to 10 pc. Given a favourable policy framework, R&D in the country can be adopted. It is a process that requires long gestation investment and commitment to develop new products suiting the market.



The IP regime should be strengthened to encourage research investments and prevent proprietary parent seed from being stolen from seed production fields for producing copy products, fake products or breeding purposes. Respect for IP will bring more investment as well as improved germplasm into India.

A robust policy framework, financial incentive and IP protection will help Indian seed companies to compete with international companies. It will provide new varieties for farmers, generate future demand in Indian seeds and create opportunities for Indian talent to involve in R&D.

Acceptance of technology and innovation like GM and gene-editing products can work wonders for Indian agriculture. Deregulation cost for biotech traits and their stewardship costs are significantly high. The only GM crop approved so far is Bt cotton which has seen a tremendous success. Data shows the impact of Bt cotton where yields have doubled, cotton production has tripled and made India the largest producer globally and the second-largest exporter. There is opportunity in India to increase yields further when compared to countries that have been using even more advanced GM traits.

The Indian seed industry is INR 18,000 crore and is constantly growing. Looking at the country's well-developed seed industry and expertise in the sector, it has all the potential to become a global hub for seed export and can start from exporting seeds to South Asia and Africa. Currently, India's seed export is

less than 1,000 crore per annum. Annual global seed trade is \$14 billion (INR 10,460 crore). India has potential to capture 10 per cent share which is \$1.4 billion or INR 747 crore by 2028.

Three categories of seed exports have been identified by FSII.

i) Custom Production, where a company located outside India gives production orders to an Indian seed company and supplies parent seed for production in India. The Indian company exports the production back to them.

ii) Export-oriented production, where varieties will be developed in India by domestic companies purely for export. These varieties can go to other tropical markets globally.

iii) For both markets, these are varieties developed in India for export and also domestic sales

All the above needs conducive policy support. Dry Port facilities should be developed closer to production centres with modern warehouses suitable for seed storage, good seed quality testing laboratories recognized globally and efficient processing and packaging facilities. Future drivers of seed growth will be technological breakthroughs to mitigate biotic, abiotic stresses and climate resilience. FSII advocates for a favourable regulatory environment, including those for GM crops, policies to promote investments in seed technology, related R&D and seed production. Provisions of National Biodiversity Act (NBA), particularly concerning restrictions on germplasm access and exchange, will also have to be suitably amended. Adequate protection and enforcement of IPRs through both Patent Office and the Protection of Plant Varieties and Farmers' Rights (PPV&FR) Authority would accelerate the growth of Indian seed industry and exports and need extra focus.

Given India's varied agro-climatic conditions coupled with seed production expertise, seed quality management systems and the necessary policy support, Indian seed industry can utilize this opportunity similar to its international counterparts.

# WEBINAR ON MICROBIAL SPRAY

## NEED FOR IMMEDIATE, WORKABLE ACTION PLAN TO END PRACTICE OF CROP RESIDUE BURNING

The Agriculture Today Group organised a webinar on microbial spray for fast crop residue management in response to the continuing incidents of stubble burning in the country. The webinar was actively attended by scientists, agri-entrepreneurs, agriculturists, farmer groups and government officials from various organisations from all over India.

Ms Mamta Jain, CEO and Editor of the Agriculture Today Group welcomed the various distinguished guests to the webinar.



**Dr S K Malhotra, Agriculture Commissioner GOI** rationalized that the farmers' perspective is the most important while devising a strategy for large scale operations for in-situ crop residue management.

He stated that the current cropping system is such that farmers need quick resolutions for dealing with crop residue. He said that due to the late sowing of paddy, there is very slim time gap between paddy harvesting and wheat sowing. If this gap between paddy harvesting and wheat sowing would be widened by adopting correct agricultural practices,

farmers would get more time. Then they would not resort to crop residue burning.

Dr Malhotra emphasized on the use of organic or biological measures for crop residue management. He stated that the microbial consortia must be configured according to the needs of the various agro-climatic zones of the country for best results. He advised that the shelf life of the prepared consortia must be taken into consideration during demonstrations and field usage. He spoke about the importance of establishing a framework of rules and regulations for proper functioning of the industry for quality assurance.

Dr Malhotra stated that the microbes used for the consortia must be identified with the government agencies to set a benchmark for quality. He advised the industry leaders to get the products tested in ICAR labs so that a sustainable solution for combating crop residue can be developed. Dr Malhotra interacted with eminent farmers who attended the webinar in order. He solicited their views on the use of microbial consortia for crop residue management, and the methods they had developed for the purpose.

**Dr S S Marwaha, Chairman, Punjab Pollution Control Board** stated that during the Green Revolution, Punjab was asked to produce food grains to fulfil the nutritional needs of the nation. He said that this led to the adoption of wheat-paddy cropping pattern, since the government assured purchase of production. Dr Marwaha said that Punjab is India's highest contributor to food grain



production. There was urgent need to develop methods to deal with 20 million tons of rice straw each season left after harvesting.

With the advent of various ex situ measures for stubble management like biomass to energy and biomass to mushroom etc., only one-third of the total straw could be processed. He expressed concern over the contribution of stubble burning to pollution problems in the NCR region. Dr Marwaha stated that over 1,25,000 volunteers of the National Service Scheme studying in the public sector universities of Punjab visited about 12,750 villages to spread awareness about the highly harmful effects of burning paddy straw on the soil and environment. Dr Marwaha said that their effort led to a decrease by 10% in rice stubble burning by acreage in 2019.

Mr Marwaha said that this year, the demonstration for microbial spray for crop residue management is being organized for various villages in parts of Punjab, covering about 1,000 acres of land and involving around 500 NSS volunteers. Extensive soil profiling is being done for various nutrients to convince the farmers

about its effectiveness, he said.

Dr Marwaha said that with decomposition, the soil organic carbon content increases. This leads to improvement in soil water retention, thereby reducing the need for irrigation. He stated that testing for various consortia was being undertaken for field trials in the state.



**Padma Shree Dr MH Mehta, Chairman of Gujarat Life Sciences and ICFA National Working Group for Eco-Agriculture** welcomed the initiative to spread awareness regarding microbial consortia for crop residue management. Dr Mehta said that the national plan for eco-agriculture lays emphasis on in-situ crop residue management. He stated that this is a simple, cost effective approach and also beneficial for soil and human health. Dr Mehta thanked various government departments, NGOs and farmers across the nation for helping with field testing of the microbial consortia.

Dr Mehta highlighted that there is a strong case for implementation of microbial consortia spray as a solution to crop residue burning problem. He stated that microbial spray like Re-Life when sprayed on crop residue mulch in-situ has shown faster decomposition and economically attractive solution to the farmers. It enables farmers to save on input costs with improved water use efficiency, improved soil health and eliminates the air pollution problem.

Dr Mehta said that field demonstrations done through PPCB (Punjab Pollution Control Board), GLS (Gujarat Life Sciences), SIAM (Society of Indian Automobile Manufacturer's Association), Punjab Department of Agriculture, Thapar Institute of Engineering and Technology, Patiala, Indian Paryavaran Sahayak (IPS) Founda-

tion, CII (Confederation of Indian Industry) and progressive farmers in Punjab established that this is a practical solution and should be scaled up in all states, particularly the northern states immediately.

Mr Mehta expressed concern that considering the magnitude of the problem and its well-demonstrated solution, there is an urgent need for taking up large scale application of microbial spray. He strongly recommended that no further time should be wasted on debates, blame games or procedural delays any more.



**Dr Arjun Mehta of Gujarat Life Sciences**, which developed the microbial consortia for in-situ paddy straw decomposition, accepted that when farmers found economic benefit in using it, they would be further motivated in using it. He stated that ex-situ measures for stubble management would not be cost effective and would not reach the entire farming community equally. Dr Arjun stated that combination of fungi and bacterial culture helps to cut down cellulose pectin via natural processes. Lignin, another stem component helps in improving the water holding capacity of the soil. It does not harm the live plant or seed, and has various soil beneficial microbes for disease control, fertility and enhancement. He further added that the consortia can be sprayed by just mixing it with water.

**Mr Harpal Singh Grewal, an eminent organic farmer** who has been working on soil health improvement for long, said that he had not burnt a single rice straw since 1992. He stated that fundamentally, wheat is not the best crop to cultivate after paddy. Instead crop rotation must be practised. Based on his successful method of dealing with crop residue, Mr Grewal recommended the use of pellets for spreading seeds of gram, lentils, mustard, wheat etc during the last



irrigation of paddy. He said that rice straw should be spread evenly on soil surface using reaper. This would provide optimum condition for seed germination and would provide sufficient time for proper growth while saving fuel costs. Using the microbial spray after this practice would be more beneficial, he added. Mr Grewal expressed the need for a more comprehensive and detailed study of the consortia in different locations to improve the data available with the government about this novel method.



**Dr PVSM Gouri Executive Director and CEO, Association of Indian Organic Industry (AIOI)** said that all the related technologies and practises developed for paddy stubble management need to be curated and demonstrated on fields to gain farmers' confidence. This could be achieved by demonstrating the economic benefits to the farmers by introducing some of the feasible eco-friendly bi-products with rice straw after harvesting to avoid burning.

Dr Gouri further said that for reaching a wide circle of farmers, this process should be implemented through the state agriculture universities by getting the curated practises included in the package of practises for sustainable rice cultivation. She said that wider demonstration can be achieved through the extension workers of the agriculture universities in states where the incidence of paddy straw burning is high.

*Report by Vatsal Arora*

# ACTION PLAN AND RECOMMENDATIONS

## The Problem

The burning of crop residue after the harvest – a huge national problem especially in the northern states of India like Punjab, Haryana, UP, Delhi, etc. Apart from creating a huge amount of air and soil pollution and loss of resources, it reduces sustainability and causes economic loss to the farmers. Therefore, there is urgent need for practical, eco-friendly, farmers friendly, and economically attractive solutions.

## Solution

After years of R&D and field demonstrations by several institutions, there is strong advocacy for implementation of microbial consortia for dealing with crop residue. This shall minimize the air and soil pollution in the region. This is a two-step in-situ process involving:

i) Preparation of mulch from crop residue using machines like Super

seeder, Rotavator, mulcher, etc.

ii) Multi microbial spray Re-life-which helps convert the mulch in-situ to bio compost and increases the availability of nutrients, micronutrients, increasing soil health and microbial counts.

## Way Forward

It is proposed to take up a joint program involving different agriculture organizations, NGOs, R&D insti-

tutions, The Science Ashram and Gujarat Life Science (Vadodara) to take up implementation in the supervision of Punjab Pollution Control Board and SIAM in a larger area in Punjab in the coming season. The project may commence on about 1 lakh acres of land in Punjab. Farmers shall be guided and trained for agro-waste management.

## Outcomes and Benefits

- 1) Minimize air and soil pollution
- 2) Easy Implementation, farmer friendly
- 3) Improve soil health
- 4) Increased availability of nutrients, micronutrients
- 5) Improves water use and fertilizer use efficiency
- 6) Vital initiative for establishing eco-agriculture/ sustainable farming

**Dr Rashid Hasan, Advisor,  
Society of Indian Automobile  
Manufacturers (SIAM)**

### Preliminary Estimate of Cost for 1 lakh acre

- i) Microbial consortia Re-Life; 4 litres shall be needed per acre. Total requirement 4 lakh litres at Rs 100 per litre. Total cost: Rs 4 crore
- ii) Cost involved in training, demonstration literature video, travel and project teams: Rs 25 lakh



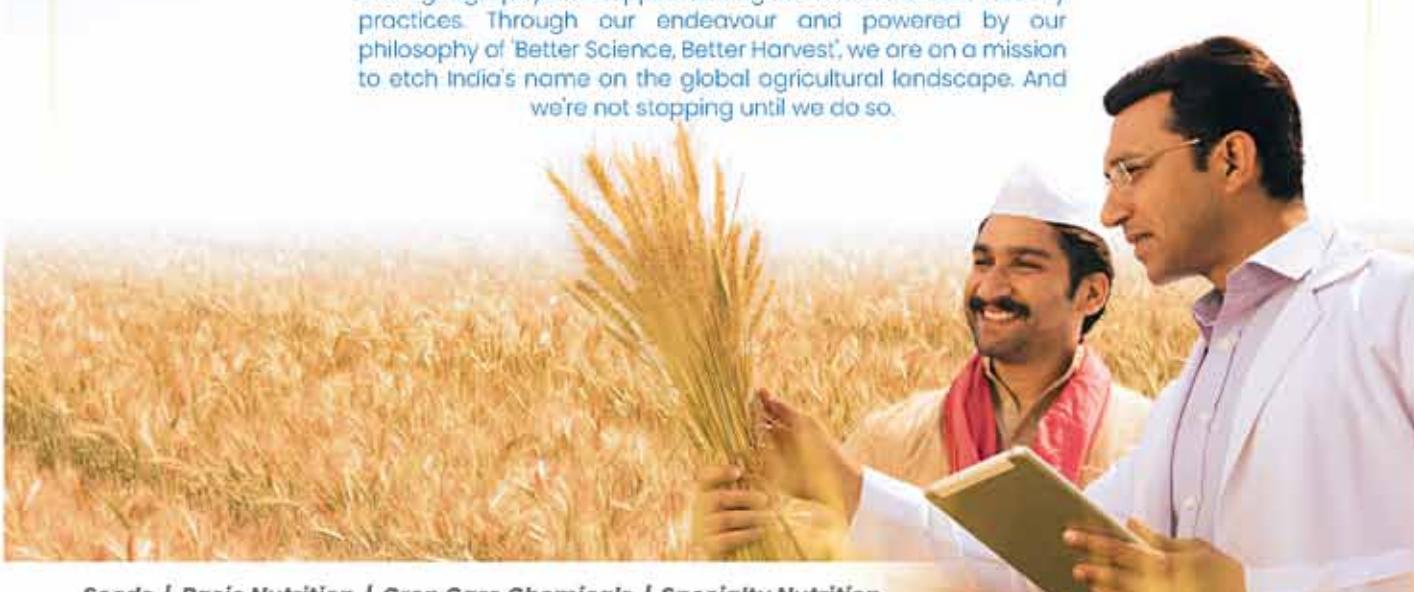


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# OPTIONS IN GOODS NEW RAY OF HOPE FOR INDIAN FARMERS



In search of remunerative prices for agricultural produce, access to alternate markets remains one of the major challenges for small and marginal farmers in India. This has been the irony of Indian farmers. Whenever they harvest their crops and get ready to offload their produce to accessible markets such as nearby APMC mandi or even to village level aggregators, they feel highly disappointed by finding the prices hovering much lower than their expectations. As can be seen from the chart below,

**The newly launched instrument by NCDEX, Option in Goods, has the potential to become the most sought after choice, not only for the farmers but also for the industries that are using these commodities**

prices are at lowest at the time of harvest during 7 out of previous 10 seasons.

Therefore, farmers are bound to fetch the lowest price of the whole season when they sell their produce immediately after harvest. Also, procurement under Minimum Support Price (MSP) is practically not available to all farmers. That also means, despite farmers spending all the capital investment and putting in so much hard work in producing the crop right from sowing until the sale of the pro-



## ABOUT THE AUTHOR

**Mr Kapil Dev is Executive Vice President and Head, Business and Products at National Commodity & Derivatives Exchange Limited (NCDEX). He has been instrumental in launching new products and building new categories at the Exchange. In his current capacity, he has been the driving force behind bringing innovation to the business operations, besides strategizing market penetration across agri ecosystem**

duce, they are mostly deprived of the price benefits.

Now, the choices that the farmers are left with to secure a better return on their produce are one, they can hold it – generate electronic negotiable warehouse receipts (eNWRs) and sell at a later date. This is not practically feasible as farmers will need immediate cash after the harvest to fulfil their other financial commitments. Two, they can use option derivatives.

For the last five years, farmers through Farmer Producer Organizations (FPOs) have been using the commodity derivatives market to lock in the prices for some of their produce. The newly launched instrument by NCDEX, Option in Goods, has the potential to become the most sought after choice, not only for the farmers but also for the industries that are using these commodities.

We can understand this with an example of Soybean. The minimum support price of Soybean is fixed at Rs 3,880 per quintal for the 2020-21 marketing season. On 28 August 2020, NCDEX Soybean Futures price of October 2020 expiry contract is Rs 3,962 per quintal. For November 2020, the expiry contract is Rs 3,902 per quintal. A Put Option on Soybean with Rs 3,900 strike price (which is already more than MSP) provides farmers with an assured price in a scenario when prices prevail below Rs 3900 per quintal during harvesting period (October-November 2020).

The above example makes it evident that Option in Goods takes care of the adverse situation where 70% of the time, prices are at the bottom

### fun FACT



**In my free time I like to do many things, and one of my favourite activities is working out at the gym. I love going there because that is the only way for me to clear my head and focus on myself for a while. I have been going to the gym for many years. I usually go to the gym at night because that's the time when there are only a few people in there and you don't have to worry about social distancing**

or lower than MSP during harvesting season. The benefits of this instrument doesn't end here. Additionally, it also gives them the choice to sell their produce at a price higher than Rs 3,900 per quintal if prices in mandi prevail above it during harvesting period i.e., October-November 2020. The only downside here is the loss of the Option premium. The Option premium is a fee or price that Option buyers (here farmers) have to pay towards protecting a minimum price for their produce. Farmers can now safely enjoy the opportunity to see the price of their produce rise without being bothered about the situation of price fall from this level during the harvesting period.

This is not the case with the Futures derivatives where farmers are bound to receive the same price at

which they have sold Futures contracts. Option in Goods contract, being a much simpler contract, is the best suited for farmers/FPOs. For farmers willing to sell their produce, buying Put Option provides them with the choices of whether they want to deliver at exchange at the pre-agreed price (i.e., strike price) or exit by selling (squaring off) the Put Option and sell produce in the physical market, if the price is higher than the strike price.

On NCDEX, Option in Goods is currently available in seven commodities (Maize, RM seed and Wheat, Chana, Soybean, Guar Gum and Guar Seed). There is need to include more and more commodities to this basket. To enable farmers to take optimum advantage of the same, augmenting the ecosystem with appropriate infrastructure facilities such as assaying, grading, logistics, and storage near farm gate along with large scale awareness among farmers/FPOs is a must.

To understand it better, let's assume farmers buy a Put option of Soybean strike price of 3,900 at a premium of Rs 25. Nos in a case where soybean price rises to 4,000, the premium on the put option can at the most become '0' in worst case, which is loss for the farmer on one side. On the other side, the farmer has no obligation to deliver goods as per the norm of the instrument. As a result, he can sell soybean at market rate, which is Rs. 100 more than his Option Strike of 3900. The net impact is Rs75 profit. In contra case, where soybean spot prices fell to Rs 3,700, the premium on Option goes up. This offsets the loss emanating from lower spot price.



Forage Seeds Division

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## Rasi Seeds (P) Ltd.

### Administrative Office

70/9, Cuddalore Main Road, Thulukkanur, Ammampalayam Po.,  
Attur - 636 141, Salem Dist., Tamil Nadu, India.  
Tel: +91 99449 35146  
Email: rasimail@rasiseeds.com

### Corporate office

174, Sathyamurthy Road, Ramnagar,  
Coimbatore - 641 009. Tamil Nadu, India.  
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# PARBHAT



## प्रभात सीइस ट्रेडर्स

(फाउंडेशन सर्टिफाईड एवं संशोधित किस्मों के ब्रीज निर्माता)

नजदीक पावर हाऊस, गंव अमीन, जिला कुरुक्षेत्र-136 038 (हरियाणा), हैल्प लाइन : 01744-270684, 254684, pstkkr97@gmail.com