taas
Progress Through Science

INDIAN SOCIETY OF SEED TECHNOLOGY
ISST
Estd. 1971

Stakeholders Dialogue on Way Forward for the Indian Seed Sector

- A Road Map

Trust for Advancement of Agricultural Sciences (TAAS)

Avenue II, IARI, Pusa Campus, New Delhi – 110012
Website: *www.taas.in*

The Indian Society of Seed Technology (ISST)

IARI, Pusa Campus, New Delhi 110012
Website: *www.isst-india.com*

Printed: *June 2020*

Stakeholders Dialogue on Way Forward for the Indian Seed Sector

- A Road Map

Preamble

Agriculture in India is backed by a strong seed system involving both public and private sectors. The organized Indian seed sector started taking roots in early 1960s with the establishment of the National Seeds Corporation (NSC) in 1963, the largest single seed organization in the country with a wide product range that initially played an important role during the Green Revolution period. The enactment of Seeds Act (1966) and Seeds Rules (1968) along with the spread of high yielding varieties (HYVs) ushered in Green Revolution in the country and since then the seed sector has become quite vibrant and dynamic.

In reality, the Indian seed program got strengthened through the support of World Bank funded National Seed Project (NSP)-Phase I, II & III. Under these, the required infrastructure for quality seed processing and distribution of seed was created across the country. Initially, the Indian seed sector was dominated by the public institutions. It was only after the introduction of 'New Policy on Seed Development, 1988', the growth of private seed sector got accelerated, involving both national and multinational seed companies. With substantial investments made by the private sector both in R&D as well as quality assurance, the seed industry witnessed a healthier growth during 1990s. Over the years, several significant developments have taken place in various spheres of the seed industry; with prominent presence of private sector. During the past five years, the seed market in India has shown much faster growth, nearly twice as fast as the global seed market. Currently, the Indian seed industry is valued at USD 3.6 billion (4.4% share of the global trade) and has emerged as the fifth largest seed market across the globe.

In order to boost the 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.). In view of this, 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 internal market, India also has great potential to emerge as an important player in the global seed market.

Challenges and Opportunities

Among various challenges faced by the Indian farmers, the most important ones are the quality, price, and timely availability of seeds of improved varieties/ hybrids. Although seed cost is less than five per cent of general cost of cultivation, many farmers still prefer their own farm saved seeds. Considering that greater adoption of improved varieties/hybrids has a direct effect on crop productivity, it is critical to enhance the seed replacement rate (SRR) for most of the crops. Fortunately, recent advances in seed technology are able to help improve the quality and range of seed/planting materials. However, only 30 per cent of the total seed requirement is met presently which can be enhanced considerably.

Fortunately, the Indian seed market is growing at much faster pace on account of emerging private sector and favourable agroclimatic conditions allowing good quality seed production. In addition, India has a strong National Agricultural Research System (NARS) with competent human resource in the field of seed technology.

Also, biotechnology offers great opportunities for increasing productivity while reducing the cost on inputs like pesticides. Bt cotton has clearly demonstrated the benefits to smallholder farmers. Similar benefits can be reaped in other crops like soybean, rapeseed-mustard, maize, rice, potato, brinjal, tomato, etc. Also tapping the seed market using new and safer breeding technologies such as CRISPR/Cas-9, a genome editing technology, would open greater scope in future. For this to happen, there is an obvious urgency to have clarity on government policy.

India also has a great potential to become a major player in the global seed market. Its present share (around 1%) could easily be enhanced substantially. This would require harmonisation of various Acts and the removal of regulatory barriers affecting the quality seed production. The future drivers of seed growth would be the technological breakthroughs to mitigate biotic and abiotic stresses, favorable regulatory environment, including those for GM crops, policies to promote investments in seed technology related R&D and seed production, strengthening of infrastructure, and permitting access to international markets. In this context, also the seed industry will have to be vitalised to become globally competitive. Provisions of National Biodiversity Act (NBA), particularly concerning restrictions on germplasm access and exchange, will have to be suitably amended. Also, adequate protection and enforcement of Intellectual Property Rights (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.

Considerable time has elapsed since the Seed Act was first passed in 1966. Since then, the Government of India has taken several corrective steps to address the new challenges and concerns of the seed sector, such as introduction of the 'New Seed Bill in the Parliament twice, first in 2004 and later in 2014. Somehow, recently the draft has again been revised as 'New Seed Bill 2020', and the same has been placed in the

Parliament for approval. The main purpose of the New Seed Bill is to regulate the quality of seeds for sale, import and export and to facilitate production and supply of quality seed and planting materials and to address the issues connected therewith or incidental thereto. It provides for compulsory registration of 'any kind or variety of seeds' that are sought to be sold. Hence, the hybrids and varieties developed by the private companies will now need to be registered and the seeds would have to meet the minimum prescribed standards relating to germination, physical and genetic purity, etc. Breeders would be required to disclose the 'expected performance' of their registered varieties 'under given conditions'. If the seeds of such registered variety fail to provide the expected performance, a provision for the farmers to claim compensation from the producer, dealer, distributor or vendor under 'The Consumer Protection Act, 1986' has also been included.

The Dialogue

In order to discuss the above important issues, 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 (ISST) at NASC Complex, Pusa, New Delhi on 22 February, 2020 in which 65 eminent seed experts, administrators, policy planners, seed industry stakeholders and farmers participated. The main 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, detailed deliberations took place on the global perspective for Indian seed sector, role of research institutions and public seed system, growth of the seed from private sector perspective; future of seed sector in Asia and the Pacific region; and the regulatory reforms required for growth of Indian seed sector. It was felt that private seed sector has made significant contributions to Indian agriculture in the past and is expected to contribute in future as well but to do so, it would require much needed and stronger partnership with public research institutions. The need for all out effort to increase India's share in global seed export market was recognised, wherein responsible partnerships and confidence building among stakeholders through enabling policy environment would indeed be vital. It was strongly felt that all the stakeholders would have to play a synergistic role and build mutual understanding to 'Serve the Farmer to Save Farming'.

The Road Map

The global population is expected to reach 9 billion by 2050 with India being the forerunner. This implies that every farmer must produce more from declining land and water resources to feed

more people. With 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. In India, nearly 60-70 per cent of the seed requirement of farmers is primarily met through farm saved seed or the seed procured from informal sources. Making the quality seed of improved crop varieties available to farmers at the right time is thus a bigger challenge than production *per se*. Seed, being the principal input in determining productivity, its timely replacement need to be given high priority. Increasing the seed replacement rate (SRR), by using certified/quality seeds other than farm saved seed, is currently a major challenge. Though some progress in this regard has been made in the recent years, still we have a long way to go for making available quality seeds at the farmers' doorsteps. In order to harness the full potential of seed sector, there is need to re-visit the existing policies and regulations, strengthen seed research, production and quality assurance systems, and explore the seed export potential expeditiously. To ensure faster growth in the Indian seed sector, the following Road Map was proposed based on detailed deliberations during the dialogue.

I. Revisiting the Policies and Regulatory Framework

The discussion on policies and regulatory framework centred around: i) important suggestions for needed improvement in the draft New Seed Bill 2020; ii) creation of an autonomous National Seed Registration and Promotion Board (NSRPB); iii) regulations for ensuring quality of commercial seeds including truthful labelled (TFL) seed; and iv) enabling policies including intellectual property (IP) regimes for scaling innovation in agricultural biotechnology, plant breeding and seed technology. The important recommendations emerged were:

1. The regulatory system along the seed value chain should be judiciously and effectively implemented to ensure that quality seed reaches the small and marginal farmers at reasonable price and in time to enable them reap the full benefits of their yield potential. Regulatory system needs to be efficient and foolproof with no slow down in the release process. The Ministry of Agriculture and Farmers' Welfare (MoA&FW) has, therefore, to play a leading and coordinating role in harmonising seed related regulations, both at the central and state levels.

2. The proposed registration of varieties/ hybrids in the new Seed Bill is indeed a welcome step. For this, the variety registration process has to be efficient and undertaken in time bound manner. Hence, for this it is recommended that a "National Seed Registration and Export Promotion Council" be created immediately. This council should have exclusive responsibility for the varietal registration based on conduct of independent trials by it and also the data provided by the developer concerned. The test period for value for cultivation and use (VCU) should not be for more than one year but must ensure multilocation testing under defined agro-ecological conditions (2 years testing should be

only under exceptional cases), using the infrastructure facilities available with both the public and private R&D institutions/companies.

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

4. A distinction among the seed producer, processor and the seed dealer has been proposed in the New Seed Bill 2020, especially for the purpose of licensing. However, recognition of national level seed companies with R&D capabilities, variety evaluation system, seed production, testing and storage facilities is missing and hence be included. The accreditation of laboratories both under public and private sectors for seed certification and quality testing shall reduce pressure on the existing government system. Also, unique identification number (UIN) could be assigned under the National Registry System. All information relating to seed production, quality assessment and performance be recorded at the national level and shared with the State organizations. States within given agroclimatic conditions be asked to use the same UIN and allow sale of seeds under the same registration process.

5. Currently, a large percentage of seed is sold as truthfully labelled (TFL) seed**.** The provision of TFL seed is serving good purpose and hence it shall be permitted in the Act. However, provision of safeguards needs to be made in the New Seed Bill 2020 so as to reduce the footprints of poor quality seeds sold by 'Fly by Night Companies'. As per Section 30 (1) of the proposed New Seed Bill 2020, seed certification is being proposed to be voluntary. This means that self-certification of the TFL seed category will continue and the challenge to ensure desired quality of such seeds would remain. Accordingly, the provisions in the guidelines would be necessary for self-declaration and accountability. As an incentive, the quality assured TFL seed of registered varieties produced either by public or private seed companies should also qualify to get seed subsidy. Subsidies in future be also linked to area coverage under new HYVs/hybrids so as to increase the productivity of different crops.

6. The New Seed Bill 2020 be based mainly on science-led evidences and guided by the principle of science with a human face. The legislation should give broad framework of the New Seed Bill 2020 and its implementation be based on mutual trust and data verification. The Act should create conducive environment for enhancing growth of seed sector both in private and public sector. The self-regulation should, in principle, be the key element of new seed bill. Laws under it need to be liberal with strict enforcement to build a strong seed system. It will also be desirable to create a platform for continuous dialogue with stakeholders to find solutions to the problems rather than entering into the legal battles.

7. The practice of seed price control by the Government, adopted lately, is serving as disincentive to the seed sector also affecting adversely the access to new innovation. This policy, therefore, needs to be re-examined. In fact, the provision of price control in the Act should be implemented only in exceptional situations that too under well defined guidelines by the Ministry of Agriculture and Farmers' Welfare (MoA&FW), Government of India, and not individually by the State Governments. In its absence, farmers are getting an impression that the seed companies are fixing seed price to exploit them and hence increasing their cost of cultivation.

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. This provision is not included in the New Seed Bill 2020. Instead, it is proposed that the disputes on compensation shall be decided as per the 'Consumer Protection Act 1986'. Consumer courts are not so favourable to the farmers presuming that they are producers and not consumers. Moreover, under the New Seed Bill 2020, farmers are eligible for compensation if a plant variety fails to give expected results under the 'given conditions' which are invariably difficult to be defined. Seed companies on the contrary would try to justify that 'given conditions' were not provided/ensured by the farmers. Thus, invariably it would be difficult for the farmers to submit a claim and provide evidence in the consumer court thus leading to unresolved disputes. There is also likely possibility that the States may use this provision to penalise some seed companies even on grounds like delay in seed supply by a few days. The dialogue recognised full justification for powers to regulate seed price in emergent situations (such as seed shortage, abnormal increase in price, monopolistic approach, profiteering, etc.) to remain only at the discretion of Central Government and not by the States. In nutshell, the mechanisms of addressing farmers' grievances should be simple, accessible and time bound.

9. Criminalization of violations and imprisonment may be categorized either as a major or a minor penalty and clear guidelines be defined for proper understanding by the State Government and all others concerned. Deliberate violations with intent to cheat the farmers may be categorized as an offence for heavy penalties with provision of compensation to the farmers once proved through an assessment by the expert committee constituted mainly for the purpose. On penal provisions, the draft New Seed Bill 2020 differentiates the agronomic performance of the seed, the physical quality of the seed and the supply of spurious seed and consequently penalizes the offenders and prescribes punishment. It must be understood that all offences are not criminal. Thus, there is a need to differentiate between minor offences, unintended offences and major offences made intentionally.

The best course would be to have a provision for compounding of minor offences. In view of above, the criminal penalties which impose imprisonment and fines would need to be re-visited. For example, the penalties for the first offence could be a monetary penalty only, whereas the subsequent offences may attract major penalties.

10. Under Section 14, 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. In the New Seed Bill 2020, 'farmer' means any person who owns cultivable land or any other category of farmers who are engaged in agricultural work as may be notified by the Central/ State Governments. Actually, 'farmer' includes the farmer himself or another person engaged in cultivation on behalf of the farmer. The New Seed Bill 2020 definition limits the farmers only to land owners. 'Any other category' is rather discretionary. Hence, clarification needs to be provided on other categories of farmers.

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

13. The New Seed Bill 2020 is silent on crop diversification which can help farmers in choosing alternatives for increasing income. Diverse crop varieties and different cropping patterns would demand diversity in the seed requirements. Hence, the New Seed Bill 2020 should ensure varietal as well as crop diversity, check the trend towards monopolisation and provide space to different seed players to grow.

II. Strengthening Seed Research, Production and Quality Assurance Systems

For strengthening seed research, production and quality assurance systems, the discussion was focused on: i) strategic areas for seed enhancement research; ii) strengthening the system for seed quality assurance bringing precision in seed certification through accreditation of testing centers/laboratories and PQPs; iii) increasing area under hybrids by providing a level playing field through public-private partnership (PPP) and performance and acceptance linked incentives; and iv) strengthening of 'National Mission on Seeds (NMS)' to facilitate the seed sector through research and capacity building. The following major recommendations emerged:

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. To ensure this, realistic state-wise and crop-wise five year rolling plans for breeder, foundation and certified seed-must be finalised keeping into consideration the desired improvement in seed replacement rate (SRR) in different crops.

15. There is need to intensify research in a Mission Mode 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. These should include standardization of effective protocols for seed quality enhancement, providing clear guidelines for commercialization of plant protection and non-plant protection seed treatment products, standardized procedures for disposal of treated seeds, and evaluation of new seed treatment molecules in PPP mode.

16. From the stage of release of a variety to its use, maintenance of varietal purity plays a critical role. Therefore, research on maintenance breeding in self and cross-pollinated species needs priority attention. Every research institute involved in crop breeding must establish a Maintenance Breeding Unit on the lines of IARI Regional Research Station, Karnal. This unit will also oversee the quality of Breeder Seed produced by the respective institutes/ university.

17. It will be highly desirable to build a reliable database on the current situation of seed production and availability in the country and prepare an effective seed plan for the next decade using Big Data Analytics tools. Data also need to be generated for actual availability and use of seeds by different public and private sector organisations.

18. There is an urgent need to have a full fledged 'National Mission on Seeds' by elevating the current Sub-Mission especially to accelerate the quality seed production, strengthening seed technology research, ensuring maintenance breeding, capacity building through short-term Diploma Courses to have required professionally qualified persons (PQPs) and establishing incubators in each of the State Agricultural Universities (SAUs). This would ensure seed-oriented entrepreneurship as well as attract and retain youth in agriculture - all contributing to the goal of doubling farmers' income (DFI). Under the Mission on Seeds, a provision need to be made for employing only the qualified Seed Technologists in each of the *Krishi Vigyan Kendras* (KVKs) to undertake and promote quality seed production and availability, Also, the Mission could target one accredited Seed Testing Laboratory in every district or at sub-divisional level.

19. In view of changing climate scenario, there is need to select the most suitable/alternate areas for high quality seed production. The Indian Minimum Seed Certification Standards (IMSCS)

also need to be revisited particularly in case of vegetable crops, flowers and medicinal plants based on scientific data from multilocations. Seed testing protocols must also be upgraded on the lines of international protocols followed by the International Seed Testing Association (ISTA), Association of Official Seed Analysts (AOSA) and Organization for Economic Cooperation and Development (OECD) for better seed quality assurance and easy access to international seed trade. Since only a few ISTA accredited laboratories exist at present, there is an urgent need for accreditation through National Accreditation Board for Calibration Laboratories (NABL), International Organization for Standardization (ISO), etc. Use of biochemical and molecular markers including electrophoresis/ iso-electric focusing of proteins, isoenzymes and DNA fingerprinting involving first and second generation markers for establishing the distinctiveness of varieties, particularly the essentially derived varieties (EDVs). Lab based tests could also supplement the Grow-Out Test (GOT) for genetic purity. Particular attention would also be required for distinguishing closely related and essentially derived varieties.

20. Focus is needed on development of user friendly molecular detection kits for fast and accurate identification of varieties, hybrids, pathogens and genetically modified organisms (GMOs). With increasing biotechnological interventions in different crops and development of GM crops, research on seed certification, traceability, isolation distance from non-GM crops and cost effective kits for detection of transgenes by using micro-array chips and proteomic approaches have to be carried out. There is need for fiscal incentives like tax exemptions, advancing credit on soft terms, duty free import of equipment for R&D and seed processing; and infrastructure development through public private partnership.

III. Accelerating Seed Export Potential

For accelerating seed export potential, three important points discussed were: i) creation of 'Seed Export Council (SEC)'and establishing special economic zones (SEZs); ii) strengthening the system for seed quality assurance bringing precision in seed certification through accreditation of testing centers/ laboratories and PQPs; and iii) increasing area under hybrids by providing a level playing field through PPP and performance and acceptance linked incentives were discussed. The following major recommendations had emerged:

21. There is an urgent need for conducting 'scoping study' to identify country's strengths, assessment of need in the target countries for export, preferred products for exports, etc. Such study would provide useful guidance to both public and private sectors to identify most potential export destinations. This will obviously help in identifying crops and country specific SPS requirements thus enabling an ease in seed exports.

22. In order to ensure production of good quality seeds/planting materials meant for export, the seed assurance and seed quality systems need to be revamped to match the international standards. For this, seed testing/ certification process should henceforth be exclusively through accredited laboratories/testing centres, be those under public or private sector institutions or those under private service providers. As already emphasised, seed companies of the national stature need to be recognized through a process of granting National Seed License. This will eliminate considerably the present need for obtaining licenses from each State, being a time consuming and tedious process. However, the manufacturing license for processing and packing of seeds from respective State Government could continue.

23. The Indian Agricultural Research Institute (IARI), National Bureau of Plant Genetic Resources (NBPGR), and any other institution under ICAR or the Ministry of Agriculture and Farmers' Welfare is presently not responsible for testing the seed samples of private companies meant exclusively for export although there are a few internationally/nationally accredited laboratories to cater to this requirement. Therefore, there is an urgent need for highly competent human resource for crop inspection, especially for the export related seed production in defined zones.

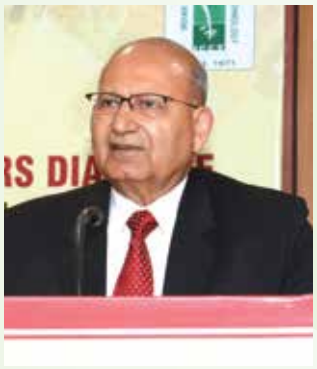
24. The well defined seed testing protocols would help in promoting a forward looking, long-term seed export policy. The Dialogue did emphasize that current opportunity during an era of globalization should not be missed. To achieve this, an enabling policy environment is required to be created through a single-window system of clearance of export related proposals.

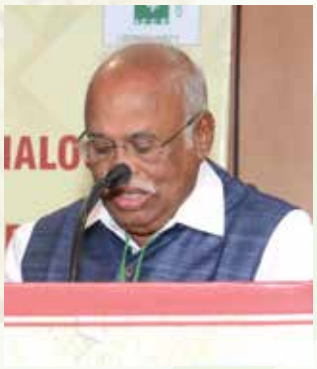
25. In view of emerging opportunities and the strength of Indian seed sector, time is ripe to promote seed export to various countries, especially in South Asia and Africa. In fact, the current contribution of India to the global seed market is only one per cent which could easily be enhanced to five per cent in the next one decade provided a long-term export policy is put in place. In this context, for ease of doing business, those 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 facilities with necessary infrastructure for which private seed sector could be invited to invest. These dry ports should have all modern warehouses, good seed testing laboratories and efficient processing and packaging facilities. Also there is need to streamline the guidelines for international movement of seeds to promote exports, including developing the framework for implementation of IPPC Standard ISPM 38 in India.

26. As emphasised already under recommendation 2, a National Seed Registration and Export Promotion Council be established on priority for undertaking activities relating to seed registration, certification, and

export. This Council be entrusted with the responsibility to ensure: i) variety registration process in a time bound and scientific manner, ii) facilitation of an efficient seed certification system through creation of a network of accredited laboratories having competent human resource, iii) promoting the use of seed of improved varieties by the farmers while increasing the seed replacement rate (SRR), iv) building effective public-private partnerships (PPP), and iv) regulating smooth quality seed movement both within and outside India. For accelerating the seed and other agricultural exports, the position of Agricultural Counsellor in selected Indian Embassies abroad is fully justified and needs to be created.





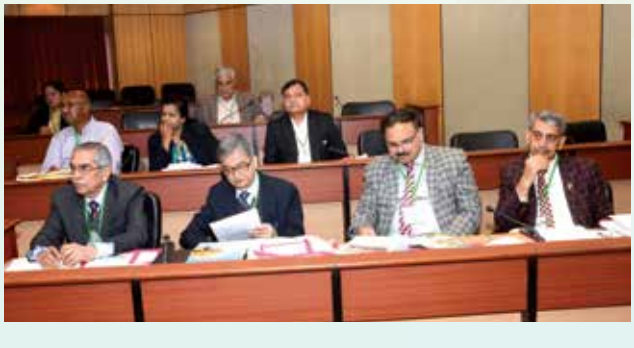






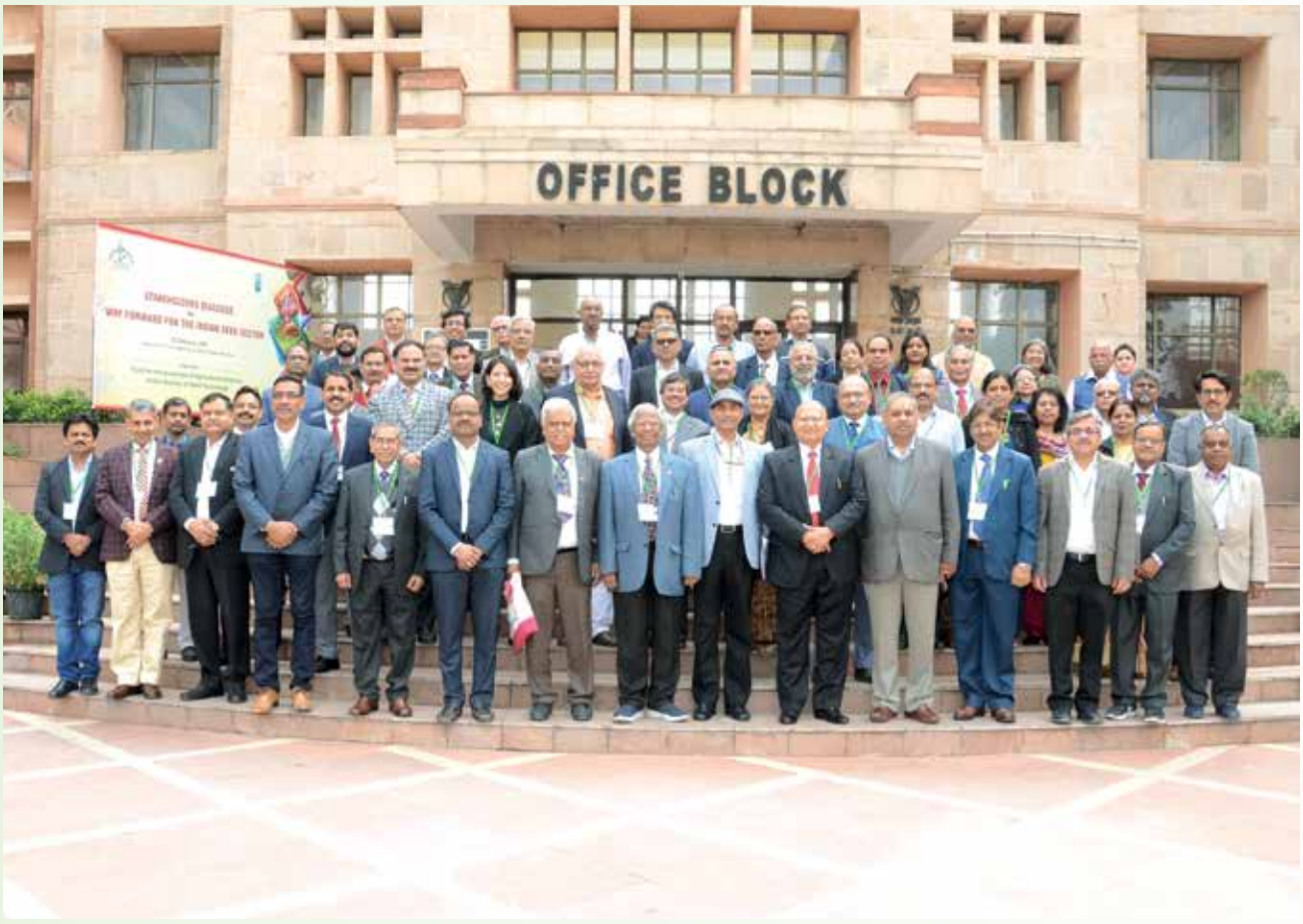




CO-CHAIRS



Important TAAS Publications

- Brainstorming Workshop on Soybean for Household Food and Nutritional Security - Proceedings and Recommendations, March 21-22, 2014.
- The Eighth Foundation Day Lecture on "Sustainable Agricultural Development - IFAD's Experiences" by Dr. Kanayo F. Nwanze, President, IFAD, August 5, 2014.
- Need for Linking Research with Extension for Accelerated Agricultural Growth in Asia - Strategy Paper by Dr. R.S. Paroda, September 25, 2014.
- Global Conference on Women in Agriculture - Proceedings and Recommendations, March 13-15, 2015.
- Brainstorming Workshop on Upscaling Quality Protein Maize for Nutritional Security - Recommendations, May 21-22, 2015.
- The Ninth Foundation Day Lecture on "21st Century Challenges and Research Opportunity for Sustainable Maize and Wheat Production" by Dr. Thomas A. Lumpkin, Former DG, CIMMYT, September 28, 2015.
- National Dialogue on Efficient Management for Improving Soil Health - Soil Health Declaration - September 28-29, 2015.
- Regional Consultation on Agroforestry: The Way Forward - New Delhi Action Plan on Agroforestry, October 8-10, 2015.
- National Dialogue on Innovative Extension Systems for Farmers' Empowerment and Welfare - Road Map for an Innovative Agricultural Extension System, December 17-19, 2015.
- Round Table Discussion on Promoting Biotech Innovations in Agriculture and Related Issues - Proceedings & Recommendations, August 4, 2016.
- Awareness-cum-Brainstorming Meeting on Access and Benefit Sharing – Striking the Right Balance – Proceedings, October 22, 2016.
- Delhi Declaration on Agrobiodiversity Management – Outcome of International Agrobiodiversity Congress 2016, November 6-9, 2016.
- National Conference on Sustainable Development Goals: India's Preparedness and Role of Agriculture, May 11-12, 2017.
- Policy Brief on Efficient Potassium Management in Indian Agriculture, August 28-29, 2017.
- Regional Policy Dialogue on Scaling Conservation Agriculture for Sustainable Intensification, Dhaka, Bangladesh, September 8-9, 2017.
- Policy Brief on Scaling Conservation Agriculture in South Asia, December 2017.
- Retrospect and Prospect of Doubling Maize Production and Farmers' Income – Strategy Paper by Dr. N.N Singh, September 10, 2017.
- Indian Agriculture for Achieving Sustainable Development Goals - Strategy Paper by Dr. R.S. Paroda, October, 2017.
- Strategy for Doubling Farmers' Income - Strategy Paper by Dr. R.S. Paroda, February, 2018.
- Livestock Development in India - Strategy Paper by Dr. A.K. Srivastava, Member, ASRB & Trustee, TAAS, February, 2018.
- Policy Brief on Agricultural Policies and Investment Priorities for Managing Natural Resources, Climate Change and Air Pollution - April, 2018.
- Women Empowerment for Agricultural Development - Strategy Paper by Dr. R.S. Paroda, May, 2018.
- Brainstorming Meeting on Harnessing Intellectual Property to Stimulate Agricultural Growth – Proceedings and Recommendations, July 27, 2018.
- Road Map on Motivating and Attracting Youth in Agriculture (MAYA), November 2018.
- Regional Conference on Motivating and Attracting Youth in Agriculture (MAYA) - Proceedings and Recommendations, August 30-31, 2018.
- Motivating and Attracting Youth in Agriculture - Strategy paper by Dr. R.S. Paroda, November, 2018.
- Tenth Foundation Day lecture on "Can India Achieve SDG 2 – Eliminate Hunger and Malnutrition by 2030" by Dr. Prabhu Pingali, Professor in the Charles H. Dyson School of Applied Economics and Management at Cornell University, January 24, 2019.
- Urgency for Scaling Agricultural Innovations to Meet Sustainable Development Goals (SDGs) – Strategy Paper by Dr. R.S. Paroda, April, 2019.
- Horticulture for Food and Nutritional Security - Strategy Paper by Dr. K.L. Chadha and Dr. V.B. Patel, October, 2019.
- Crop Biotechnology for Ensuring Food and Nutritional Security - Strategy Paper by Dr. J.L. Karihaloo and Dr. R.S. Paroda, December, 2019.
- A Road Map on Policy Framework for Increasing Private Sector Investments in Agriculture and Enhancing the Global Competitiveness of Indian Farmers, December, 2019.
- A Road Map on Efficient Land Use and Integrated Livestock Development, February, 2020.
- National Dialogue on Land Use for Integrated Livestock Development – Proceedings and Recommendations, 1-2 November, 2020



taas
Progress Through Science

For Copies Contact:

Trust for Advancement of Agricultural Sciences (TAAS)

Avenue-II, Indian Agricultural Research Institute, Pusa Campus
New Delhi - 110 012, India
Phone: +91-11-25843243; 8130111237
Email : taasiari@gmail.com; Website: www.taas.in