



Public-Private Partnership in Agriculture: A Way Forward

Policy Brief



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Preamble

Indian agriculture is currently facing challenges of yield stagnation, especially in the context of growing population, rapid depletion of natural resources (water, soil, biodiversity, *etc.*) besides climate change leading to weather extremities and above all decline in farm income. On the other hand, increasing demand for variety of food puts pressure on the entire food chain. Hence, urgent efforts are needed for reorientation of our agricultural systems in an efficient and sustainable manner for the production of required quantity and quality of diversified food. Also, there is a need for scaling innovations to reap faster the benefits by the end users, which requires strong public-private partnership (PPP) and an enabling policy support by the government.

India's agriculture sector currently contributes around 17 per cent to the gross domestic product (GDP) while employing a major workforce around

it. To contribute at least USD 1 trillion of the projected USD 5 trillion national economy, current growth rate of the sector will have to be maintained between 4 and 5 per cent. This could be possible through genetic enhancement and efficient management of every agricultural produce be it from crops, livestock or fisheries. To ensure this, the thrust on harnessing new science to attain vertical gains, especially when scope for horizontal expansion is limited, is currently the best option. Fortunately, genetic advancements through marker assisted selection (MAS), genetically modified (GM) crops, genome editing, digital agriculture, artificial intelligence (AI), *etc.* offer new opportunities needing higher investment for agricultural research and innovation for development (ARI4D) and collective efforts to let the new technologies reach farmers at a faster pace. Also, the time is ripe to lay greater emphasis on improved production efficiency of quality products that are cost competitive to capture



global markets. Fortunately, we see great potential to almost double our agricultural exports to USD 100 billion from current USD 55 billion by 2030.

India shall need more investment in ARI4D for achieving the above goals, beside the current efforts of Central and State Governments, Indian Council of Agricultural Research (ICAR), State Agricultural Universities (SAUs) and the private sector. According to a recent study by the ICAR-National Institute of Agricultural Economics and Policy Research (NIAP), our current investment in agricultural research is only 0.61 per cent of agricultural GDP, whereas investment in agricultural research per rupee gives a return of Rs 13.85. It also revealed that the Central Government, State Governments and the private sector contributes 33.8, 58.5 and 8.0 per cent, respectively, of the total agricultural research investment in the country. Hence, there is an obvious need to increase investment by the private sector requiring stronger PPP through enabling policies, Intellectual Property Rights (IPRs) and incentives. It is also evident that both public and private sector institutions have independently accelerated the growth of Indian agriculture. Whereas, to scale innovations in the field of biotechnology, digital agriculture, precision agriculture, AI, protected cultivation, value chain, *etc.*,

the partnership with the private sector is the most critical. Evidently, the public institutions have evolved a large number of improved varieties and hybrids, while the private seed sector had been more efficient in seed production and distribution especially of hybrids. Also, the latter has played significant role in harnessing the genetical and biotechnological options through enhanced productivity despite biotic and abiotic stresses as well as adverse impacts of climate change. Such gains could be much faster through PPP needing mutual trust and partnership, besides support and incentives by the public research and development system. In this context, to move forward, we now need to build innovative partnerships be those in the form of joint research, sharing of infrastructure, licencing of the products, *etc.* rather than current practice of sharing the end products through one time gain. In fact, *Bt* cotton, the only GM crop approved for cultivation in India since 2001, came through private-private partnership but with enabling support by the government for testing of technology and the regulatory approval. This technological breakthrough yielded outstanding results: doubling cotton productivity from 270 kg/ha to 500 kg/ha in just two decades, reducing the pesticide consumption by 45 per cent, and emergence of India as the largest cotton producer by 2014. Thus, while

private to private enterprises seemed to have collaborated effectively, similar gains could have been faster had there been effective public-private partnership, needing obviously an enabling environment and policy support. Empresa Brasileira de Pesquisa Agropecuaria (EMBRAPA) in Brazil and Malaysian Agricultural Research and Development Institute (MARDI) in Malaysia, have amply demonstrated the success of public research institutions adopting a corporate approach by building public-private partnership right from innovation stage to production and marketing with clear understanding on access and benefit sharing. Such partnerships have also helped in resource generation by the research institutions, currently having a crunch of research funds. Also in the process, objective of national public good and the faster availability of the end products at affordable price to the farmers and consumers can be ensured through appropriate partnership models and policy guidelines defined by the government.

Brainstorming Session

In view of above, a “Brainstorming Session on Public-Private Partnership in Agriculture: A Way Forward” was organized by the Trust for Advancement of Agricultural Sciences (TAAS) jointly

with ICAR, and the Federation of Seed Industry of India (FSII) with support of the National Seed Association of India (NSAI) and AgVaya at the National Agricultural Science Complex (NASC), Pusa Campus, New Delhi, on 9 July 2024. The Brainstorming Session embraced in-depth discussions on a common platform as per the program (*Annexure I*). A total of 61 key stakeholders including researchers, policy makers, development officials and the private sector representatives participated (*Annexure II*) to develop a clear Road Map for strong and effective PPP. The objectives of the Brainstorming Session were to: (i) understand the current status of PPP, including successful models; (ii) review constraints for required progress and upscaling of PPP; (iii) identify critical areas of national importance that require effective collaboration through PPP; and (iv) suggest a Road Map with enabling policy environment to strengthen PPP.

This policy brief highlights the major constraints for scaling PPP; specific areas of national importance needing PPP; and the potential of PPPs in accelerating agricultural innovation and growth. The importance of trust-building and innovative partnership strategies for mutual benefit is well emphasized and a clear Road Map for scaling-up PPP suggested.

Outcomes of Technical Sessions and Working Groups

Policy facilitation for public-private partnership in agriculture is essential for leveraging the potential strength of both public and private sectors in evolving innovations and scaling these to transform the agri-food system for efficient, sustainable, and inclusive economic growth. However, there is an acute lack of partnership between the two sectors. There are presently several factors that hinder public-private collaboration. On the other hand, the Indian agricultural sector presents a multitude of exciting opportunities for collaboration between public and private entities to accelerate growth of Indian agriculture. In-depth discussion in the Technical Session I on the constraints for scaling PPP, available technological options, and a few case studies concerning PPP initiatives for public-private and private-private partnerships clearly revealed the constraints, challenges and opportunities. Technical Session II was tailored for developing strategic PPP framework based on the outcome of discussions in three Working Groups on: (i) Building Research Partnership, (ii) Promoting Access and Benefit Sharing, and (iii) Enabling Policy Environment.

Each Working Group was provided with a few key questions around which the participants deliberated intensively and the salient action points emerged.

Constraints

The major constraints and challenges in public-private partnership are: (i) conflicting objectives of the public and private sectors pose serious challenges, for example, investment in public sector aims to enhance social welfare, while in the private sector, it aims to maximize profits; (ii) the most significant hurdle in partnership is negative perceptions and mistrust between the public and private sectors; the public sector views private-sector firms with suspicion, while the private sector views the public sector as slow, inefficient, and not willing to change; (iii) there is a common belief that the private sector competes with the public sector, and being more efficient in delivering goods and services, it may capture the markets for particular goods or services and even charge higher prices from the end-users, the resource poor farmers; (iv) the adhocism in implementation of the government policies concerning incentives and regulations, often discourages the private sector investments in partnerships agriculture R&D, (v) lack of institutional mechanisms for sharing data and experiences, as well as monitoring

and evaluation, often leads to non-transparency and unethical practices in partnership; (vi) the success depends on mutual trust, commitment from top management, shared vision and goals, clarity of roles and responsibilities, enabling policy environment and complementarity of partners; (vii) PPPs are often constrained by regulatory policies that prevent or impose restrictions, including on sharing of germplasm, use of research facilities, and human resources discouraging the parties from entering into partnership and, therefore, the outputs of such partnerships have remained invariably below the expectations; (viii) there are not many successful models of PPP which could be replicated by others. Even if there are some successes, there is not much data to validate and document the same for further use.

Opportunities

Ample opportunities exist for collaboration between public and private sector: (i) joint research and development to address national priorities like development of improved climate-resilient, nitrogen- and water-use efficient, herbicide tolerant and biofortified varieties in cereals, pulses, and oilseed crops; germplasm characterization and evaluation to identify genes for specific traits, exploring

diverse male sterile systems for hybrids in sorghum, pearl millet, cotton, rice, vegetable crops, *etc.*, (ii) collaborative projects for allele mining, functional genome including genome editing, climate adaptation (heat, drought, flood, salinity, *etc.*), and major challenge to address biotic stresses. Contract research in breeding and biotechnology is, therefore, needed, especially between small and medium companies not having their R&D facilities, (iii) establishing consortia among important institutions and major seed companies for each crop in which the members of the consortium contribute a fixed amount every year and gain access to the pre-breeding material from ICAR (model similar to the consortia in CGIAR system); (iv) focused attention is needed for developing and promoting new agricultural practices like direct seeding rice (DSR), conservation agriculture, and high-density planting systems (HDPS); (iv) ample opportunities also exist for technology transfer and capacity building. For ensuring access to germplasm and improved varieties/hybrids, sustainable licensing arrangements and undertaking for access and benefit sharing (ABS) are critical for success of PPP. For licensing of germplasm and products to private sector by public institutions, proper model needs to be developed with exclusivity, IP sharing rights, royalty levels, *etc.* (vi) allowing access

of R&D infrastructure of public system to the private sector and *vice versa* will create a level of understanding of each other's capabilities and build trust and interdependence on each other for achieving faster growth in agriculture.

Need for Strategic PPP Framework

The participants were unanimous in emphasizing that to increase agricultural productivity in the face of increasing population, climate change and natural resource degradation, which cannot be done by any single organization, and hence, collaborative efforts are required. Public research institutions do have multiple strengths like research programs on diverse agricultural crops/animals/fisheries and related infrastructure spread all over the country, trained manpower, and germplasm of different crops. To complement it, the private sector has well-trained manpower in seed production and marketing, good infrastructure for seed production and processing and a trusted network for seed distribution. Hence, it is a win-win situation for both sides to accelerate development of new technologies and their faster adoption for impact at the field level. Thus, working together would greatly synergize the development and delivery of new seeds, technologies, and

other farm inputs to serve our farmers effectively.

Unfortunately, partnerships between public and private agencies have not progressed beyond limited sharing of germplasm, breeder seed, joint variety evaluation and general licensing of varieties. Hence, there is a strong justification of building robust partnerships for accelerating variety development, scaling production and delivery of seeds and related products and provide needed extension service to the farmers. Also, there is a need for high-end research for climate resilience, breaking yield barriers and enhancing nutritional quality of food that we consume.

Undertaking PPP projects/programs is indeed very important and be given focussed attention. The SAUs can tie up with smaller companies to improve local crops which are important for food and nutrition security of communities. Joint efforts are needed for developing solutions for new pests and diseases and scaling-up their use. For collaborative biotech projects in the area of democratization of genome/gene editing, public institutions like National Agri-Food Biotechnology Institute (NABI) could provide gene editing services to small and medium size companies and charge the cost. Greater

emphasis is needed on next generation sequencing, genotyping by sequencing, and bioinformatics analyses, *etc.* For licensing of germplasm and products to private sector by public institutions, proper models need to be developed with exclusivity, IP sharing rights, royalty levels, *etc.* Public and private sector may share infrastructure and resources with each other at a mutually agreed price. This will help in avoiding unnecessary capital expenditure on reinventing the wheel on both sides, improving the capacity utilization of existing infrastructure and other benefits.

Major Recommendations

General

1. The first step towards a successful public-private partnership is to identify and delineate priority areas across the entire value chain (research, consumer preferences, food safety, marketing, trade, services, *etc.*). ICAR needs to identify the crops on which partnership with private sector would be beneficial followed by identification of private sector institutions possessing the requisite capabilities and a shared commitment to achieve the desired goals.
2. There is a need to set-up a joint Task Force with industry to identify high-impact projects in the selected areas and actually stitch together PPP model for each project with all principles, targets and clearly defined timelines. After further discussion with respective partners, the desired number of both Indian and multinational companies (MNCs) with whom joint projects can be carried out may be identified. There is need for steering, mentoring and monitoring of such projects till completion and helping in sorting out any conflicts that might arise during implementation.
3. Based on the strengths and weaknesses of prospective partners, clear terms and conditions need to be developed for sharing of resources, including manpower and data, mechanisms for implementation, monitoring, and evaluation of the partnerships. Initially, ICAR needs to facilitate the consultations among partners from different sectors, including farmers, to foster open dialogue and build trust.
4. India's agricultural systems are diverse and need system-specific PPPs. A cluster-based approach, focusing on specific regions and value chains, can effectively address local challenges. The government should invest in infrastructure, while

the private sector should provide inputs and services. Collaborative efforts among public and private entities are crucial for realizing economies of scale.

5. Strengthening the extension system through joint initiatives for demonstrations, seed production, training, *etc.* and using the best facilities of both private and public sector will support farmers and promote sustainable farming practices much faster for the economic benefits to our farmers.
6. The possibility of sharing of research facilities of selected seed companies by ICAR and infrastructure resources of ICAR centres for regulatory trials by the private sector at a price and also renting of biotech facilities to smaller companies for research needs to be explored.

Building Research Partnership

7. Crop-specific consortia need to be established to facilitate public-private collaboration both for research and development. Also, concerted efforts are needed for prioritizing characterization of germplasm available in the genebanks, including multi-location evaluation of important crops. The private sector involvement be encouraged for speedy evaluation requiring more resources, including manpower.
8. There is a need for development of genetic and genomic resources through the concerted efforts of dedicated joint groups from public and private sectors. Application of GM, genome/gene editing, CRISPR/Cas9 and other advanced molecular breeding techniques for crop improvement need to be accelerated through public-private partnership.
9. Genetic resource enhancement and pre-breeding using valuable accessions in the genebanks needs to be accelerated so as to reduce time for developing varieties. Collaborative research with private sector needs to be initiated not only for hybrid crops but also for composites and open-pollinated varieties, which could be useful for smallholder farmers who are unable to afford costly hybrid seed.
10. While the public sector breeders at SAUs and national research institutes have access to valuable genetic resources, the private sector largely remains disengaged from the genebanks. Compliance burden in sharing of germplasm needs to be reduced for free flow of the germplasm

protecting IP and following ABS as per extant regulations.

11. There is a need for jointly establishing large-scale research facilities like molecular biotechnology laboratories, facilities for speed breeding, phenotyping, off-season nursery, confined field trials, pest risk assessment, hot spot locations for various biotic and abiotic stresses and cold storage facilities for storing seeds. Also, ICAR may provide facilities for open field testing of varieties with GM traits developed by private industry - the new technology file system (NTFS) needs to be implemented urgently.
12. There is a need to develop the information systems in genebanks and dissemination of information about germplasm holdings (e.g. searchable web-based databases that link evaluation data from multi-location trials to passport data) by integrating new age tools like big data, machine learning and AI. A national agricultural research data pipeline system with rules about authorities, data flow, data storage and users should be outlined for proper use of vast data available with the NARS.
13. Developing catalogues of germplasm, including landraces, with DNA fingerprints, especially for all registered, released and designated proprietary lines by both public and private breeders needs to be encouraged.
14. As India is moving towards demand driven agriculture, the researchers have to understand the sources of demand for agricultural produce and develop crop varieties to meet the requirements of these sources of demand. This necessitates developing maps of market demands and using them in setting-up breeding objectives for seeds/product development and technology transfer for addressing biotic and abiotic stresses as well as the output traits that contribute to developing the crop varieties desired by the consumers. Hence, focussed attention is needed on PPP as the private industry brings market knowledge into such joint programs and both the sectors together need to invest in setting- up joint research projects.
15. Facilitated access to germplasm and related information is essential for the success of any breeding program. Hence, concerted efforts be made towards supply of germplasm, sharing of well-documented

Access and Benefit Sharing

- information including post-supply history of its use and distribution.
16. The existing practice of organizing field days by ICAR-National Bureau of Plant Genetic Resources (NBPGR) to showcase unique traits in its holdings be encouraged to attract breeders both from the public and private sector to ensure greater use of germplasm.
 17. The exchange of plant genetic resources for food and agriculture (PGRFA) involves navigating multiple agencies, which creates big hurdles for the researchers, breeders, and institutions. Hence, a single window clearance mechanism is urgently required through designation of authority by National Biodiversity Authority (NBA) to Department of Agriculture Research and Education (DARE)/ICAR through Ministry of Agriculture and Farmers' Welfare (MoA&FW) for all crop breeding related germplasm/agrobiodiversity.
 18. Option be made available for the breeders to enter commercial material transfer agreement (MTA) while accessing the germplasm, especially the one which is characterized and has specific trait(s). Wherever single plant progenies are available, these be made available as most breeders prefer using them directly in breeding.
 19. The guidelines of accessing the germplasm or advanced breeding materials from SAUs are not well defined with the result sharing of material is invariably limited. It will be appropriate if SAUs also adopt the same standard material transfer agreement (SMTA) of ICAR/DARE while sharing the genetic resources under intimation to NBPGR/ICAR.

Enabling Policy Environment

20. For long-lasting partnerships, a stable business environment is critical for both public and private sectors. Appropriate policies must be in place to extend incentives in the form of tax credits on sales, sharing the benefits proportionately, and enforcement of IPRs, once granted.
21. The prices of technologies, innovations, and services are currently being determined arbitrarily due to lack of cost accounting methodology. There is a need to develop methodologies to determine the price, considering the cost of development, and likely economic, environmental and social benefits.
22. Currently, ICAR constituted a committee to propose the terms for commercialization of crop varieties/hybrids/value added germplasm/

- transgenic and genome edited events and needed change in National Seed Policy 2002 to facilitate public-public and also to include the same in the public-private partnership. The recommendations of this Committee need to be shared with all stakeholders, including private sector for seeking suggestions for needed improvements before the same are finalized for implementation.
23. To optimize the impact of public-public and public-private partnerships, coordinated efforts are needed. The government programs do overlap in objectives, hence, necessitate the need for improving synergy between Science Social Responsibility (SSR) and Corporate Social Responsibility (CSR).
 24. Currently, the use of genome editing technology using CRISPR/Cas9, is under IPR with Corteva Agriscience. Hence, to ensure that benefits of research in various public research institutions, using this technique reaches the end-users, department of biotechnology and ICAR must urgently devise a strategy and enter into an umbrella agreement with Corteva Agriscience, without which scaling of research outcomes will just not be possible.
 25. For establishing an effective and long-lasting public-private partnership, it needs to be aligned with the national goals and based on mutual strengths. The terms and conditions need to be defined for sharing of resources, manpower, data and laboratory facilities. Also, the suitable mechanisms for implementation, monitoring and evaluation be evolved and put in place.
 26. Capacity building of all stakeholders from public and private sectors in the areas of research and development, negotiation, communication, IPRs, licensing, marketing, commercialization, monitoring and evaluation is highly critical for effective business and hence, be given focused attention. This will ensure integration of Science of Discovery with Science of Delivery.
 27. For the success of mutually agreed research partnerships between public and private sector, ensuring that smallholder farmers get benefitted, an enabling institutional mechanism must now be put in place for implementation, monitoring and evaluation of defined objectives, targets, timelines responsibilities, code of conduct, co-financing, co-mitigation of risks, and sharing of benefits on mutually agreed terms.

Technical Program

Venue : ICAR Lecture Hall, 2nd Floor, NASC, New Delhi
9 July 2024

10:00 -11:10

10.00-10.15	Welcome and Setting the Context	RS Paroda , Chairman, TAAS
10.15-10.25	Special Remarks	Sanjay Kumar , Chairman, ASRB
10.25-10.35	Special Remarks	Ajai Rana , Chairman, FSII
10.35-10.45	Special Remarks	M Prabhakar Rao , Chairman, NSAI
10.45-11.05	Address by Chief Guest	T Mohapatra , Chairperson, PPV&FRA
11.05-11.10	Vote of Thanks	Bhag Mal , Secretary, TAAS

11.10-11.45 *Tea Break and Group Photo*

11.45- 13.00 **Session I : Constraints and Opportunities for Building Public-Private Partnership (PPP)**

Co-Chairs : **RB Singh**, Former President, NAAS
: **Renu Swarup**, Former Secretary, DBT

Rapporteur : **Kuldeep Tyagi**, Deputy Director – Government Affairs, FSII

11.45-12.00	Constraints and Challenges for Scaling PPP	Ram Kaundinya , Advisor, FSII
12.00-12.15	Technological Options for PPP	Ashwani Pareek , Director NABI
12.15-12.30	Case Studies: PPP Initiatives: Public-Private Partnership	AK Singh , Former Director, IARI
12.30-12.45	Case Studies: Initiatives and Options: Private-Private Partnership	Raju Barwale , Chairman, MAHYCO
12.45-13.10	General Discussion	

13.10-14.00 *Lunch*

14.00-15.00 **Session II : Working Groups on Developing Strategic PPP Framework**

Group I: Building Research Partnership

Convener: DK Yadava, ADG (Seed), ICAR

Rapporteur: Ratna Kumria

Group II: Promoting Access and Benefit Sharing (ABS)

Convener: Kuldeep Singh, Former Director, NBPGR

Rapporteur: Anuradha Agrawal, National Coordinator, NAHEP

Group III: Enabling Policy Environment

Convener: PS Birthal, Director, NIAP

Rapporteur: Raghavan Sampathkumar, ED, FSII

15.00-16.30

Plenary Session

Co-Chairs : RS Paroda, Chairman, TAAS
: M Ramasami, Chairman, Rasi Seeds

11.45-12.00 Constraints and Challenges for Scaling PPP

Ram Kaundinya, Advisor, FSII

15.00-15.30 Presentation by Group Conveners

DK Yadava, ADG (Seed), ICAR

Kuldeep Singh, Former Director, NBPGR

PS Birthal, Director, NIAP

15:30-16.00 General Discussion

16.00-16.25 Remarks by Co-Chairs

M Ramasami

RS Paroda

16.25-16.30 Vote of Thanks

Ram Kaundinya

16.30

Tea

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