

**POLICY
PAPER
124**

Enhancing Agri-Infrastructure and Agri-Business Development through Public-Private Partnerships (PPPs) in India



NATIONAL ACADEMY OF AGRICULTURAL SCIENCES, NEW DELHI
February 2024

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- CITATION** : NAAS 2024. Enhancing Agri-Infrastructure and Agri-Business Development through Public-Private Partnerships (PPPs) in India, Policy Paper No. 124, National Academy of Agricultural Sciences, New Delhi: 20 pp.

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Preface

Over the past few decades, Public-Private Partnerships (PPPs), the pathway for a nation's growth, have been widely utilized in many sectors. PPP approach and execution face several problems, difficulties, and shortcomings. Since agriculture is the main growth sector and plays a big part in economies worth \$5 trillion, approaches and techniques must be accelerated to meet the goals. In light of Amrit Kaal, which the Nation is currently undergoing, traditional agriculture is to be transformed into an agribusiness with an emphasis on agricultural value chains, agricultural research for innovation, and transfer of technology. Additionally, market infrastructure is to be built and upgraded, and services for business development are to be provided to farmers and small businesses.

The National Academy of Agricultural Sciences (NAAS) held a brainstorming session on the main theme of enhancing agri-infrastructure and agri-business development through public-private partnerships (PPPs) in India on May 25, 2023. The topics discussed at the brainstorming session led to the creation of this policy document. The document outlines the possible areas for PPP in agricultural sector, the environment that supports PPP in agriculture, and some changes or alterations that are required in policies, guidelines, and regulations to encourage cooperation among various players.

I thank Dr. Ch. Srinivasa Rao, Dr. G. Venkateshwarlu and Dr. D. Thammi Raju for convening this brainstorming session, and synthesizing the opinions, comments and suggestions of the participants in the form of this document. I am grateful to all the participants for their contribution. My sincere thanks are due to Dr. V.K. Baranwal and Dr. Rakesh Kumar Jain for their editorial support in bringing out this document in its present shape.

February, 2024
New Delhi



(Himanshu Pathak)
President, NAAS

Acronyms

ABI	Agribusiness Incubator
ACIAR	Australian Centre for International Agricultural Research
AI	Artificial Intelligence
AIF	Agriculture Infrastructure Funds
AIG	Academia – Industry – Government
ATMA	Agriculture Technology Management Agencies
AU	Agricultural Universities
BOT	Built, Operate, and Transfer
CIMMYT	International Maize and Wheat Improvement Center
CSIR	Council of Scientific and Industrial Research
CSR	Corporate Social Responsibility
DARE	Department of Agriculture Research and education
DBT	Department of Biotechnology
DIDF	Dairy Processing & Infrastructure Development Fund
DST	Department of Science and Technology
FAO	Food and Agriculture Organisation
FCI	Food Corporation of India
FIDF	Fisheries and Aquaculture Infrastructure Development Fund
GoI	Government of India
IARI	Indian Agricultural Research Institute
ICAR	Indian Council of Agricultural Research
ICARDA	International Center for Agricultural Research in the Dry Areas
ICRAF	International Council for Research in Agroforestry
ICRISAT	International Crops Research Institute for the Semi-Arid Tropics
IIM	Indian Institute of Management
IISER	Indian Institutes of Science Education and Research
IIT	Indian Institutes of Technology
IPDF	India Infrastructure Project Development Fund
IRRI	International Rice Research Institute
ISAM	Integrated Scheme for Agricultural Marketing
IWMI	International Water Management Institute
JIRCAS	Japan International Research Center for Agricultural Sciences
KVK	Krishi Vigyan Kendras
M&E	Monitoring and Evaluation
MoU	Memorandum of Understanding
MSME	Micro, Small & Medium Enterprises
NAA	National Academy of Agricultural Sciences
NAARM	National Academy of Agricultural Research Management
NAHEP	National Agricultural Higher Education Project
NIP	National Infrastructure Pipeline
NMP	National Monetization Pipeline
OMDA	Operation, Management and Development Agreement
PMKSY	Pradhan Mantri Krishi Sinchayee Yojana
PMU	Project Management Unit
PPI	Private Participation in Infrastructure
PPP	Public Private Partnership
PPPAC	Public Private Partnership Appraisal Committee
RKVY-RAFTAAR	Rashtriya Krishi Vikas Yojana - Remunerative Approaches for Agriculture and Allied Sectors Rejuvenation
SAU	State Agricultural University
SDG	Sustainable Development Goal
SEZ	Special Economic Zones
USAID	United States Agency for International Development
VGF	Viability Gap Funding

Enhancing Agri-Infrastructure and Agri-Business Development through Public-Private Partnerships (PPPs) in India

1. INTRODUCTION

Partnerships between the public and private sectors have existed for the past two millennia, starting with the massive development of ports and inland harbors during the rule of the Roman Empire, but this process vanished with the fall of the Roman Empire. Many subsequent developments occurred throughout the world in the 16th and 17th centuries, and the industrialization of the 19th century brought about fast urbanization and the expansion of public networks for energy, water supply, sewage, and transportation (such as railroads and tramways), among other things. These networks were primarily made possible by private participation. New public infrastructure was primarily planned, built, and funded by the government following World War I. In emerging or transitional nations, relatively little private funding had been provided for transportation infrastructure prior to 1982. From the 1980s and growing significantly throughout the 1990s, there has been a renewed push for infrastructure liberalization and privatization throughout the industrialized and developing worlds. Some PPP initiatives saw consolidation in the first ten years of the new millennium, while others saw stagnation and some development into new markets, particularly in Asia. Participating in this movement, numerous developing nations have invented enhanced PPP models. Leading rising economies, like Brazil, China, Hungary, Chile, and most recently, India, have included the private sector into infrastructure building and upkeep to a greater extent than many developed nations. Initiatives to outsource maintenance to private companies are being conducted concurrently across Africa, Asia, and, to a greater extent, Latin America (World Bank Report, 2009).

The experiences of PPP world over portray that frameworks for the development of PPP infrastructure have changed constantly over time. The PPP evolution is driven by the partnership-related components, the external environment, and internal project features. The need for infrastructure, government backing for a certain political philosophy to provide legitimacy, the legal and regulatory framework, and the existence of specialized government PPP units to facilitate implementation are all considered aspects of the external environment. The internal project characteristics include resource availability, project design, financial viability, contractual document maturity, project management functions, project type, and project complexity. Pre-planning inputs, institutional and financial support, income stream identification, project preparation, fiscal risk management, civil society involvement, procurement competition, etc. are all key learning points that contribute to PPP success. In emerging economies, the primary factor influencing the success of PPPs is institutional capability. In the context of public-private partnerships in India, government coordination is crucial. The institutional and regulatory frameworks required are provided by the government, and their maturity creates the right environment for luring private investment into the improvement of public infrastructure (Garg and Dayal, 2020).

PPPs typically entail the construction of new assets and assign accountability for their upkeep and management to a private enterprise. A crucial aspect of a public-private partnership in both scenarios is that the services or investments offered are described in terms of outputs rather than inputs, that is, what is needed rather than how it is to be done. PPPs can also be controversial, as critics argue that they can lead to the privatization of public services, lack of transparency, and potential conflicts of interest. Hence, PPPs must be carefully designed and monitored to ensure that they serve the public interest as stipulated in the contract and achieve the intended goals. Public Private Partnership initiatives are vibrant in many other sectors. In agriculture, the value chain is linked between field and food plate by series of micro, medium and large scale service and infrastructure project network. Some of these sub projects are not commercially viable in isolation but very essential to make the chain sustainable and viable, both commercially and socially. The goal of sustainable agricultural development, which includes smallholder farmers, can be advanced by implementing Agri-PPPs, which are widely marketed as having the capacity to modernize the agriculture sector and offer several benefits. (WEF & McKinsey and Company, 2011; WEF & McKinsey and Company, 2013). The concept and approach of PPP in agriculture raise many questions about what type of projects can be taken up and its effectiveness in achieving inclusive agricultural development objectives.

Achieving the target of a US\$ 5 trillion economies in the country is possible through improving the supply-side economy, which demands good infrastructural facilities and providing services for quality of life. The statistics elucidate that a very meagre per cent of investments are going into agriculture. The agriculture sector portrays different dimensions, such as research and development, outreach, and education. The National Agricultural Research and Education System has been actively engaged in PPP, especially in research and development, in the pursuit of alleviating the pertinent problems of the farming community. However, the much-anticipated partnerships need to develop to the level of vibrancy and desire.

Against this backdrop, on May 25, 2023, the National Academy of Agricultural Sciences (NAAS) hosted a brainstorming session titled “Enhancing Agri-Infrastructure and Agri-Business Development through Public-Private Partnerships (PPPs) in India.” The session explored the scope for PPP in agri-infrastructure, agri-business development and research, how to nurture PPP in agricultural service delivery, research & development and what policy considerations are needed. This policy paper is an outcome of the deliberations in the brainstorming session.

2. CURRENT STATUS OF INVESTMENTS THROUGH PPP

With the Indian economy presently growing at a pace of more than 8%, it is projected that Rs. 20.01 lakh crores (at 2006-07 prices) or US\$ 488 billion will be required for infrastructure investment over the next five years. The private sector is anticipated to contribute significantly to this investment. Public-Private Partnerships offer the best means of achieving these goals by drawing in private investment for the development of infrastructure and raising the bar for more effectively providing services. With 120 projects, investment

pledges totaling US\$ 42.3 billion in the first half of 2022 represented a 24% rise from the first half of 2021 and roughly a 1% increase from the previous five-year first-half average (2017–2021). Between the first half of 2021 and the first half of 2022, investment levels in India increased by 2.6 times (The World Bank Group, 2022). Once more, the transportation industry outperformed the other PPI (Private Participation in Infrastructure) sectors. In terms of total PPI investments made in the first half of 2022, China, India, Brazil, Indonesia, and Vietnam accounted for the highest shares. These five countries together attracted US\$ 32.0 billion, capturing 74 per cent of global PPI investment in the first half of 2022. Over the past three decades, 11 to 12 sectors received prominence and huge money were invested in the country, wherein the electricity sector is leading the list. This portrays the importance of the creation of infrastructure in the country.

The sector-wise projected annual capital expenditure in infrastructure during 2020-25 (Fig. 1) depicts that 71% of the budget goes primarily to four sectors: Energy (24%), Roads (18%), Urban (17%), Railways (12%), out of total Rs111 lakh crores. The agriculture sector only gets a share of 2% in food processing. In several other areas of agriculture, investments are required to boost the economy, viz., research and development, extension services, market infrastructure, post-harvest technologies, etc.

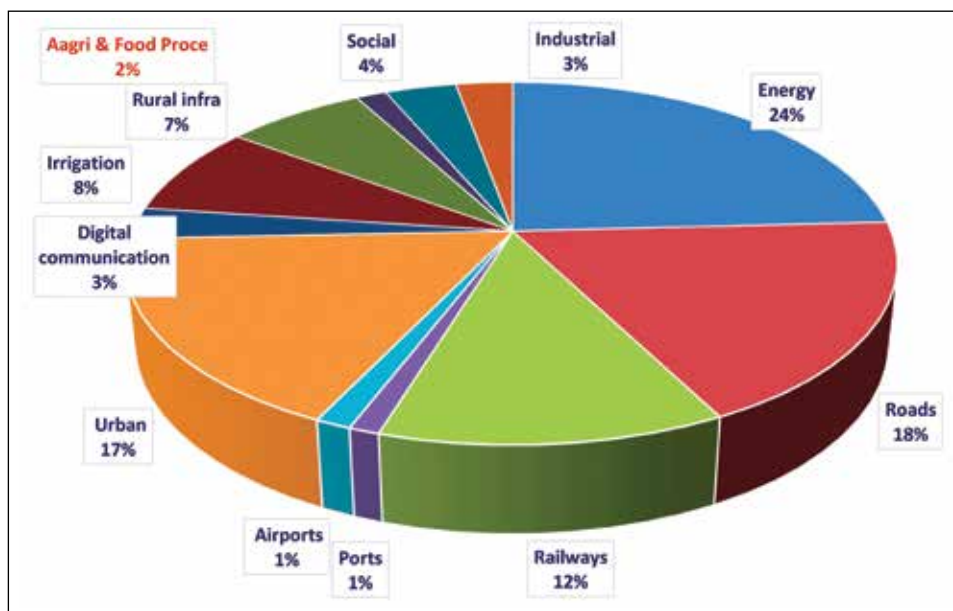


Fig. 1: Sector-wise projected annual capital expenditure in infrastructure 2020-25 (Rs 111 lakh crores)

(Source: <https://ppi.worldbank.org/en/snapshots/country/india>).

In an effort to increase the attraction of Public-Private Partnerships as the going rate for infrastructure project implementation, the Niti Aayog has instituted a vertical mode of PPPs. It aims to attract institutional and private sector financing to infrastructure projects

and develop world-class infrastructure within a set timeframe. 'The Agriculture and Allied Sectors' is one of the Verticals. This vertical focuses on research and knowledge sharing, policy advocacy, stakeholder consultations, policy design and analysis, and working with states and ministries to transform Indian agriculture. Innovation is driving this transformation, with a focus on improving farmer income and nutrition through sustainable and inclusive growth (<https://www.niti.gov.in/verticals/ppp>). The vertical also partners with private and public institutions, including IARI and NAARM.

Niti Aayog assessed 125 PPP projects between April 1, 2020, and March 31, 2021, for a total estimated cost of Rs 1,72,314 crores. There are two state projects and 123 central government projects included in this. The sector-wise distribution of the PPP projects (including the projects under the VGF scheme) appraised is given in Table 1.

Table 1: Sector-wise PPP project appraisals during 2020-21

S. No.	Project Appraised	No. of Projects	Total Cost (Rs in Crores)
1	Roads	69	63,279
2	Ports	12	3,359
3	Eco-Tourism	10	2,232
4	Silos	1	401
5	Petroleum Reserves	4	27,728
6	Ropeway	1	996
7	Telecom	9	29,199
8	Railway Stations	6	7,600
9	Railway Passenger Trains	12	30,099
10	Metro	1	7,420
	Total	125	1,72,314

The above table depicts the success of PPP in certain identified sectors, and this becomes a pointer for consideration in agriculture.

In order to ensure prompt project appraisal, eliminate delays, adopt international best practices, and maintain uniformity in the appraisal mechanism and guidelines, the Public Private Partnership Appraisal Committee (PPPAC), the apex body for PPP project appraisal in the Central Sector, has streamlined the appraisal mechanism. The Secretary of Economic Affairs (DEA) is the chair of the PPPAC, which reviews and evaluates proposals for Public-Private Partnership (PPP) projects in the central sector. Other members of the PPPAC include the Secretaries of Expenditure, Legal Affairs, the Sponsoring Ministry and the CEO of NITI Aayog. The PPPAC has cleared 79 projects with a total project cost of ₹2,27,268.1 crores from FY15 to FY23.

56 projects with a total project cost of ₹57870.1 crore were given in-principle approval under the VGF Scheme between 2014–15 and 2022–23. Final permission for 27 projects totaling ₹25263.8 crore (including both GoI and state share) was given along with approval for ₹5813.6 crore in Total Viability Gap Funding. The state's portion of the total approved VGF is ₹2710.9 crore, while the Government of India's share is ₹3102.6 crore. The total VGF amount disbursed by DEA under the scheme from FY15 to FY23 is ₹2982.4 crore. (Chapter 12, Economic Survey, 2023).

3. EFFORTS OF GOI IN PROMOTING PPP

The Prime Minister gave a clarion call for establishing a New India by 2022. The “Strategy for New India @ 75” summarizes three key messages: 1) development must become a mass movement in which every Indian recognizes his or her role and also experiences the concrete benefits accruing to him or her in the form of improved ease of living; 2) development strategy should help achieve broad-based economic growth to ensure balanced development across all regions, states, and sectors; and 3) the strategy, when implemented, should bridge the gap between public and private sectors.

Previously, the Committee on Revisiting for Revitalizing the PPP Model of Infrastructure Development, led by Dr. Vijay Kelkar, prioritized service delivery over financial advantages and a more equitable allocation of risks among participants. They also suggested creating an Institute of Excellence in PPP, establishing the National Facilitation Committee, and other measures to ensure that problems are resolved within a reasonable time frame. (Department of Economic Affairs, Ministry of Finance, Government of India, 2015). With the goal of resolving policy and regulatory environment issues, the Indian government has initiated a number of initiatives to overcome these barriers and create a framework that will facilitate PPPs.

- ◆ **Viability Gap Funding Scheme:** In order to make PPPs for infrastructure projects financially feasible, the initiative offers grants, either one-time or deferred.
- ◆ **India Infrastructure Project Development Fund (IIPDF):** The main goal is to finance the development costs of potential PPP projects, including the fees for hiring consultants and transaction advisors, to increase the number and quality of successful PPPs and enable the government to make well-informed decisions based on high-quality feasibility reports.
- ◆ **National Agriculture Infra-Financing Facility:** This facility is created with 1 lakh crore as Agri Infrastructure Fund towards creating farm-gate infrastructure for farmers (Primary Agricultural Cooperative Societies, Farmers Producer Organizations, Agriculture entrepreneurs, Start-ups, etc.). The construction of an inexpensive and commercially feasible post-harvest management infrastructure, including a farm gate and aggregation point, was encouraged.
- ◆ **National Infrastructure Pipeline:** It is a first-of-its-kind government initiative to build top-notch infrastructure across India and raise everyone's standard of living. It aims

to improve project planning, highlight investment prospects in India's infrastructure industry, and draw foreign capital into the country.

3.1 PPP Efforts in Agriculture

The Indian Council of Agricultural Research and other institutions of the National Agricultural Research and Education System have constantly engaged with different players in their endeavour in product development, technology commercialization, knowledge management, training, and education, through various means such as *Memorandum of Understandings* (MoU) in a limited scale. However, the efficacy of these MoUs between National and International Organizations is far below the expectations due to obvious reasons. The ICAR-NAARM has conducted a preliminary study with the available records of MoUs, about 19 SAUs. Most of the time, collaboration is in the areas of research, extension, education and capacity building, in that order (Fig. 2). Many of the SAUs had collaboration with National Organizations (73.4%) than International organizations (25.56%). The AUs viz. Navsari Agricultural University, Navsari; University of Agricultural Sciences, Bangalore; IARI, New Delhi, etc., collaborated more with industries than others. The collaboration with international organizations and industry is focused more on research, education, extension, and capacity building. So the dynamics are to be relooked at the purpose, organization, and process of MoUs.

To boost funding for agricultural R&D and the development of agricultural technology, the Department of Agricultural Research and Education obtained funding from a variety of sources, including CSR, the private sector, collaboration with the private sector, etc. Following ICAR's acceptance of the CSR Guidelines, private corporations are increasingly expressing interest in investing in R&D in partnership with SAUs and ICAR. More than 500 private seed companies were granted licenses to produce and distribute seeds, along with other uses, by the Department under PPP, using Public Sector varieties and hybrids, via memorandums of agreement. In order to achieve sustainable agriculture that effectively achieves the aims of nutritional security and boosting farm income, the DARE sought funding from international organizations such as USAID, ICRISAT, World Agroforestry Centre (ICRAF), IWMI, CIMMYT, IRRI, JIRCAS, ACIAR, ICARDA, etc. The department worked with the public and private sectors as well as potential entrepreneurs to create equipment and technology that would increase the nation's agricultural mechanization, post-harvest processing, and other agricultural operations. There are numerous partnerships in existence covering a range of topics in horticulture, animal science, fisheries sciences, etc. Funds of Rs 172.67 crores have been created by the Animal Science division, whereas Fishery Science has earned Rs 36.15 crores (47th Report of Standing Committee on Agriculture, Animal husbandry and Food Processing, 17th Lok Sabha).

The key recommendations of a National Conference on 'Policy Development and Implementation Strategies for Academia-Industry Government Linkages in Agricultural Higher Education in India under Component 2 of NAHEP at ICAR-NAARM, Hyderabad during March 12-13, 2023 assumes significance in this context. Many stakeholders expressed concern over the process/procedure to be adopted for an MoU with international organizations.

'Administrative Simplification Strategies: A single window system for simplifying the procedures/processes in building effective collaboration through an institutionalized mechanism with functional autonomy is needed. Revisiting existing guidelines/ procedures and developing user-friendly and simplified policies with a minimum time frame is the need of the hour (See box for other key recommendations).

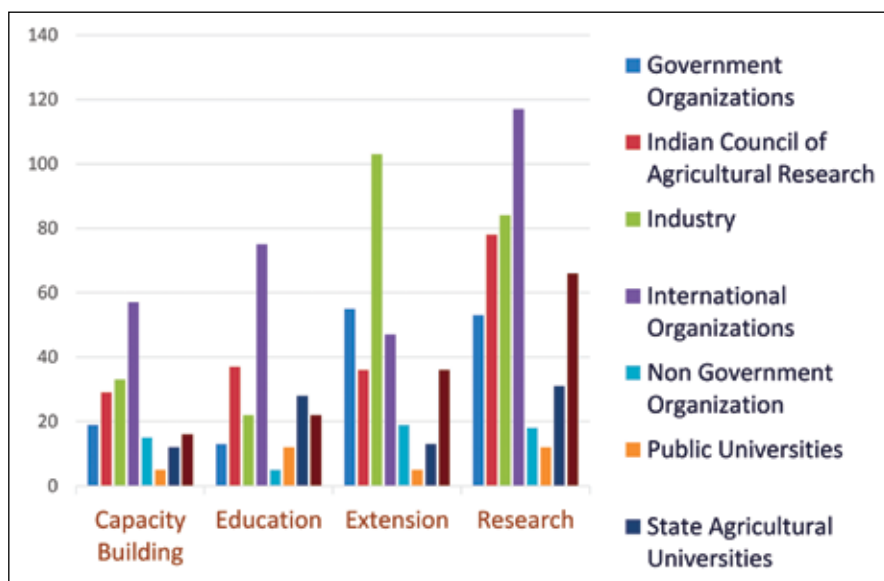


Fig. 2: Trends in MoUs by State Agricultural Universities – types of organizations and areas of collaboration

The government launched programs including the National Monetization Pipeline (NMP), National Infrastructure Pipeline (NIP), and Public-Private Partnership (PPP) to encourage the private sector's involvement in the construction of new and existing infrastructure. Furthermore, Gati Shakti and the National Logistics Policy (NLP) were introduced as part of the structural changes aimed at improving cost competitiveness and efficiencies. The Pradhan Mantri Krishi Sinchayee Yojana (PMKSY), the Integrated Scheme for Agricultural Marketing (ISAM), the Agriculture Infrastructure Funds (AIF), the Dairy Processing & Infrastructure Development Fund (DIDF), the Fisheries and Aquaculture Infrastructure Development Fund (FIDF), the Rashtriya Krishi Vikas Yojana - Remunerative Approaches for Agriculture and Allied Sectors Rejuvenation (RKVY-RAFTAAR), and other agricultural and allied sciences initiatives have all been instrumental in stimulating infrastructure development in India. The varying conditions across these programmes in terms of fund size, duration of the scheme, target agencies, interest subvention, cap on the interest rate, credit guarantee, selection procedure, repayment (years), provisions for marginal sections etc., are to be relooked for better utilization.

The Ministry and FICCI recently established the Project Management Unit (PMU) on Public-Private Partnership in Agriculture to expedite large-scale PPP projects in the field by utilizing private sector investments and bringing together government schemes and subsidies. In order to increase yields, lower losses, and raise farmer incomes, the Central Government is also eager to support PPP projects in the agriculture sector. PPP in agriculture R & D is also viewed as the priority area by G20 Presidency.

4. PPP IN AGRICULTURE INFRASTRUCTURE/BUSINESS DEVELOPMENT/RESEARCH

The projects were categorized into four types of partnerships based on a study of approximately 70 cases of agribusiness development from 15 countries: i) developing agricultural value chains; ii) collaborative agricultural research, innovation, and technology transfer; iii) constructing and modernizing market infrastructure; and iv) providing business development services to farmers and small businesses. Given the variety of models and potential applications of PPPs in developing country agriculture, this classification helps the government understand the kinds of agribusiness projects that can be managed using PPP mechanisms (FAO, 2016).

The key lessons were:

1. Agribusiness partnerships must come to an agreement on matters concerning public-sector aims and objectives for developing PPPs in order to successfully balance the divergent interests and aspirations of the partners.
2. The unique skills and expertise that can bring to agri PPP should be considered while defining each partner roles with due incetivisation.
3. Effective agri-PPPs distribute risks evenly among partners and incorporate risk management procedures to safeguard the most vulnerable.
4. Financial institutions can play a significant role in agri-PPPs.
5. Agri-PPPs have the potential to encourage the involvement of smallholders and SMAEs, but they are unlikely to have an effect on the world's poorest people.
6. A crucial component of all agri-PPPs is collective action, which lowers transaction costs and promotes participation.
7. Effective PPP design requires strong institutional and regulatory foundations.
8. Enhancing the Monitoring and Evaluation (M&E) of agri-PPPs is crucial.

By implementing PPPs in the agriculture sector, India can benefit from:

- ◆ **Improved agri-infrastructure:** Leveraging private sector expertise and resources can lead to the development of better infrastructure, such as wholesale markets, warehouses, cold storage facilities, and irrigation systems. This can help stabilize prices, reduce post-harvest losses, and improve overall agricultural productivity.
- ◆ **Enhanced agri-business development:** PPPs can facilitate the growth of agro-processing industries and contribute to the development of value chains, providing farmers with better access to markets and increasing the value of their produce.

- ◆ **Technology transfer and innovation:** Partnerships between the public and private sectors can facilitate the exchange of knowledge, fostering innovation and the adoption of new technologies in agriculture, which can lead to improved productivity and sustainability.
- ◆ **Inclusion of smallholder farmers:** PPPs have the potential to promote the inclusion of smallholder farmers and small and medium agri-enterprises (SMAEs) by encouraging collective action and reducing transaction costs.
- ◆ **Strengthening of agricultural extension services:** PPPs can help revitalize agricultural extension services by involving the private sector in providing tailored advice and support to farmers, ultimately improving the efficiency and effectiveness of these services.
- ◆ **Creation of job opportunities:** Developing agri-infrastructure and agri-businesses through PPPs can generate new employment opportunities in rural areas, contributing to poverty reduction and sustainable rural development.

The National Infrastructure Pipeline captured key greenfield and brownfield projects for investments across all economic and social infrastructure sub-sectors on a best-effort basis. In agriculture and allied sectors, the opportunities are mostly in the areas, as detailed below (Table 2):

Table 2: PPP project areas in Agriculture

S. No.	Sub Sector	Projects (%)
1	Food processing and additives	56.3
2	Horticulture	33.5
3	Post-harvest storage infrastructure	3.8
4	Terminal markets	2.3
5	Cold chain	2.0
6	Soil Testing Labs	1.8

The states like Maharashtra, Madhya Pradesh, Tamil Nadu, Uttar Pradesh, and West Bengal, in that order, have the highest number of opportunities in the food processing and agriculture sectors (<https://indiainvestmentgrid.gov.in/analytics/india-overview?type=0&viewBy=0§orId=1&subSectorId=137>).

Thus, investments in agricultural sectors are limited to certain sectors and geographical locations. The key areas are food processing, horticulture, post-harvest storage, including cold chain, terminal markets, and establishment of labs such as soil testing laboratories. The Ministry of Food Processing Industries of the Government of India has targeted the establishment of mega food parks, cold chains, creation/expansion of food processing/preservation capacities, agro-processing cluster, operation greens scheme, production linked incentive scheme etc. There is a need to identify the potential sectors and successful models that can be replicated in agriculture.

Kaushik and Ranjan (2022) argue that the essentiality of four pillars for successful public-private partnerships in agriculture and how they 1) open up the data ecosystem, 2) share field resources and infrastructure, 3) partner with academic and research institutions, and 4) convergence of programmes and policies for agricultural technology services. However the critical issues in agricultural PPPs, as identified in the study by Agarwal et al (2023), are “Complex and Time-Consuming Procedures”, “Governance Issues”, “Lack of Enabling Environment”, “Costly Contracting and Endogenous Contract Incompleteness”, and “Coordination Failures”. Also, potential risks associated with PPPs must be carefully managed to ensure successful and sustainable outcomes. In some cases, PPPs may result in an unequal distribution of risks between public and private partners, with the public sector bearing a disproportionate share of the risk. This can lead to financial strain on the government and limit the intended benefits of private sector involvement. Moreover, private sector partners may prioritize profit maximization over the broader public interest, potentially resulting in projects that do not adequately address the needs of the intended beneficiaries or that compromise environmental and social standards. This may also lead to smallholder farmers, local communities, and marginalized groups from participating in and benefiting from the projects, leading to increased inequality and social tensions. Therefore, it is crucial to create an enabling environment with appropriate incentives to attract private investment in the agriculture sector through PPPs in a sustainable manner. Some incentives channeling private investment in the right direction include transparent and clear-cut risk-sharing mechanisms, land leasing policy and regulatory support.

To ensure inclusive participation in PPP projects, research and capacity-building efforts are needed to identify and develop viable project models that can be replicated and scaled up, making them attractive for private investment. Capacity-building programs targeting potential entrepreneurs from poor economic backgrounds should focus on improving their technical and business management skills to enable them to participate effectively in PPP projects. In addition, providing legal and regulatory guidance to entrepreneurs from poor economic backgrounds can help them navigate the complex legal environment surrounding PPP projects, ensuring their rights are protected, and their businesses comply with relevant laws and regulations.

By addressing these areas, the government and other stakeholders can create a more conducive environment for private investment in the agriculture sector and ensure that entrepreneurs from poor economic backgrounds have the necessary resources and support to participate in and benefit from PPP projects.

5. POTENTIAL AREAS FOR PPP IN AGRICULTURE

For higher-quality and better services, it is imperative to create a systematic approach for expanding the number of bankable agribusinesses and agri infrastructure projects with private sector involvement. The role of the private sector is immense in the reinventing agri-food sector.

Engaging the private sector in developing and managing agri-infrastructure will bring improved technologies and best practices in operations and generate rural employment. The partnership can merge as an important tool to induce investment and capitalize on

the synergies of the public and private sectors. While the government continues to lead and facilitate the development of the agriculture sector through its policies, the entry of the private sector will induce fresh ideas that, when scaled up, can emerge as mass development models for the agriculture sector. The following are some of the areas for PPP on agriculture that are recommended for implementation (Joshi and Pandey, 2017, Brainstorming Session NAAS, 2023).

- ◆ **Wholesale Market Development:** Agricultural markets in India are thinly distributed. Existing marketing is characterized as inefficient, fragmented, and unorganized. Very few markets have been developed during the last three decades; most are concentrated only in well-off areas. Now is the right moment to develop PPP-style wholesale market mechanisms in a manner akin to building and operating national highways using the built, operate, and transfer (BOT) method. The central government should implement a model concession agreement using a viability gap funding mechanism with encouragement to states to implement the process as per the specific needs of each state.
- ◆ **Warehouse and Cold Storage Development:** High price volatility is one of the major reasons for agrarian distress. Prices crash in the event of high production. Warehouses and cold storages play an important role in stabilizing prices and benefiting farmers and consumers. There are several options for public-private collaborations in the building of warehouses and cold storage facilities. The two biggest challenges facing the private sector's reaction are reportedly a lack of land and a small size of operations. *Panchayat* land, uncultivated land, and government land, including some of the railway's land, may be allocated on a long-term lease with annual rent by inviting bids from the private sector in OMDA (Operation, Management and Development Agreement) mode as has been done for airport development and management.
- ◆ **Agro-processing Development:** The demand for agricultural products, particularly perishable ones, is rapidly growing both domestically and internationally, which presents enormous prospects for agro-processing. Utilizing this industry can help to reduce unaccounted losses of perishable goods and meet future demand. With the development of Mega Food Parks and Integrated Cold Chains, the Ministry of Food Processing and Industries is dedicated to maintaining a focus on building top-notch infrastructure to support the growing food processing industry. The agri-processing industry will grow as a result of the PPP mode's success in accomplishing these goals, creating processing facilities, and connecting them with MSMEs. We can draw a parallel lesson from successful PPP mode in constructing airports, providing numerous services, and linking operations by various airlines.
- ◆ **Canal Irrigation Development and Management:** India has a large network of major and minor canals and distributaries from various rivers. Roughly 40% of all irrigated area is covered by canals. Huge investment has been made to develop reservoirs, canals, and distributaries. Over the years, the canal irrigation system in many parts of the country is reported to be underperforming. With canal irrigation, the irrigation effectiveness is only thirty percent. PPP mode can cover this industry by taking the electricity industry's lessons to heart. Responsibility for developing and managing water reservoirs lies with irrigation department. The canal management and water delivery

contract could be given to the private sector based on its credentials. The contract may include canal and distributary management, water pricing, and promoting efficient irrigation methods. This will incentivize assessed volumetric release of water at different phases from the reservoir to the farmers, thereby improving water usage efficiency.

- ◆ **Agriculture Extension:** The public agricultural extension system had a vital role in bringing the green revolution in the country. But the sector is now being questioned for its efficiency and effectiveness despite introducing various reforms. At present, *Krishi Vigyan Kendras (KVKs)* and *Agriculture Technology Management Agencies (ATMA)* are the last mile connectivity for technology delivery. The private sector also runs some of the KVKs but the majority are with agricultural universities (AUs) and the Indian Council of Agricultural Research (ICAR). The Agricultural Universities, ICAR institutes, and KVKs have good infrastructure, including land and water resources, which can be leased to the private sector for a medium to long period of time (7-10 years) to demonstrate best practices. The private and public research systems might also collaborate to do research for demonstration of best practices. The process can also incentivize the private sector to use its CSR funds.
- ◆ **Crop/ Animal Insurance:** The public and private sectors' role is critical in providing insurance in the crop/ livestock sector. Market inefficiencies, such as information asymmetries, a lack of data infrastructure, and constrained insurer access to reinsurance, frequently plague the agriculture insurance markets. Governments must take the initiative in large-scale crop insurance schemes to solve market inefficiencies, incorporating the private sector in activities like producing data, assuring outreach, risk financing, assisting with technical chores, building an enabling environment, etc. (The World Bank Blog, 2015).
- ◆ **Supply of Quality Inputs (seed, vaccine, etc.):** Most of the time, farmers are facing problems in procuring quality seeds and end up with a loss of production. Especially fodder production has been a major challenge as no one is the champion in fodder production. The huge lands available with state agricultural universities (redefining the land grant system?) can be used for the production of quality seeds involving the private sector. Often public institutions are deprived of funding despite their technological advancements. PPP is to be harnessed for the production of vaccines to improve livestock health status (e.g., Lumpy Skin Disease).
- ◆ **Resources Optimization:** The NARES is endowed with land, technologies, expertise, labs etc., which need to be improved in the private sector. Budgetary constraints of SAUs and low resource generation always plague the development of agricultural education. The partnership between private and public agencies on identified mutually beneficial areas would help nurture the agricultural system. This may lead to addressing the industry issues while deriving their presence on the campus in terms of employability, internships etc., for students.
- ◆ **Promotion of Special Economic Zones (SEZs) in Agriculture:** The Government of India has issued a significant policy on the establishment of Special Economic Zones to attract foreign direct investment, generate job opportunities, expand infrastructure, promote technology transfer, and gain access to global markets, among other things.

Drawing the lessons from the evaluation of SEZs, there is a need to reinvigorate the SEZs (PwC 2021), especially in the agricultural sector.

- ◆ **Development of Customized Products/Prototypes:** Specific, focused, time-bound research collaborations between ICAR and other input companies (eg: fertilizer, seeds, nutrition) in the development of customized products/ prototypes from the problem identification stage itself. Translational research is to be taken up by analyzing the gaps between solutions provided and requirements for reaching the last mile.
- ◆ **Competence Development in Public and Private Organizations:** Competency mapping and development is the critical element in PPP's different aspects, such as the preparation of winning PPP project proposals, because of which the magnitude of successful projects is less. Joint Capacity Building Programmes by public and private institutions for the benefit of ultimate clientele i.e. farmers along with sensitization about government programmes.
- ◆ **Creation of Innovation Platform for R&D** – The convergence of private players, regulators, policymakers, funders (international, philanthropic) etc., with a larger focus on SGDs with a provision for each player for specific interventions is needed for nurturing collaborative partnerships. All other players, including IITs, IISERs, DBT, DST, Start-ups, etc., must be brought together. Collation of funds of different agencies through a governance mechanism to prioritize specific and address the problems. This platform can support small players and start-ups in coordinating technological development programmes at the national level. It also can identify key areas and relevant stakeholders in the public and private sectors, which will help understand, anticipate, and influence future scientific policies better.
- ◆ **Development of Alternate Quality Control Tests:** The protocols developed for quality testing were so old and time-consuming. Using the latest cutting-edge technologies, the ICAR and the industry can collaborate in developing alternate quality protocols/tests (eg: vaccine industry). Both ICAR and private industries can develop regulatory mechanisms through SoPs/techniques/guidelines etc. to facilitate implementation by manufacturers and their monitoring.
- ◆ **Agri Warehousing:** While promoting warehousing more focus should be given to quality management (assaying, grading, sorting) using the FCI standard machines. AI-based assaying is the one area where private players and start-ups can contribute significantly. Farmers must be provided with market information, advisories and inventory management.

6. ENABLING ENVIRONMENT FOR PPP IN AGRICULTURE

The ICAR and other organizations made many efforts to build an ecosystem for nurturing the partnership in agricultural research, education and extension. Stronger relationships among the public and private organizations, with mutual trust and equal distribution of risks, are crucial when the supply side demands are in the offing. Enhanced relationships among the players can be fostered by creating an enabling environment and/or removing the bottlenecks in policy regulations, relooking agriculture as a business entity by increasing

the supply chain linkages, building world-class infrastructure and imbibing innovation and disruption. The following factors are critical for enabling PPPs in agriculture.

1. **AIG Linkages:** Considering the overall development of agriculture development, stronger Academia – Industry – Government (AIG) linkages are needed in research, extension and education (see box) for nurturing healthy relations for finding the solutions to farming problems and their implementation.
2. **Expansion of Spectrum for PPP:** Generally, the PPP are launched for the development of infrastructure with key players from the public and private sector. The PPP in agriculture points towards the expansion of its spectrum of engagement. The organizations like ICAR, SAUs from the public system and R&D, and inputs companies from the private sector are the major players. The other potential players viz. bankers (NABARD/SBI etc.), national/international institutions working in agriculture and allied sciences (IITs, IIMs, IISER, CSIR etc.), start-up ecosystem etc. should be brought together for PPPs.
3. **Design and Execution of PPP:** The projects should be based on equity, tech services, shared user fee, capital cost recovery, subsidy and provision for operational costs etc. European PPP models are to be emulated where in government goes to private industry with a specific product development target such as vaccines and vice versa. Understanding the responsibilities of both parties, transparency in the governance mechanism, clear roles and responsibilities of each party involved, equitable risk-sharing mechanisms, and mutual trust are critical for success. PPP frameworks need to be specifically defined for the type of private entities that are involved. Need to sharpen the definition of the types of the private sector, which will then allow us to identify the nature of risks that these pvt sectors are exposed to and then arrive at what risk mitigation approaches can be put in place.
4. **Integration of Networks:** Information asymmetry and the absence of transportation networks are huge contributors to failures of the value chain. This requires the integration of agri-logistics and transportation networks into our design of these PPPs.
5. **Innovations and Management:** While traditional agriculture has been transformed into agribusiness, more investments in Agtech and Fintech aspects are required. Further, it involves the integration of digital systems of agriculture into an IT platform with all aspects of agriculture, including marketing, banking for all stakeholders and a special focus on education. To replicate initiatives like Telangana's Saagu Baagu, a pilot project established through Artificial Intelligence for Agriculture Innovation (AI4AI) is needed. The pilot project is a collaboration between the Telangana government and the World Economic Forum's Centre for the Fourth Industrial Revolution (C4IR). Farmers enrolled in the program receive support through Artificial Intelligence (AI) technologies such as quality testing and soil testing and access to new customers and suppliers in different geographies.
6. **Start-up Ecosystem:** The start-up ecosystem is slowly emerging as a potential business entity in the agricultural sector due to the vast scope of the food supply chain. There is a paradox in funds flows to the start-up ecosystem; funds are available

for post-harvest management while many are focusing on pre-harvest management. The young entrepreneurs need to be sensitized through ABIs of ICAR with a focus on pre-harvest and post-harvest infrastructure development with support from incubation centres. Models to be developed in PPP mode involving ABIs. There is a need for support from the private sector in setting up and strengthening incubation infrastructure. This can be met from not-for-profit, privately managed incubation centres with access to CSR money and bilateral donor money and nitty-gritty to be worked out.

- 7. Agtechs and Fintechs:** Many Agtechs and Fintechs have raised successful financing from private institutional sources. Start-up India is a good method to use PPP to scale Agtech and Fintech businesses. The key enablers would be opening a data ecosystem, sharing field resources and infrastructure, partnering with academic and research institutions (public and private) and through PPP-based program and Policies for Agtechs and start-ups, Agtech and Fintech integration etc. In particular, many Agtech are focusing on field based science interventions for small farmers. Social equity based PPP should be explored with involvement of such Agtech and Fintech firms. The digital cashless payment system (particularly UPI and credit delivery) can be effectively and more cost effectively integrated in several value chain infrastructure and service projects using PPP approach. Indian agricultural system can in fact lead such agri based PPP project systems.

The ICAR-NAARM organised a National Conference on 'Policy Development and Implementation Strategies for Academia-Industry Government Linkages in Agricultural Higher Education in India under Component 2 of NAHEP at ICAR-National Academy of Agricultural Research Management, Hyderabad during March 12-13, 2023. The following are the major recommendations:

1. Resource Sharing: *Harping on the strengths of respective organisations and avoidance of duplicity, an ecosystem needs to be developed and implemented among the stakeholders for sharing of resources, including knowledge, expertise, infrastructure, innovations etc., through appropriate means.*

2. Reimagining the Research and Innovation: *The technological advancement should address the community needs through stakeholder participation in the research-innovation continuum through changes in the curriculum, building synergies and convergence among the stakeholders.*

3. Triple Helix Partnerships: *The three key partners i.e. Academia- Industry, and Government, is essential for promoting agriculture research, innovation and business. Achievement of effective partnerships and trust building can be achieved through participatory decision-making in regulatory bodies of respective organisations.*

4. Tapping into Corporate Social Responsibility funding: *CSR funds are critical means of enhancing the quality and relevance of Agri. Research and education due to the lack of funds in the public system. A consortium of agro-based industries can facilitate the flow of CSR funds to academia.*

5. Administrative Simplification Strategies: A single window system for simplifying the procedures/processes in building effective collaboration through an institutionalised mechanism with functional autonomy is needed. Revisiting existing guidelines/ procedures and developing of user-friendly and simplified guidelines with a minimum time frame is the need of the hour.

Under the sponsorship of the NAAS and the NCAP, the **National Colloquium on “Innovations in Rural Institutions: Driver for Agricultural Prosperity”** deliberated on developing an institutional model for rural development. The model highlighted the traits of rural institutions that allow them to adapt to a variety of socio-political and ecological circumstances. In order to achieve inclusive growth, the colloquium emphasized the importance of public investment in social infrastructure, such as health care, roads, and schools, as well as economic infrastructure, such as markets and supply chain backward and forward linkages that can be transformed into value chains through creative pricing incentive policies. The infrastructure—which includes agro-input retailing facilities, subject matter experts from local organizations providing pertinent advice, agro-processing, storage, packaging, and marketing—needs to be rejuvenated in order to maximize profits. Strangely, at the moment, less than 2% of agricultural produce is processed. Such a poor agro-processing is wasteful, particularly for the perishable commodities, and drains away larger portion of valuable income (Policy paper #39, NAAS).

The BSS organized by NAAS reiterated that in order to improve relationships and collaborations between various stakeholder types, it is also essential to develop creative licensing models for risk-sharing and equity participation (Policy Paper #75, NAAS).

7. POLICIES, GUIDELINES AND REGULATIONS IN AGRICULTURE

The coherence between the anticipated change and existing policies, regulations, and guidelines of PPP in agriculture determines the path of its progression. Ease of doing (research/ business) should be the core philosophy in the implementation of projects. Over the years, several issues have been raised by different players in objectively furthering the partnerships. This calls for the attention for change in existing policies, guidelines, and regulations. Some of the critical changes required are given below:

1. **Product Takeoff:** Customised multiple product launching (fertilisers, seed, nutrition) is a challenge due to the lengthy process for approval. Hence the approval process has to be eased with strict compliance from manufacturers – imposing heavy penalties in case of violation. ICAR has to facilitate importing of strains through its referral labs from SAARC and other countries to reduce the time gap in the product launch. Also, ICAR has to collaborate with private industries in product development and the popularisation of the same.
2. **Granting Exclusivity:** Regulatory streamlining by providing exclusivity to industries, case to case, for effectively nurturing PPPs. Private sectors have better containment

facilities, and they can compete with international markets, provided policy changes for importing strains are modified.

3. **Time Delays:** Import policies and regulations are time-consuming and thus delay the manufacturing schedules, needing changes in the rules in tune with changes adopted regarding COVID.
4. **More autonomy to Agri Incubation Centres of ICAR:** ABIs are project-based activities and lack flexibility in attracting private funds to support start-ups, unlike other similar programmes of DBT/DST etc. So there is a need to change the existing guidelines.

KEY RECOMMENDATIONS

1. **Effective Product Takeoff:** To develop multiple products on a scientific basis at a quicker pace, the government approval process has to be modified with strict compliance conditions on the part of manufacturers. ICAR has to play a proactive role in product development, testing and popularisation.
2. **Scaling up of Agtechs and Fintechs** across Agriculture, Education, Health, Wellness, and Travel, among others.
3. **Nurturing AIG Linkages:** Stronger Academia – Industry – Government (AIG) linkages are needed in research, extension and education for fostering healthy relations for finding the solutions to farming problems and their implementation through an institutionalised mechanism involving all the stakeholders.
4. **Vibrancy in Start-up Ecosystem:** Synergy between the funds flow and emergence of start-ups is to be balanced at the National level, which can be brought through sensitisation among entrepreneurs by ABIs of ICAR.
5. **Strengthening of Incubation Infrastructure through CSR Funds** for sustenance of the incubators. Through the public-private collaboration in India's transformation, the CSR Initiative will propel the country toward the attainment of sustainable development goals. The detailed guidelines of CSR Funding by ICAR are available at <https://icar.gov.in/sites/default/files/Circulars/ICAR%20CSR%20FUND%20GUIDELINES.pdf>
6. **Competence Development in Public and Private Organizations:** Organization of Joint Capacity Building Programmes by public and private institutions on development of winning PPP proposals.
7. **Creation of an Innovation Platform for R&D** for private players (including IITs, IISERs, DBT, DST etc.), regulators, policymakers, funders (international, philanthropic) etc. with a larger focus on SDG with a provision for each player for specific interventions is needed for nurturing collaborative partnerships.

ACKNOWLEDGEMENT

The authors gratefully acknowledge the contributions of many experts who helped us in bringing out this document.

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