

Innovation System and Public Private Partnership interactions in India Agricultural Sector

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Abstract

Public-Private-Partnership (PPP) provides a prospect to private sector participation in financing, construction, designing and operation & maintenance of public sector projects and programmes. Such intra and inter sectoral corroborations base the platform for each other towards the path of development. In most of the major sectors like health, biotechnology and agriculture etc., the socio-economic and research development prospects are favoured by the partnerships between the public and private institutions. In country like India which is still in the list of developing ones need to provide livelihood and surveillance to all. As India is a huge populated country it needs to combat the poverty. To provide food to all the people provokes the increased productivity of agriculture sector. Agriculture sector is the main economy providing sector in India. This sector needs too much focus to track the development which in turn impacts the socio-economic development of the country. In this sector, the collaborations within various institutions like universities, R&D institutes and other firm, industries should be empowered. These partnerships incentives the innovation for agricultural development and have various advantages over other institutional arrangements fostering R&D. PPP is a mode of applying government programmes/schemes in partnership with the private sector. The word 'private' in PPP encompasses all non-government agencies such as the corporate sector, voluntary organizations, self-help groups, partnership firms, individuals and community based organizations. PPP, moreover, incorporates all the purposes of the service being provided earlier by the government, and is not intended to compromise on them. The objective of this research paper is to analyse the role of private public partnership in agricultural innovation system within the framework of India. The research work is based on the secondary data collected from various articles, government reports, and other relevant sources. Qualitative research methodology approach has been used in the research paper. In the past recent years it has been shown that the boost in agricultural productivity pointed out due to various factors. The collaborations and partnerships had also been proven a good factor in the development of the agriculture sector. Such processes help in generating and transfer of knowledge and technologies. Both the knowledge and technologies are main steps for the innovation in the sector. Hence such innovations impacts the socio-economic conditions of the country and people.

Keywords: Public-Private-Partnership, agriculture sector, agriculture innovation system, technology, knowledge.

1. Introduction

Public-Private-Partnership (PPPs) in research collaboration between public- and private-sector are entities in which partners jointly plan and execute activities with a view to accomplishing agreed-upon objectives while sharing the costs, risks, and benefits incurred in the process. PPPs in the innovation systems approaches that examine how

collaborations between public and private agents in the generation, exchange, and use of knowledge are conditioned by internal behaviours, practices, and routines, and by the external social and economic context within which they operate. PPPs in agricultural R&D are increasingly viewed as an effective means of conducting advanced research, developing new technologies, and deploying new products for the benefit of small-scale, resource-poor farmers and other marginalized social groups in developing countries (Spielman, Hartwich and Grebmer, 2007). Since their emergence, PPPs have been the focus of extensive study in a variety of disciplines, including economics, public administration, and management science. In innovation approach whatever the discipline may be it intakes the exchange of knowledge and technologies. Certain barriers impede the otherwise smooth process of exchanging and using knowledge necessary to the innovation process. These barriers might be attributable to market failure, wherein the social benefits of research exceed the private benefits, resulting in a chronic undersupply of research and the need for public intervention (Dalrymple, 2006; Sandler, 2003; Martin and Scott, 2000; Pray and Umali-Deininger, 1998). Market failures in the exchange of knowledge emerge from factors including the public goods characteristics of knowledge (that is, it's no excludable and nonrival properties), limited willingness or ability to pay by farmers with constrained market access or purchasing power, the inability of small firms to access the capital markets needed to finance knowledge acquisitions, or poor market infrastructure. The barriers might also be attributable to institutional constraints, or the absence of effective institutions to bridge these market failures and promote efficient knowledge exchanges. Where instruments such as intellectual property rights regimes, contract enforcement norms or the intra-firm organizational structure are insufficiently robust, knowledge exchange may incur prohibitive transaction costs, thus impeding market-based knowledge exchanges (Naseem et al., 2006; Alfranca and Huffman, 2001; Williamson, 1991). Finally, the barriers might also be described in terms of systemic weaknesses inherent in the exchange and use of knowledge (Nelson and Winter, 1982; Lundvall, 1988; Metcalfe, 1988; Revilla et al., 2005). Systemic weaknesses could be reflected in the inability of agents to learn about each other, identify areas of complementarity and synergy, build and sustain trust through interpersonal or organizational relationships, communicate and exchange ideas effectively, or respond to leadership.

Public-private partnerships are often thought to improve the management of scarce resources by capitalizing on economies of scale and scope in research, exploiting complementary resources and capacities across the public and private sectors, and reducing transaction costs in the exchange of knowledge and technology.

2. Organisational architecture of Indian agricultural policy

The agriculture sector in India is governed by the Ministry of Agriculture, under which are three main departments: The Department of Agriculture and Cooperation (DAC), Department of Animal Husbandry, Dairying & Fisheries (DAHD&F) and Department of Agricultural Research and Education (DARE). In India R&D in agriculture sector is being managed under a three tier system, (i) Indian Council of Agricultural Research (ICAR) at the apex level, (ii) State Agricultural Universities (SAUs) at the state level, and (iii) Private sector at both sector and commodity levels. In addition, there are some institutions in central Departments of Agriculture, Council of Scientific and Industrial Research (CSIR), Departments of Science and Technology, Fertilizers and Chemicals, Commerce, etc. also which contribute to the national efforts through R&D (Jha and Kumar, 2006). The present ICAR-SAUs system is supported by All India Coordinated Research Project (AICRP), which is based on the principle of inter-disciplinary and inter-

institutional collaborations. Starting with the first AICRP on maize in 1957, the ICAR had 76 AICRPs in 2007-08, covering several disciplines and commodities, viz. soils, water, crops, horticulture, livestock, fisheries, home science, agricultural engineering, education, etc. AICRPs related to crops have delineated the operational area based on ecological conditions. This set-up enables AICRPs to effectively utilize natural resources in man and material to solve the national, regional and local problems in a coordinated manner according to predetermined priorities and strategies. In addition, private sector R&D has come forward to build R&D infrastructure and harness opportunities. As per latest estimates nearly 500 R&D units have been established by the private sector to meet its R&D needs.

3. Agricultural Research Infrastructure

The Indian Council of Agricultural Research (ICAR) is an autonomous apex body responsible for the Organisation and management of research and education in the fields of Agriculture, Animal Sciences, and Fisheries in India. The Headquarters of the ICAR are located in Krishi Bhavan, New Delhi. The Minister for Agriculture is also Secretary to the Government of India in the Department of Agricultural Research and Education (DARE) which was set up to provide the requisite linkage with the Central and State Government agencies and to look after international cooperation. The Director General of the ICAR functions as the Principal Adviser to the Government of India in all matters concerning agriculture, animal husbandry and fisheries. In scientific matters the Director General is assisted by 8 Deputy Director Generals – each in charge of a Division i.e. (i) Crop Sciences, (ii) Horticulture, (iii) Natural Resource Management (iv) Agricultural Engineering, (v) Animal Sciences, (vi) Fisheries, (vii) Agricultural Education and (viii) Agricultural Extension. The Deputy Director Generals are responsible for the institutes and projects in their respective fields. In administration, the Director-General is assisted by the Secretary (who is also the Joint Secretary to the Government of India in the Department of Agricultural Research and Education), Directors of Personnel, Finance and Works and other administrative officers and staff at different levels. The Joint Secretary (Finance) in the DARE is the principal financial adviser in matters of finance. In matters relating to publications, publicity and information, the Director-General is assisted by the Officer on Special Duty, Directorate of Information and Publications of Agriculture. Although agriculture is a State subject, ICAR has established many Central Research Institutions over the years to meet the agricultural research needs of the country. These are essentially meant for:

- (i) implementing research mandates extending beyond the administrative boundaries of the States;
- (ii) pursuing basic research not undertaken by most Agricultural Universities;
- (iii) evaluating research results through multi - location testing; and
- (iv) Developing manpower for Agricultural Universities and other agricultural institutions. The ICAR directly administers 47 Research Institutes in the areas of crop, animal and fishery sciences.

3.1. Role of Private Sector in Agricultural R&D

In India, the entry of private sector into agricultural R&D started with the development of seed sector during mid-1980s and picking up its momentum in late-1990s, as incentives for private investments in R&D were made lucrative. The number of private sector players is on increase and in a few commodities, they are playing significant roles and their presence is expected to increase rapidly with time (Pal and Byerlee, 2003). Private sector are investing a lot more on the human capital development to in turn get benefited. The research persons in such firms, industries, had such

profession to workout research in agriculture. This sector has invested in those activities crops like sugarcane, cotton, etc. where returns are quick, relatively higher, and less risky (Pardey *et al.*, 2006). In few cases, the private sector has come forward to capture futures markets and has invested huge resources in developing R&D infrastructure. The driving force behind entry of the private sector into agricultural R&D is its enormous potential and several relaxations are being offered by the government. The private sector accounts for about 14 per cent of the total research funding in agricultural R&D (Pal and Byerlee, 2003). Some private firms are more focused on the forward and backward linkages within the agricultural sector, i.e. they empower the linkages of market and farmers. All these partnerships are fruitful in developmental processes of each sector.

3.2. Status of Public Agricultural R&D

In India, the public sector plays a major role in agricultural R&D. The sector has helped in meeting social goals of removing hunger and poverty, ensuring food and nutritional security, diverting dependence of population from farm to non-farm sector, conserving limited natural resources of soils and water, etc. The status of public sector has been studied in terms of public expenditure on agricultural research and education (R&E) and scientific manpower resources engaged in R&D activities. Public expenditure on agricultural R&E has been discussed in terms of share between central and state system including investment intensity. The scientific manpower resources have been described considering number, its quality and allocation across crop groups and agro climatic regions. The universities either government or private are responsible for the research and development of various sectors, same in the case of agriculture sector. Too much amount is invested on the research systems to carry out the research and generate new knowledge. Knowledge and technology are both linked with the research programmes which later on formally or informally benefit the farmers or other groups. Indian economy is totally dependent on such diverse sector which avail livelihood and survival to most of the population either rural or urban. Hence this sector needs too much intensive research to cope up the problem of food insecurity and poverty of people. Public sectors either at central or state level are therefore investing too improve the sector. Most of the actors in public sector concerned with agricultural innovation system are universities and research institutes. But within their premises research work is not fulfilled without the support of private firms or actors.

3.3. Funding and R&D in agricultural sector

Agricultural research and development (R&D) investments are a crucial determinant of agricultural productivity through the introduction of improved crops and cropping practices, labour-saving technologies, improved quality of food storage, processing, and marketing. In addition to newly developed technologies, existing technologies need to be better disseminated. Considerable empirical evidence indicates high rates of return from agricultural R&D investments in the range of 40-50 percent (Alston *et al.*, 2000), making agricultural research a cost-effective way for governments to accelerate agricultural development.

According to the Budget 2013-14, Eastern Indian states to get Rs 1,000 crore allocation for improving agricultural production and Green revolution in east India significant. Rs 500 crore allocated for programme on crop diversification. Average annual growth rate of agriculture and allied services estimated at 3.6 per cent in 2012—13 when 250 MT food grains was produced. Rs 27,049 crore allocation to the Agriculture Ministry in 2013—14. The target for farm credit for

2013-14 has been set at Rs. 7, 00,000 crore against Rs. 5, 75,000 crore during the previous year (Economic Survey 2013).

Agriculture sector is the mainstay of the Indian economy, contributing about 15 per cent of National Gross Domestic Product (GDP) and more importantly, about half of India's population is wholly or significantly dependent on agriculture and allied activities for their livelihood (GOI, 2011). The contribution of agricultural sector to GDP has continued to decline over the years, while that of other sectors, particularly services, and has increased. In 1970-71 agriculture contributed about 44 percent of GDP, which declined to 31.4 percent and 14.6 percent in 1990- 91 and 2009-10 (at 2004-05 prices), respectively (CSO, 2011). Nevertheless, agriculture remains a major source of employment, absorbing about 52 percent of the total national work-force in 2004-05, down from about 70 percent in 1971. The share of agricultural exports in total export value declined from about 18.5 percent in 1990-91 to about 10.6 percent in 2009-10, while share of agricultural imports to total national imports increased from 2.8 percent in 1990-91 and reached a high of 8.2 percent in 1998-99 and declined to about 4.4 percent in 2009-10 (GoI, 2011a). Importance of agriculture in a country like India is not likely to decline due to concerns for food security, employment, rural poverty and availability of wage goods (Vyas, 2003).

Successive Five Year Plans have stressed on self-sufficiency and self-reliance in food grains production and concerted efforts in this direction have resulted in substantial increase in agricultural production and productivity. This is clear from the fact that from a level of about 52 million tonnes in 1951-52, food grains production rose to above 241.5 million tonnes (4th Advance Estimates) in 2010-11 (GoI, 2011). The idea is that the innovation system should not be a source of supply driven interventions. There is a need for some analysis of the possibilities for interventions in a participatory mode so that these could be sustained. Here the focus should be on facilitation of intervention in the context of location-specific intervention rather than being some kind of a prescription.

Table 1: Expanding view of innovation capacity in agriculture

Scope	Approach	Focus	Actors
Activity based	National Agricultural Research Systems (NARS)	Technology generation and transfer	Research organizations, universities
Output based	Agricultural knowledge and information system (AKIS)	Knowledge and technology dissemination	Research organizations, universities, extension services, non-governmental organizations
Outcome based	National Agricultural Innovation System (NAIS)	Technology and institutional innovation	All economic actors that activity use or generate knowledge

Source: Janssen (2006)

Capacity development of end-users and other actors for access and sharing of knowledge, learning and collaboration are extremely important (Janssen, 2006). The capacity for innovation underscores (a) actors in the innovation system and their respective roles, (b) attitude and practices of main actors, (c) pattern of interaction among the actors, and (d) enabling environment (Hall, 2006). This means that the focus is on the actors in the creation and application of new knowledge because this is important in the innovations. Agricultural innovation system is mostly concerned with the knowledge and technology to the pathway of socio-economic development. Table 1 shows the inter relativity within the different actors to main outcome of knowledge and technology. Hence the knowledge and technology invented or generated needs to be disseminated to the core group actors of the agriculture. Core groups are farmers which lie at base of the system.

The advantage of PPP of the Technology is that achievement can be taken to the farmer very rapidly. In case of development of new seeds, the private partner can arrange seed production to reach the farmer, as he is very keen to earn profit on his investment. If it is basic research then the private firm can work with the results for application research. Public-Private Partnership is the best utilization today of the large facilities created in the public-sector institutions. The Indian Council for Agricultural Research (ICAR) state that PPPs provide a functional mechanism for collaboration to leverage CPS resources, for adaptation of technology and for commercialisation where the costs, risks and benefits can be shared. Improvements are possible as the growing demand for quality agricultural products in agriculture through the integration of producers on the one hand and retailers and processors on the other. This creates an opportunity to reduce risk in production and price, but also the potential to create partnerships between farmer's groups and market players also opens up better links with input suppliers, financial and research institutions (Tiwari, 2012). The Indian Policy on Agriculture (NPA, 2012) promotes in collaborative efforts between the government, CPS and farmers (cooperatives). It recognises the role of the smallholder and importance of representation and organisation, and it recognizes the role of the CPS in critical areas business development, agricultural growth and effectiveness, and in human resource development. The 12th – 5 year plan (2012-2017) the GOI, Ministry of Agriculture launched a scheme PPP in Integrated Agricultural Development (PPPIAD, 2012). The aim is to facilitate large-scale projects and combine the effectiveness of the CPS and funding of the Public Sector to aggregate farmers, and integrate the agricultural supply chain. Financial assistance is from the National Agriculture Development Scheme or Rashtriya Krishi Vikas Yojana. Here CPS corporates via proposal will have responsibility for integrated development projects in agriculture and allied sectors. The PPPIAD allows flexibility in design, but has to ensure a value chain approach, covering all aspects from production to marketing.

The key features include:

- Targeting at least 5000 farmers in projects lasting 3-5 years
- Mobilise farmers into producer group cooperatives
- Technology infusion
- Value addition in agriculture

- Marketing solutions
- Project management.

There is a framework for business proposal review, results documentation, conflict resolution, independent evaluation and monitoring. Average investment per farmer is Rs. 100K with GOI funding restricted to 50% and the remaining investment via commercial private sector (CPS) institutional financing and farmer contributions (Rajendran, 2012). Many large corporations, even multinationals are involved as ITC, Nestle, Tata Chemicals and Shriram. Priority is on high value food crops, as pulses and non-food crops, as tobacco and cotton. PPPIAD was initiated for the kharif season 2012.

In the 1960s industrial countries accounted for approximately two-thirds of the total public sector investments in global agricultural research. It was not until 1990 that developing countries invested marginally more than industrial countries in agricultural R&D. In 1990 global investments in agricultural R&D by the public sector were estimated at \$17.3 billion, with \$8.8 billion invested by developing countries and \$8.5 billion by industrial countries (Alston and Pardey 1996).

Conclusion

In the concluding remarks, it is draw the prospectus values of PPP in the agricultural sector which has increased the margin of research and development. Various public and private sectors are dependent on each other in order to privilege the developmental pathway pf agriculture. Without such corroborations they cannot function independently in such an effective way as they are. Agriculture being the primary sector for most of the Indian population in employment and livelihood needs more R&D funding and inter relations. Various private institutions related with the agricultural research had a prominent role in knowledge generation and technological inventions and usage. By the networks within the groups either private or public, knowledge can be disseminated more and the linkages to be strengthen.

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