

## **Public-Private sector partnership—A novel institution building for supporting agricultural research and enhancing impacts**

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### **Abstract**

As a science-based activity, agricultural research is best performed by multidisciplinary and inter-institutional teams of scientists from both public and private sectors. While public sector research played a major role in resource-limited areas and food crops species, private sector (PS) played major role in more productive areas and commercial crops species. However, with rapid developments in agricultural technologies and liberalized national seed policies, PS started investing in hybrid seed research and development. The International Crops Research Institute for the Semi-Arid Tropics (ICRISAT) has global mandate for improving sorghum, pearl millet and pigeonpea, which offered hybrid cultivar options in India. PS companies based in India initially relied on ICRISAT-bred hybrid parents, and gradually developed their own research and development capabilities, and became a major conduit for large-scale farm level adoption of hybrids derived from ICRISAT-bred hybrid parents and/or their derivatives. ICRISAT further realized that PS, being closer to seed merchants and farmers, have better integrated perceptions of farmer's preferences. These considerations prompted ICRISAT to treat PS seed companies both as complementary expertise and as a funding source, instead of a mere passive recipient of ICRISAT-bred parental lines, triggering the initiation in 2000 of ICRISAT-PS Hybrid Parent Research Consortia for sorghum and pearl millet. The consortia arrangements were revised, and expanded to include pigeonpea in 2004. This concept of consortium approach for public-private partnership research is a novel institution building approach, and has received wide appreciation from PS seed companies and the Consultative Group on International Agricultural Research (CGIAR). This approach also exploits complementary expertise from PS in marketing hybrids, without compromising the global research agenda of ICRISAT in delivering the research products as international public goods (IPGs).

### **Media summary**

A consortium approach involving private seed companies, recently initiated at ICRISAT, has emerged as a successful model in resource mobilization and enhanced technology adoption.

### **Introduction**

Agricultural growth is a prerequisite for economic development, especially in countries with agri-based economy. Agricultural research is seen as a key element in enhancing agricultural growth, by involving both public and, increasingly the private sector (Reddy et al. 2001). While public sector research has been particularly relevant to resource-limited areas, the private sector (PS) is seen as the major player in the irrigated regions (Ryan and Spencer, 2001). However, assumptions underlying this public-private sector dichotomy on returns to agriculture research appear to be flawed, as Fan et al. (1999) have shown that returns to research are often higher in the more marginal areas and that there are complementarities to be exploited between public-private sector research, even in low-potential marginal areas in Asia. The impacts of agricultural investments, as measured by the coverage of high-yielding varieties, were similar in high- and low- potential rainfed areas.

In developing countries, private sector (PS) investments in agricultural research and development are concentrated in a few large countries such as Brazil and India. PS research expenditure was only 1% of public sector research expenditure in 1990 globally (Pray and Echeverria 1991). Traditionally, PS focused on mechanical and chemical innovations, where proprietary knowledge could be easily protected. Except for hybrid seeds, the PS did not engage itself in biological technology in the past. However, with the

advent of biotechnology and the broadening of the scope of intellectual property rights (IPR) into life forms, PS is becoming a major player. In India, the Central Seed Act of 1966 had restricted the development of PS seed industry and as a result, public organizations dominated agricultural research and seed production (Morrison et al. 1998). However, the enactment of new seed policy in 1988 encouraged PS to engage in seed production and in R&D. Following this liberalization, annual investment of PS in Indian seed industry increased from US\$ 1.2 million in 1987 to US\$ 4.7 million in 1995 (Ramasmami et al. 2001). By 1999, the PS dominated agricultural research and seed production and marketed a large number of hybrids of several crops, including two ICRISAT mandate crops—sorghum and pearl millet. The objective of this paper is to discuss the evolution of public-private partnership at ICRISAT, its impact on development and adoption of improved cultivars in India, and its implications for the future in developing countries.

### **Origin and evolution of public-private partnership research at ICRISAT**

ICRISAT's crop improvement research is supported by funds from various public and philanthropic donors. The funds are provided for producing global public goods and the outputs of this research remain in the domain of international public goods (IPGs)—accessible equally to both public research institutions and PS seed companies. The discovery and development of cytoplasmic-genetic male sterility systems (CMS) in sorghum and pearl millet has made it possible to harness heterosis through the development of hybrids in these crops. More recently, the availability of CMS in pigeonpea has opened avenue for commercial hybrids.

*A. Breaking new ground: forming hybrid parents research consortia.* The relationship between ICRISAT and PS seed companies, especially in India, has evolved over time. In the past, ICRISAT played a nurturing role to the fledgling industry and provided breeding material, often through informal networks. As PS seed companies grew, they started to develop significant research and development capabilities of their own. ICRISAT scientists soon recognized that the Institute's traditional relationship with national public sector, though important, was no longer the sole route to farm-level adoption of improved cultivars. The PS, being close to the hybrid seed merchants and farmers, has better and integrated perceptions of farmers' choice and needs. This realization was all the more pertinent as succession of funding shocks in ICRISAT and other Consultative Group on International Agricultural Research (CGIAR) centers were accompanied by increased scrutiny of the impact of international agricultural research (Reddy et al. 2001). Based on these considerations, ICRISAT recognized PS seed companies as a valuable research partner and good source of funds for research on hybrid cultivar development and seed production. This led to the conceptualization and initiation of Sorghum and Pearl millet Hybrid Parents Research Consortia during 2000 at ICRISAT, the first of its kind in the entire CGIAR system (Reddy et al. 2001). Under this arrangement, each PS consortia member provided a small grant each year for sorghum and pearl millet for a five-year period. This arrangement was very effective as evidenced by 16 PS seed companies becoming consortia members for sorghum, 18 for pearl millet, with 11 being common for both the crops by the end of 2003. The consortia funds were used to augment the ICRISAT core funds for research. A significant aspect of this arrangement was that the products developed with consortia grants were available freely to the public sector and to non-consortia PS companies. Effective 2002, the Pigeonpea Hybrid Parents Research Consortium was initiated to support CMS-based hybrid parents research.

*B. Consortium structure revisited.* The consortium arrangement, principally designed to strengthen ICRISAT's research on sorghum and pearl millet, worked reasonably well during the entire agreed project period. However, the level of funding support initially agreed by PS seed companies was considered too small to support the dynamic crop improvement research at ICRISAT following further shocks in core funding. The consortia arrangement for sorghum, pearl millet and pigeonpea was revisited and revised in consultation with the PS scientists and managers. The Revised ICRISAT-PS Partnership in Hybrid Parents Research Consortia—one for each crop—work on the following agreed guidelines”:

- FAO designated germplasm will be provided freely to all R&D institutions.
- Improved breeding lines, populations, and potential hybrid parents will be available to consortium members in the private sector [under the Material Transfer Agreement (MTA) for breeding materials].

- Improved breeding material (above) at all stages of development will be available to all NARS public sector institutions (under MTA, with conditions indicated below).
- Private sector (including public sector, profit making companies) seed companies can join the consortia by making annual contributions to the consortia. Medium and large-sized companies can join as primary members (US\$ 10,000 per year per consortium); while small and/or start-up companies can join as promotional members (US\$ 5,000 per year per consortium). Promotional members have to graduate to primary members after two years.
- Primary members will have access to all four categories of improved materials—(i) breeding lines ( $F_4$  or  $S_2$  onwards), (ii) A/B pairs under conversion, (iii) finished A/B/R lines, and (iv) parents of released/promising hybrids. Promotional members are eligible for last two categories of materials. Non-members can have access to the last category of materials, three years after they are supplied to consortium members.
- All four classes of material will be supplied to PS companies (based on above membership criteria) on charge basis, but consortium members will have 50% discount.
- MTA will indicate that the material supplied (to public or private sectors) is for their use only, and cannot be transferred to any third party.

### **The Impacts of Hybrid Parents Research Consortia**

A. *Cultivar adoption*: The ICRISAT-PS partnership has greatly contributed to development and marketing of improved hybrids and varieties in Asia. In India, more than 4 million ha (80% of the total) of rainy season sorghum and one million ha of the summer season sorghum are planted with about 50 PS-based hybrids, of which 30 are based on ICRISAT-derived parental lines. Similarly, 4.5 million ha (50% of the total) pearl millet area in India is planted with more than 70 PS-based hybrids, of which 60 are based on ICRISAT-derived parental lines/improved germplasm. These hybrids have made substantial contributions to enhance genetic diversity, productivity, yield stability, and also improved the livelihoods of poor farmers in the dry areas (Gowda et al. 2003). ICRISAT organizes Scientists' Field Days regularly to provide opportunities for partners to visit and select breeding materials. These events and other such meetings are also used to elicit feedback on the usefulness of materials, and also to set priorities (such as farmer or trade or industry preferences) for future research.

B. *Resource mobilization*: Eighteen PS seed companies in sorghum, 20 in pearl millet, and 6 in pigeonpea have expressed their interest to join the revised Hybrid Parents Research Consortia in 2004. As of April 2004, more than 25 PS Seed companies have agreed to become members in one or more of the three hybrid parents research consortia. By this, ICRISAT expects to generate funds in excess of US\$ 2 million over a five year period. The funds generated will augment the core funds to support crop improvement research at ICRISAT for developing elite sorghum, pearl millet and pigeonpea hybrid parents to serve both public and private sectors. This resource mobilization is particularly significant at the crucial time of diminishing core funding to crop improvement research at ICRISAT.

### **Implications of consortia**

As a member of the CGIAR, ICRISAT adheres to policies concerning the transfer of germplasm in line with the 1993 Convention on Biological Diversity (CBD) and the agreement between the CGIAR Centers and FAO by which designated germplasm held in-trust for the world community is made freely available through the Interim Material Agreement (MTA) under the International Treaty on Plant Genetic Resources for Food and Agriculture. However, not all ICRISAT material is designated under CBD (Reddy et al. 2001), and the breeding lines and improved populations fall outside the designated category. Intellectual Property Rights (IPR) is a dynamic issue for ICRISAT and it wishes to be proactive in developing PS-friendly IPR policy without compromising its basic principle of keeping the products as international public goods.

### **Conclusions**

The liberalized seed acts in India and other countries enabled several PS seed companies to exploit ICRISAT-developed hybrid parents and improve their research and development infrastructure over the years. Realizing the importance of PS in not only delivering the ICRISAT-developed breeding lines (as

hybrid cultivars) to farmers and providing feedback on the relevance of the ICRISAT-developed materials, but also in providing complementary expertise and funding, the ICRISAT-Private sector Joint Hybrid Parents Research Consortia were established—one each for sorghum and pearl millet in 2000. These two consortia helped mobilize US\$ 405,000 over a three-year period and contributed significantly to the adoption of ICRISAT-PS hybrid cultivars in India. The revised consortia effective January 2004 (one each for sorghum, pearl millet and pigeonpea) are expected to generate US\$ 2 million over a five-year period, as >25 seed companies (from India, Egypt, Indonesia and Thailand) have agreed to be partners in development.

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