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Paper prepared for presentation at the “World Food Security: Can Private Sector R&D Feed the Poor?” conference conducted by the Crawford Fund for International Agricultural Research, Parliament House, Canberra, Australia, October 27-28, 2009

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Private Sector Partnering on Crops for the Poorest of the Poor

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The International Crops Research Institute for the Semi-Arid Tropics (ICRISAT) has a mandate to improve the livelihoods of the poor in the semi-arid tropical (SAT) regions of Sub-Saharan Africa and Asia, which is home to 550 million poor people. Sorghum, pearl millet, chickpea, pigeon-pea and groundnut are the staple food crops in the SAT, often grown on marginal lands with poor soil fertility and erratic rainfall. Dryland farmers are physically, economically and politically vulnerable and need to be empowered to enhance their income and livelihoods. Seed-based technologies (high-yielding and adapted cultivars) are the cheapest and easiest to be adopted by poor farmers, and often serve as catalysts for adoption of inputs such as fertiliser, pesticides and good crop management practices. ICRISAT partners with public- and private-sector institutions to ensure that seeds of improved varieties and hybrids are available to poor farmers at an

affordable price and at the right time and place. As a public-sector institution, ICRISAT develops improved varieties and hybrid parents. Private-sector (PS) partners test, multiply and market promising hybrids through their well-established market linkages in the rural areas. ICRISAT has partnered with more than 50 seed companies in India, Indonesia, Egypt, Mexico and Brazil through a novel consortium approach to deliver its research products (improved hybrids and varieties) to poor farmers through public-private partnerships. Some PS partners, who have their own research programs, also benefit by accessing pre-release breeding material. This approach exploits complementary expertise and resources, and generates synergies between international agricultural research centres (IARCs) and the PS in development and marketing seed of improved cultivars, without compromising the global research agenda in delivering international public goods (IPGs).

DR C.L. LAXMIPATHI GOWDA is currently Global Theme Leader of Crop Improvement at ICRISAT. He has PhD (in Genetics and Plant Breeding) from IARI, New Delhi, India. He has worked at ICRISAT since 1975, and has 35 books, 25 book chapters, more than 60 journal articles and 90 conference papers to his credit. He is also a recipient of several national and international awards and recognitions. He is an internationally renowned legume breeder associated with the development of 65 chickpea varieties released in 10 countries that have made significant impacts. He established a viable Cereals and Legumes Asia Network (CLAN) for exchange of technology for enhancing agricultural production, and trained over 2500 scientists from 12 Asian countries. He is one of the main architects for public-private partnership with seed companies that is now a model in other CGIAR centres.

Introduction

Partnership between public-sector research institutions and private-sector companies is considered important and essential for enhancing the scale and pace of agricultural research and development (Reddy *et al.* 2001). Although public-sector research has been relevant and has contributed to enhancing crop productivity in resource-limited areas, the private sector has reportedly played a major role in resource-endowed areas and in irrigated regions (Ryan and Spencer 2001). However, Fan *et al.* (1999) have shown that returns to agricultural research are often higher in the more marginal areas, and there are complementarities to be exploited through public-private partnership research, even in low-potential areas in develop-

ing countries. The International Crops Research Institute for the Semi-Arid Tropics (ICRISAT) was established in 1972 at Patancheru, near Hyderabad in Andhra Pradesh, India. ICRISAT's vision is to improve well-being of the poor of the semi-arid tropics, and its mission is to reduce poverty, increase agricultural productivity, enhance food and nutritional security and protect the environment of the semi-arid tropics by helping empower the poor through science with a human face and partnership-based research. ICRISAT's major mandate is genetic improvement of grain and fodder yields of sorghum, pearl millet, pigeonpea, groundnut and chickpea. 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 enhancing crop production in developing countries. This case study illustrates that partnering with the private-sector seed companies does indeed benefit the poor people who grow dryland crops such as sorghum, pearl millet, pigeonpea and other legumes.

About 2.1 billion people in the world live on less than \$2 a day and 880 million on less than \$1 a day. About 850 million people are food-insecure due to issues of availability and access to food. The FAO's 2006 *State of Food Insecurity Report* cites agricultural growth as critical for reducing hunger (FAO 2006). Future global food security cannot be taken for granted given the scarcity of resources like land and water, and the new challenges posed by climate change. Moreover, with global food reserves at their lowest level for 30 years, food price hikes seen during 2008 are likely to continue.

Agriculture is a crucial development tool that can help achieve the Millennium Development Goal of halving the number of people living in extreme poverty and hunger by 2015. Whether as an economic activity, or a means of livelihood or a provider of environmental services, agriculture is a unique instrument for development because of its ability to work with other sectors.

Advances in agricultural research and development, including major breakthroughs in new areas of science, have significantly contributed to meeting the challenge of food and nutrition security, agricultural sustainability, production and productivity. For every \$1 invested in international agricultural research, \$9 worth of additional food is produced in developing countries where it

is needed most. Less than 10% of public spending in developing countries goes to agriculture even though this sector commonly accounts for about half of their Gross Domestic Product, and less than 1% of public spending goes to agricultural research, which is vital to the innovation that opens new livelihood opportunities. Of that 1%, only a small proportion is invested in dryland agriculture (Dar 2008).

In developing countries, private-sector (PS) investments in agricultural research and development are concentrated in a few large countries such as Brazil and India. 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, the PS is becoming a major player. In India, the Central Seed Act of 1966 had restricted the development of the PS seed industry and as a result public organisations had dominated agricultural research and seed production (Morrison *et al.* 1998). However, the enactment of new seed policy in 1988 (in India) encouraged the PS to engage in seed production and in R&D.

Public-private sector partnership and ICRISAT

Public-private-people partnerships in agricultural R&D are increasingly viewed as an effective means of conducting advanced research, commercialising new technologies and deploying new products for the benefit of resource-poor, food-insecure farmers and other marginalised groups in developing countries. Multi-level strategic partnerships mobilising science and technology for the poor lie at the heart of all ICRISAT's research, including its links with researchers based at international, regional and national organisations spread across Asia and Sub-Saharan Africa. ICRISAT is committed to strengthening the capabilities and opportunities of developing-country scientists, civil society organisations and communities. It undertakes collaborative research and provides high-quality, unbiased and timely information to everyone from policy-makers to local communities, from agriculture-related industries to research scientists. It recognises that building capacity is a two-way process. While partners benefit from ICRISAT's expertise and its

technological tools and resources, many ICRISAT research projects benefit greatly from the skills and knowledge that its research partners bring to the table. ICRISAT has taken a proactive approach to develop partnerships with private-sector companies (including profit-making state and national seed corporations), foundations and trusts to jointly deal with the main constraints to rural development through the identification of priorities and joint collaboration in key research areas (Dar 2008).

Agri-Science Park @ ICRISAT

The Agri-Science Park @ ICRISAT was started in 2003 as part of the Genome Valley Initiative of the government of Andhra Pradesh, India. Its mission is to be the 'hub' for public-private partnerships that enhance the development and commercialisation of science-generated technologies and knowledge through market mechanisms that will ultimately benefit the poorest of the poor. Among its components are:

- Agri-Business Incubator (ABI)
- Ag-biotech Innovation Center (AIC)
- Hybrid Parents Research Consortia (HPRC)
- Bioproducts Research Consortium (BRC).

In this paper, we describe the formation and implementation of the HPRC as a case-study in public-private partnership.

Hybrid Parents Research Consortia

The crop improvement program at ICRISAT and those of its partners have developed a diverse range of improved breeding lines, varieties and hybrid parents and have shared these with national programs, including the private sector. More than 650 varieties and hybrids have been released and marketed in many countries, leading to tremendous increases of production and productivity, and enhanced income to farmers.

The partners involved in crop improvement at ICRISAT include:

- national agricultural research systems (NARS)
- advanced research institutes, both in the north and south
- private-sector seed companies
- non-government organisations
- farmers' organisations and cooperatives
- farmers — both men and women.

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 an avenue for commercial hybrids in this crop as well.

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 recognised that the Institute's traditional relationship with the 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 (Gowda *et al.* 2003).

ICRISAT recognised PS seed companies as a valuable research partner for research on hybrid cultivar development and seed production. This led to the conceptualisation 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 company provides a small grant each year for becoming a member of the Consortium. This arrangement was very effective as evidenced by 16 PS seed companies becoming consortia members for sorghum and 18 for pearl millet, with 11 being common to both crops by the end of 2003. The consortia funds were used to augment the ICRISAT core funds for research. The significant aspects of these arrangements are that the funds received from the PS companies are used to address the core research agenda of the institute to generate scientific information and breeding products that remain in public domain as IPGs, and are available freely to the public sector (Gowda *et al.* 2004; Reddy *et al.* 2005). The

second phase of HPRC was operative during 2004–2008, and 50 PS seed companies were members of one or more consortia — sorghum, pearl millet and pigeonpea. Currently, this consortium is in phase 3 of HPRC, operative since January 2009.

Synergies in public–private partnerships

Most people agree that there are synergies to be gained by a combination of the social equity of the public-sector research institutions and the efficiency in product delivery of the private-sector companies, creating linkages in the supply chain for delivery of inputs (in this case seed of hybrid cultivars) to small-holder farmers at reasonable costs. Pooling of resources minimises the risks involved in R&D, for mutual benefit. Sharing of investment costs leads to lower product costs, thus benefiting the consumers.

ICRISAT is involved in strategic research as well as in applied research that includes pre-breeding and development of improved breeding lines and hybrid parents that are shared with all its partners, including the private sector. The private-sector companies further select among the breeding lines to identify good parental lines and produce and test experimental hybrids for suitability in different agro-ecological niches. Seed of selected promising hybrid cultivars are then multiplied rapidly, processed, packed and marketed using the vast network of agro-dealers in the rural areas, for purchase by small-scale farmers at rural markets.

Benefits to resource-poor farmers

In India, the HPRC membership involves about 50 seed companies. Involvement of large number of companies increases competition among them and reduces monopolistic behavior. The cost of hybrid seed is kept at reasonable levels by competitive forces, hence remaining within reach of resource-poor farmers. Adoption of hybrids is rapid because farmers get higher yields and increased income. The incremental seed cost (of hybrid seed vis-à-vis open-pollinated varieties) is offset by higher incomes to farmers because of higher yields from hybrid cultivars that have greater yield potential. Seeds of hybrid cultivars are now available in remote rural areas because of the extensive market networks of the PS seed companies, leading to rapid adoption of high-yielding

hybrids. ICRISAT provides a diverse range of hybrid parental lines each year, enabling PS companies to market several genetically diverse hybrids, reducing disease epidemics. For example, there have been no pearl millet downy mildew epidemics in India during the past two decades, mostly because of the diversity of hybrids under cultivation (by a conservative estimate, more than 80 hybrids — by name — were marketed by seed companies in India in 2008). A similar genetic diversification of hybrids has occurred in sorghum, with more than 50 hybrids reportedly cultivated in 2008. Adoption of diversified hybrids in pigeonpea is at the farm-level testing stage.

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