

# Why We Partner: Collaborations Between the Private and Public Sectors for Food Security and Poverty Alleviation through Agricultural Biotechnology

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It is a natural human value to share with others, and there are good business reasons for a company such as Monsanto to share as well. Monsanto has a track record of sharing knowledge and technologies with the public sector. Such technologies include genes that impart traits of agronomic value and the methods required to integrate these into crop species. Knowledge (such as the first working draft of the rice genome) and agricultural know-how (such as conservation tillage methods) have been made available to researchers and farmers around the world. Information and products shared in such ways do not compete directly with our commercial pursuits, but can and do make a profound difference in growers' lives. Monsanto does not give away finished products, but shares the work of making valuable products available to smallholders at reasonable cost and in appropriate quantity. Over the years, partnerships have been built around the world with nonprofit NGOs, universities, government laboratories, and intergovernmental organizations. Farmers are the most important partner of all, because they know their environment, their problems, and the relevance of solutions better than anyone else does.

**Key words:** biotechnology, development, food security, partnership, private, public.

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## Introduction

Most of the world's chronically hungry people live in rural areas and depend heavily on agriculture for their livelihood (Food and Agriculture Organization of the United Nations, 2004). Despite the hard work and ingenuity of smallholder farmers, significant portions of their harvests are lost to pests and diseases they cannot control, drought, poor soil, inferior seed, and lack of access to modern agricultural technologies. Although there are other contributing factors, their low yields are a root cause of the poverty, hunger, and malnutrition that afflicts more than a fifth of the world's people (Millennium Project Task Force on Hunger, 2004).

Today, advances in science and technology—including breeding, biotechnology, and integrated farm management practices—make it possible to envision new and more effective solutions to the age-old problems of crop loss, low productivity, and nutritional deficiency. Some of these advances have already provided substantial benefits for a wide range of farmers in developed and developing countries alike—whether they are already successful and profitable, struggling at a subsistence level, or in a transition between subsistence and income producing. In the Makhathini Flats area of South Africa, smallholders who have accessed Bollgard insect-protected cotton (*Gossypium* spp.) use up to six

fewer insecticide sprays per season, and have seen their yields increase 20–60%—generating significantly more income per hectare than farmers growing conventional cotton (Kirsten & Gouse, 2002).

The private sector has led development and introduction of these products. Commercial introduction of improved crops has already benefited millions of smallholder farmers in developing countries (James, 2003). These applications have been made possible by adapting products developed for the United States to similar agricultural problems elsewhere. That is the good news. The bad news is that farmers in developing countries face other challenges that cannot be solved simply by adapting US products. In order to fully benefit farmers in developing countries, new technology must be applied to the crop varieties, pests, food preferences, and agricultural practices of each region—an enormous task that requires leading-edge science, global cooperation, and resources of the global agricultural community. The broad spectrum of institutions involved must include public sector development agencies and agricultural research institutes, nongovernmental organizations, public and private universities, and corporations—each bringing different perspectives, strengths, and resources to help meet the challenge.

## The Partners

Smallholder farmers in developing countries face some of the world's most difficult agricultural challenges as they strive to grow food, so successful partnerships must begin on the ground with them. These farmers are eager for change—for new choices, new knowledge, and a chance to help solve their own agricultural problems. By sharing their knowledge of the land, local growing conditions, and cultural preferences with their partners, smallholder farmers help to assure that new technologies and products are adapted, practical, and effective for their needs.

Partners in the government sector ensure that technology cooperation projects are well aligned with real needs in the agricultural community. These include the Kenya Agricultural Research Institute (KARI), an agricultural research center that develops and disseminates appropriate agricultural technologies to Kenyan farmers. KARI has been a leader in the partnership to develop virus-resistant sweet potatoes for smallholders in Africa. This partnership now includes another African public sector research institution—the ARC-Roodeplaat Vegetable and Ornamental Plant Institute (VOPI) of South Africa—as well as the Donald Danforth Plant Science Center in St. Louis, Missouri. The Center for Advanced Studies (CINVESTAV)—a government research laboratory in Irapuato, Mexico—has led a project to develop virus-resistant potatoes. From the developed world, the United States Agency for International Development (USAID) has a long history of sustained support for plant research and agricultural capacity building in developing countries, including work on virus-resistant sweet potato and high beta-carotene mustard in India.

Equally important in these partnerships is the participation of nongovernmental organizations. The International Service for the Acquisition of Agri-biotech Applications (ISAAA) is a not-for-profit international organization that aims to alleviate poverty and increase crop productivity for resource-poor farmers in Africa and Southeast Asia. One of ISAAA's strengths is to facilitate the acquisition and transfer of agricultural biotechnology applications from industrialized countries—particularly proprietary technology from the private sector—in order to bring new hope to developing country farmers. The ISAAA leads regional networks of south-south collaboration to develop virus-resistant papaya in Southeast Asia and virus-resistant sweet potato in Africa. The Energy and Resources Institute (TERI), located in New Delhi, India, is a not-for-profit organiza-

tion with research activities in the fields of energy, environment, and sustainable development. TERI's Bioresources and Biotechnology Research Division is leading research into mustard with higher levels of beta-carotene to combat Vitamin A deficiency. The Rockefeller Foundation has a long history of investing resources into agriculture in developing countries and has supported work on the virus-resistant potato project in Mexico. Their continued engagement in the practical and policy issues of food security—including the development of a new not-for-profit facility to coordinate public-private agricultural technology partnerships in Africa—is invaluable.

Universities, such as Michigan State University in the United States, the University of the Philippines-Los Baños (UPLB), and Kasetsart University in Thailand, are also very important. The Agricultural Biotechnology Support Project (ABSP) at Michigan State University has been a leading partner in the mustard project, whereas UPLB and Kasetsart University serve as centers for work on virus-resistant papaya in the Philippines and Thailand respectively.

Companies in the private sector are increasingly joining partnerships that have been formed to meet developing country research needs. Companies can contribute a variety of resources to such partnerships, including fundamental scientific data (such as access to genomics information); specific technology, including genes and traits; training to develop or move proven technology into crops important for food security; consultation on intellectual property, environmental stewardship, biosafety and regulatory matters, and food safety; and royalty-free licenses to patented technology. For example, Monsanto is a global agricultural company with expertise in biotechnology, chemistry, plant breeding, seed production, and agronomic practices that is committed to bringing the benefits of innovative agricultural technology to farmers in the developing world. The Monsanto Product & Technology Cooperation Program has worked with partners in 20 developing countries in pursuit of enhanced economic and food security for subsistence and smallholder farmers, their families, and their communities. Moreover, corporate foundations can also provide grants to help improve farming worldwide.

The commercial marketing programs of the private sector can also reach out to farmers in developing countries who are able to transition from subsistence into profitable agricultural production, bringing them new products and technologies along with ways to use them safely and effectively. Although these activities are

**Table 1. Examples of public-private agricultural technology cooperation projects.**

| Crop                          | Technology                           | Geography   | Partners   |
|-------------------------------|--------------------------------------|---|--|
| <b>Mustard</b>                | Beta carotene enrichment             | India   | TERI, USAID, Monsanto  |
| <b>Papaya</b>                 | Virus resistance                     | SE Asia (Indonesia, Malaysia, Philippines, Thailand, Vietnam) | ISAAA, national agriculture research organizations, Monsanto |
| <b>Potato</b>                 | Virus resistance                     | Mexico  | Rockefeller, CINVESTAV, ISAAA, FMDR, Monsanto                |
| <b>“Golden Rice”</b>          | Enabling technologies (license only) | Global  | Inventors, Humanitarian Board, Monsanto                      |
| <b>Rice and related crops</b> | Rice genome sequence data            | Global  | IRGSP, national rice genome sequencing programs, Monsanto    |
| <b>Sweet potato</b>           | Virus resistance                     | Africa (Kenya and South Africa)                               | KARI, ISAAA, ARC-VOPI, Danforth Center, Monsanto             |

intended to make a profit for the company, the products must also bring benefit to farmers, or there would be no incentive for the farmers to buy them. What is often missing is the infrastructure needed for markets to function for farmer access, rather than there being a lack of value to the farmer from new technologies. The private sector’s motivation and commitment to share is based on a variety of factors, including philanthropic interests, humanitarian concerns, employee initiative, good public relations, and new business opportunities. Through international collaborative activities, we see important ways to further our expertise in agriculture. Sharing offers important long-term business advantages as well. By participating in partnerships that introduce new agricultural products, technologies, and training to developing countries, we are helping smallholder farmers realize tangible economic benefits. As local economy and infrastructure improves, we hope that formerly subsistence farmers will become satisfied commercial customers.

### Beyond Research

In addition to the science and technology development partnerships that are needed to produce “public goods” products for nonprofit applications of biotechnology, there is a growing need for partnerships to complete the regulatory assessments needed for government approvals prior to field testing or sale of finished products. There is relatively little public sector experience in producing and registering regulated products. There are encouraging precedents, such as the virus-tolerant papaya developed by Cornell University and the USDA. However, for the most part, the regulatory science capacity resides in the private sector. Much of the experience and data for enabling technologies and for extensions of approved commercial traits into new crops can be contributed by the private sector. In addition, knowl-

edge of good laboratory practice, standard operating procedures, and other process-related requirements of regulatory data packages can be shared as well. However, it will be critical for the public sector to develop an independent capacity to assess and manage the registration and stewardship of regulated public goods.

Related to the technical aspects of product registration and stewardship is public policy development. Many developing countries are still formulating their biosafety regulations and are faced with divergent models which will have a profound impact on whether they end up with de facto bans on all but the most profitable commercial products, or whether they are able to develop proportionate policies that encourage rather than discourage low-risk applications to be used rather than kept on the shelf. A purely precautionary approach that cannot distinguish low-risk and high-value products from those with greater uncertainty and risk will have the effect of blocking safe and useful technology from those who need it most. A proportionate and learning approach can retain a precautionary aspect, but allow for faster and easier assessment (and approval where warranted) of simple products or those shown to be safe and effective elsewhere. An analogy would be regulation of transportation—a category as broad as biotechnology. Transportation technology ranges from shoes or bicycles to airplanes or space shuttles. Different degrees of regulation are applied in proportion to the complexity and risk.

Even when new technology has been fully developed and approved for use, smallholder farmers are the most challenging group of farmers to reach by either commercial or public channels. Even freely available public goods are often not accessible to smallholder farmers. This results from lack of distribution of technology, information and training, credit, and markets—or some combination of several of these. Therefore,

once research has successfully developed new products, different kinds of partnership programs are needed to ensure their benefits can reach smallholder farmers in a way that responds appropriately to their needs. Demonstration plots and farmer trials may be necessary for farmers to witness the value of technology packages that include improved seeds, crop protection products and fertilizers, and conservation tillage practices. Training sessions provide the knowledge they need to use the new package safely and effectively. Microloans help them get started on their own farms, and market-access assistance helps them sell their surplus crops to generate income for their families. In addition, local knowledge and local presence of not-for-profit development organizations help ensure that the needs and best interests of smallholder farmers are the central focus (Fundacion Mexicana para el Desarrollo Rural, 2004; Sasakawa Africa Association, 2000).

### The Commitment

Partners in the fight against hunger and poverty must work for innovative science and technology to be applied to solve problems that have no other solutions. Yet technology and markets will not end hunger—people will. None of the activities described in this paper will reach all—or even most—of those most in need without partnerships between the private and public sectors and without improvements in others aspects of human welfare. Where possible, institutions should engage as full partners with others throughout the life of projects to share the full extent of each other's knowledge, rather than engage in one-way, one-time transfer of technology or knowledge. Specific activities, such as granting access to intellectual property rights, are but interrelated elements of a complex system of resources

and capacities that are required in order for agricultural biotechnology to benefit developing countries.

The global agricultural community has a long history of sharing knowledge, expertise, enthusiasm, and ingenuity with smallholder farmers in a common cause. Together, innovative solutions can be discovered and developed to be used by smallholder farmers to grow more and better food and fiber, care for the land, enhance their economic future, and protect and preserve the environment for generations to come.

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