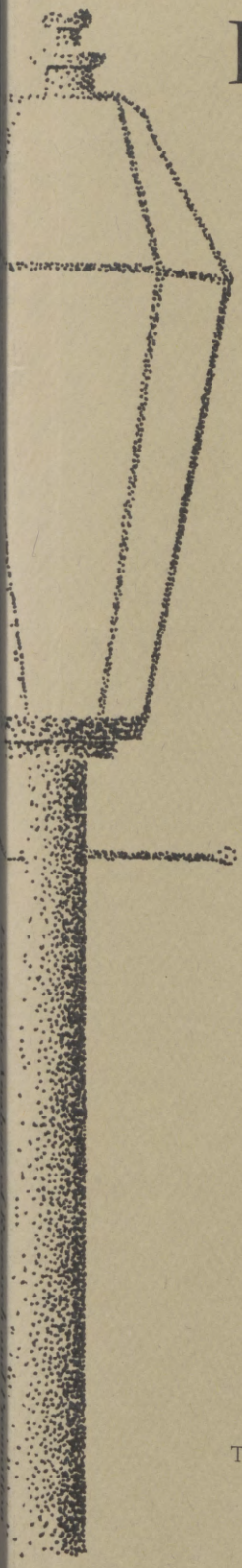

Economic Analysis of Research and Promotion

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Edited by:
Jennifer L. Ferrero
Cynda R. Clary
Timothy J. Richards

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Financing Agricultural R&D: Global Perspectives

Julian M. Alston
Philip G. Pardey

Abstract

Agricultural research and development (R&D) is big business. But "business as usual" may not be sustainable. As governments trim budgets, public support for national and international research is coming under closer scrutiny. Budget makers are asking whether the current R&D institutions are still needed. How should they adapt to accommodate changes in science (such as modern biotechnology), changes in scientific institutions (for example, plant variety rights), changes in society (demands for both a protected environment and safe, cheap food), changes in agriculture itself (fewer but better-educated farmers), changes in the markets for agricultural products (including more international trade and an evolving product mix), and changes in the economy in general (the declining relative importance of agriculture)?

Although the details of the debates concerning research policies differ from country to country, many of the fundamental questions about the public role in agricultural R&D are common to most countries. Certainly the perception is widespread that agricultural R&D needs to be revamped and revitalized. There is also a growing awareness that simply seeking more dollars is not the answer. The financing, organization, and management of public-sector R&D will have to be dealt with in an integrated way.

Publicly-Performed R&D

Worldwide, investments by national governments in public research almost doubled in real terms over the past two decades; from $7.3 billion (1985 international dollars) in 1971 to nearly $15 billion in 1991. Expenditures on publicly-performed agricultural research in developing countries grew by 5.1 percent per annum from $3 billion (1985 international dollars) in 1971 to $8 billion in 1991. Across the developed countries, public agricultural spending grew by 2.3 percent per annum from $4.3 billion (1985 international dollars) in 1971 to $6.9 billion in 1991, and $7.1 billion by 1993.

For all regions of the world, however, real R&D spending grew at a much slower pace during the 1980s than in the 1970s. In 1971, as a group, developing countries accounted for 41 percent of the spending. By 1991, the situation had changed markedly. Developing-country R&D spending had grown to more than half (about 54 percent of public-sector R&D spending worldwide). In 1991, Asian countries accounted for 62 percent of the developing world's publicly-performed agricultural research expenditures (19 percent from China alone); Latin American and Caribbean, as well as sub-Saharan African, regions (including South Africa) each accounted for 12 percent; 14 percent of the expenditures occurred in West Asia and North Africa.

Research intensities

An alternative perspective on agricultural R&D spending is provided by the agricultural research intensities (ARIs). The most commonly constructed ARIs express agricultural research expenditures as percentages of agricultural GDP. In 1991, as a group, developed countries spent $2.39 on public agricultural R&D for every $100 of output two decades earlier. Developing countries, as a group, have much lower ARIs. In the early 1970s, their ARI ratio averaged $0.38 per $100 of output, growing to only $0.51 by 1991.

Private Agricultural Research

A common perception is that agricultural research is primarily the domain of the public sector while research in other sectors of the economy is the province of the private sector. But newly available data reveal that privately-performed R&D is a prominent feature of contemporary agricultural R&D in rich countries (Alston, Pardey, and Smith, 1997 in process). Indeed, the private share has trended up significantly since 1981 and now almost half the OECD's agricultural R&D is performed by the business sector. Privately-performed agricultural R&D totaled $7 billion in 1993 compared with $4 billion in 1981; an annual rate of growth of 5.1 percent compared with 1.8 percent for publicly-performed agricultural R&D, and 4.3 percent for private research in all sectors in the OECD.

The relative importance of private R&D in total agricultural R&D varies across the OECD countries. In Belgium, Ireland, and the United Kingdom, the business sector performs over 60 percent of the agricultural research, and in Germany and the Netherlands the private share is now in excess of 55 percent. The United States and Japan, two countries that collectively account for over one half of all privately-performed agricultural research throughout the OECD, now also spend more on private than public R&D. The private share in the remaining OECD countries is smaller (about one third in 1993), but the private orientation of agricultural research in these countries has been growing quite rapidly, too.

Private and public agencies perform different types of R&D. Around 12 percent of private research focuses on farm-level technologies whereas over 80 percent of public research has that orientation. Food and other post-harvest research accounts for 30 to 90 percent of private agricultural R&D, and in countries like Australia, Japan, New Zealand, and the Netherlands, it is the dominant focus of privately-performed research related to agriculture. Chemical research (including agriculturally-related pharmaceutical research) is of comparatively minor importance in Australia and New Zealand, but accounts for more than 40 percent of private research in the United Kingdom and the United States, and nearly three quarters of private agricultural

research in Germany.

There is a clear concentration of particular lines of private R&D in particular countries. Japan, the United States, and France account for 33, 27, and 8 percent, respectively, of all food processing research carried out by the private sector in the OECD. Chemical research related to agriculture is even more concentrated--the United States, Japan, and Germany represent 41, 20, and 10 percent, respectively, of all reported private-sector research. This pattern of concentration of private agricultural research is unlikely to alter significantly if counterpart research in developing countries is also considered.

International Research Investments

Internationally-funded and conceived agricultural R&D is a relatively recent institutional innovation. Beginning in the mid-1940s, and at an accelerating pace through the 1950s, the Ford and Rockefeller foundations placed agricultural staff in less-developed countries to work alongside scientists in national research organizations on joint-venture projects. These efforts became the model for many of the subsequent programs in international agricultural research, and later evolved into the International Rice Research Institute (IRRI) at Los Baños, the Philippines in 1960, and the International Maize and Wheat Improvement Center (CIMMYT) at El Batan, Mexico in 1967. Soon after, other international centers were established in Igadan, Nigeria (IITA) in 1967 and at Cali, Columbia (CIAT) in 1968.

The CG system began modestly. Between 1960 and 1964, of the institutes that would become the CG, only IRRI was operating as such. After an initial funding of $7.4 million nominal U.S. dollars (mainly spent on capital to establish IRRI) in 1960, annual expenditures were quite small- total funding had risen to only $0.6 million per year in 1964. But by 1970, the four founding centers were allocated a total of $14.8 million annually. During the next decade, the progressive expansion of the total number of centers, and the funding per center, involved a tenfold increase in nominal funding to $142 million in 1980. During the 1980s, funding continued to grow, more than doubling in nominal terms to reach $288 million in 1990. The rate of growth had slowed but was still impressive. In the 1990s, however, although the number of centers grew (from 13 to 18 at one point, but now 16), funding did not grow enough to maintain the funding per center, let alone the growth rate. While the CG system has captured the attention of the international agricultural R&D and aid communities through the impact of its scientific achievements and its pivotal role in the green revolution, it has spent only a small fraction of the global agricultural R&D investment. In 1991, the CG represented 1.8 percent of the newly $15 billion in public-sector agricultural R&D.

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