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SLOW MAGIC AGRICULTURAL R&D A CENTURY AFTER MENDEL

PHILIP G. PARDEY AND NIENKE M. BEINTEMA

At the dawn of the 20th century, whole new vistas in agricultural research and development (R&D) were opening up. Public funding for research was rising, which supported research and extension systems that furnished innovations and relevant knowledge for free. This new knowledge first became available in the rich countries and then gradually spread to colonial countries and eventually to other parts of the developing world.

The long-term investments made a century ago have fostered huge gains in agricultural production. Technological advances over the past forty years have allowed farmers to feed twice as many people from virtually the same cropland base. But now the public purpose of agricultural R&D is less focused and more closely scrutinized. Some question the need for continued public funding, thinking that the world's food problems are solved or constrained by things other than R&D or that the private sector will do the job.

Standing on the brink of the biotechnology revolution in agriculture, it is time to take stock of the investments and institutional developments regarding agricultural R&D worldwide. *Slow Magic: Agricultural R&D a Century After Mendel*, a report by Philip G. Pardey and Nienke M. Beintema, assembles and assesses new evidence regarding investments in agricultural R&D, tracking global trends over the past several decades, and highlighting the critical importance that the accumulated stock of scientific knowledge has for today's productivity and for future innovations and economic growth.

GLOBAL PUBLIC RESEARCH

Between 1976 and 1995, public funding for agricultural R&D almost doubled to \$22 billion (1993 international prices) and developing countries now conduct the greater share (56 percent) of the total. But developments during the 1990s were distinctly different than in earlier decades. After adjusting for inflation, growth in spending stalled in the rich countries and shrank for Sub-Saharan Africa. In terms of the intensity of investment—that is, spending on agricultural R&D relative to the value of agricultural output—the gap between rich and poor countries has grown. In 1995, rich countries spent \$2.64 on public research for every \$100 of agricultural output, 4.3 times more than the 62 cents on research per \$100 of output invested by poor countries. Two decades earlier, research intensities in the rich countries were 3.5 times greater than those of the poor countries: a sizable but nonetheless smaller gap.

THE GROWING PRIVATE-SECTOR ROLE

Globally, the private sector spent an estimated \$11.5 billion (1993 prices) on agricultural R&D in 1995, about one-third of the \$33 billion public-private total. An overwhelming majority (94 percent) of this private research is conducted in developed countries, where the private sector accounts for just over half the total agricultural research. In poor countries, private firms do less than 6 percent of the agricultural R&D.

Most herbicides, insecticides, and veterinary medicines have been developed by the private sector (though they drew on discoveries made by public research), and the private sector has developed many food storage, transport, and processing technologies. Much

private science involves chemical and food-processing concerns and crops and animal technologies more suited to capital-intensive forms of commercial

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agriculture with high value-added aspects off the farm. Thus private investment covers only a small subset of the needs of the poor and mostly complements, rather than substitutes for, continued public and other nonprofit research. As profitable markets develop over the long run, private research will no doubt play a bigger role in developing-country agriculture, but it is folly to think that private research will substantively replace public science in developing countries anytime soon.

GLOBAL GAPS IN STOCKS OF SCIENTIFIC KNOWLEDGE

These research spending totals may actually understate the global

gap in scientific knowledge. Science is a cumulative endeavor, with a snowball effect. Innovations beget new ideas and further rounds of innovations or additions to the cumulative stock of knowledge. New crops not only carry forward the genes of earlier varieties, they also carry the crop-breeding and crop-selection strategies made by earlier breeders. Providing adequate funding for research is thus only part of the story. Putting in place policies and practices to accumulate innovations and increase the stock of knowledge are equally important. Without them,

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discoveries and data that are improperly documented or inaccessible can be lost from the historical record when researchers retire or as a result of institutional instabilities bought about by inadequate and fluctuating patterns of research funding. These losses seem particularly prevalent in

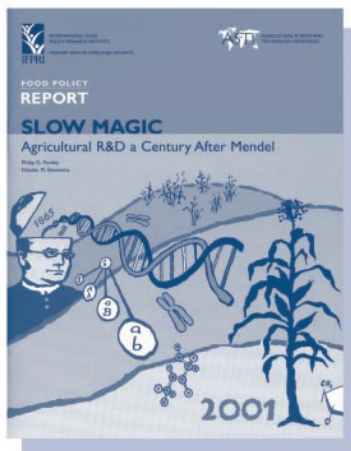
cash-strapped research agencies in the developing world, where inadequate and often irregular amounts of funding limit the functioning of libraries, data banks, and genebanks, and hasten staff turnover.

CONCLUSION

In the past, growth in productivity has enabled world food supplies to outpace the unprecedented increase in food demand. Today, reinvigorating support for developing-country science is unquestionably the top priority. But funding alone is not sufficient to close the South–North gap. Developing effective public–private partnerships—certainly easier said than done, but by no means impossible—is another requirement; making efficient and effective use of the dollars invested in developing-country science is yet another. Science, especially for agriculture, is not a stop–start affair. A sizable and sustained effort is needed, beginning now and continuing for decades to come, if the prospects for growth and development that science has to offer the developing world are to materialize.

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Please send me a copy of the Food Policy Report *Slow Magic: Agricultural R&D a Century After Mendel* by Philip G. Pardey and Nienke Beintema.

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