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FOOD POLICY STATEMENT

NUMBER 32, MAY 2001

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AGRICULTURAL SCIENCE POLICY

CHANGING GLOBAL AGENDAS

JULIAN M. ALSTON, PHILIP G. PARDEY, AND MICHAEL J. TAYLOR, EDITORS

In the second half of the 20th century, agricultural research and development (R&D) generated astounding increases in food production. Technological advances developed through R&D have supplied the world with not only *more* food, but *better* food. Since the 1980s, however, the growth of public spending on agricultural R&D has slowed dramatically in both developed and developing countries, while the need to produce enough food to feed burgeoning populations grows more pressing with every passing day. About 800 million people are undernourished today. Over the next 25 years, demand for cereals is expected to grow by over 40 percent; for meat, 70 percent. To achieve the necessary yield growth without harming the environment is an enormous challenge. This challenge will have to be met largely through agricultural research, under the shadow of ever-tighter public research budgets.

In conjunction with budgetary pressures, the emphasis of spending is shifting away from research on farm inputs and outputs toward new concerns such as the environment, genetic diversity, food safety, and human health. Research and technology policy is also being made more complicated by the changing public and private roles in funding and conducting agricultural R&D, changing intellectual property rights regimes, and changes to the general environment for products and trade in agricultural products. *Agricultural Science Policy: Changing Global Agendas*, edited by Julian M. Alston, Philip G. Pardey, and Michael J. Taylor, and published by Johns Hopkins University Press, looks at issues raised by this changing environment for agricultural productivity, agricultural R&D, and natural resource management.

CHANGING CONTEXTS AND AGENDAS

Today, private entities are paying for and conducting a larger share of research, while many governments are scaling back the growth in or reducing their spending on agricultural R&D. Spending on private agricultural R&D in the rich countries alone totaled US$7 billion in 1993, compared with US$4 billion in 1981. Changes in the world economy and in agriculture and science are having important implications for the funding, organization, and management of R&D. In many countries the emergence of modern biotechnology and a strengthening of intellectual property rights are giving rise to profound changes in both public and private agricultural R&D. Only a small part (12 percent) of private research concerns farm-level technologies for improving crop and livestock production. Much research relates to technologies embodied in purchased inputs as well as post-farm food processing and product development. Specialization has become the name of the game: in one country, firms may emphasize postharvest research; in another, pesticides and herbicides. Research results tend to be rapidly transferred around the world.

In this changing research environment, a number of important policy questions must be addressed. How should resources for agricultural research be distributed among local, national, and international research? How much agricultural research should be publicly funded? What role should multinational firms play? How should scarce research dollars be distributed among sectors such as agriculture, forestry, fisheries, and livestock? Should a large part of agricultural research be directed toward environmental issues such as climate change, loss of biodiversity, and water pollution? Should research concentrate on short-term or long-term results? On improving the environment or increasing yields?

This book lays out this new agenda for agricultural science policy and provides new evidence and new ideas as a basis for beginning to study and formulate policies to deal with the emerging issues.

PRODUCTIVITY MEASURES AND MEASUREMENT CHALLENGES

Setting research priorities requires accurately measuring the effects of alternative courses of action, a task that raises conceptual and measurement issues. One chapter in this book assesses the current methodology for measuring productivity growth and documents the many conceptual and statistical problems that remain to be resolved; other chapters provide quantitative evidence on productivity patterns. One, for example, emphasizes the effects of adjusting for changes in the quality of outputs and inputs (like aging but better educated farmers or bigger tractors and combine harvesters) in measures of state-level productivity patterns in the United States. Another chapter looks at past trends and future prospects for cereal crop productivity as growth in rice and wheat yields slows in developing countries. Yield is still the most commonly used indicator of productivity, but proper assessment of productivity growth also requires that attention be paid to trends in the use of other factors of production such as fertilizer. Empirical studies of total factor productivity—measuring the output not attributable to the inputs used in agriculture—in developing-country agriculture are becoming increasingly important in providing a complete picture of technological change.

RESEARCH, PRODUCTIVITY, AND NATURAL RESOURCES

Can research and technology solve environmental problems of water, soil, and air degradation, without adversely affecting economic development and agricultural productivity? What are the implications of agricultural R&D for sustainability? Chapters in this volume challenge the very notion of sustainability, as well as other popular ideas about the nature and extent of resource scarcity, including the effects of agriculture on natural resource stocks and the implications for science and related policy. Regulated industries based on nonrenewable or common property resources raise new issues in the measurement of productivity, as illustrated by an analysis of technical change and productivity in the North Pacific halibut fishery during 1935–78. Getting the facts right is important as well. New data on soil degradation in China and Indonesia show that, on balance, over very long time periods the contributions to soil fertility associated with urban development and intensification can more than offset the losses from land degradation in the hinterlands.

RESEARCH FOR GENETIC IMPROVEMENT

Studies of genetic improvements in crops have dominated the large body of work on the economics of agricultural R&D. This research is evolving to address new types of issues. For instance, one chapter found that international wheat and maize research and Indian wheat research have generated significant spillovers (in which research conducted in one location affects a different location) and that agricultural research has large economies of size, scale, and scope. Policies related to the conservation of agricultural plant biodiversity are addressed in a chapter that discusses methods for valuing genetic resources and the implications of property rights regimes for plant breeding programs. Another area of concern today is food safety, particularly in transgenic crops, but genetically modified crops can also promote human health. For instance, the health benefits from consuming canola oil are reported to be as large as the gross value of the crop, much greater than the benefits to producers and consumers measured conventionally.

Contributors to the book are Julian M. Alston, Walter J. Armbruster, Peter J. Barry, Wilfred Beckerman, Derek Byerlee, Barbara J. Craig, Robert Evenson, Richard Gray, Zvi Griliches, Paul W. Heisey, Frances Homans, Peter Lindert, Stavroula Malla, Philip G. Pardey, Prabhu L. Pingali, Ismail Serageldin, Michael J. Taylor, Greg Traxler, James E. Wilen, and Brian D. Wright.

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