48. R. L. Simmons, A. L. Price, A. J. Ozerkis, *Am. J. Obstet. Gynecol.* **100**, 908 (1968).
49. J. P. Munroe, *J. Reticuloendothel. Soc.* **9**, 361 (1968).
50. I. Mariyama and T. Sugawa, *Nature (London) New Biol.* **236**, 150 (1972).
51. J. M. Anderson, *The Biology and Surgery of Tissue Transplantation*, J. M. Anderson, Ed. (Oxford Univ. Press, London, 1970), p. 129.
52. T. Mori and H. Kobayashi, *Immunological Influence on Human Fertility*, B. Boettcher, Ed. (Academic Press, New York, 1977), p. 175.
53. L. H. Phuc, M. Papiernick, M. Dardenne, *Clin. Exp. Immunol.* **44**, 253 (1981).
54. L. H. Phuc, M. Papiernick, S. Berrih, D. Duval, *ibid.*, p. 247.
55. S. D. Michael, *Factors Regulating Ovarian Function*, G. S. Greenwald and P. F. Terranova, Eds. (Raven, New York, 1983), p. 445.
56. W. R. Rebar, I. C. Morandini, J. E. Petze, G. F. Erickson, *Biol. Reprod.* **27**, 1267 (1982).
57. R. W. Rebar, A. Miyaka, G. F. Erickson, T. L. K. Low, A. L. Goldstein, *Factors Regulating Ovarian Function*, G. S. Greenwald and P. F. Terranova, Eds. (Raven, New York, 1983), p. 465.
58. L. S. Allan, J. E. McClure, A. L. Goldstein, M. S. Barkley, S. D. Michael, *J. Reprod. Immunol.* **6**, 25 (1983).
59. C. J. Grossman and G. A. Roselle, *J. Steroid Biochem.* **19**, 461 (1983).
60. I thank J. Combs and J. Mason for preparation of the manuscript and R. L. Clark for preparation of the figures. This work was supported in part by funds supplied by the Veterans Administration.

The World Bank's Support for Science and Technology

Charles Weiss, Jr.

Summary. The World Bank, the largest aid-granting agency in the world, has played a substantial but largely unsung role in helping the scientific and technological development of developing countries. Its investments, totaling $15.5 billion in fiscal year 1984, involve choosing appropriate technology and financing local technological development. Since 1980, the Bank has lent $0.5 billion for agricultural research and about $1 billion for scientific and technological education. It contributes to and mobilizes finances for large international research programs in agriculture and the health sciences. It supports research on labor-based construction, low-cost sanitation, renewable energy resources, and control of traffic congestion. It provides training in the technological aspects of development policy. As funds for aid become scarce, the Bank is reexamining its approach to science and technology.

The World Bank is the largest multilateral organization for development assistance in the world. Its loans to developing countries in fiscal year 1984 totaled $15.5 billion (*1*). These loans support about 230 development projects in agriculture, rural development, energy, education, industry, telecommunications, transportation, water supply, sanitation, urban shelter, population, health, and nutrition.

The selection of appropriate technology and the building of the local technological capacity are integral and essential aspects of the Bank's projects although not their primary objectives. The technology includes not only equipment (hardware) but also governmental policies and institutional and administrative arrangements necessary to implement the project (software). A project intended to increase the production of food-crops, for example, would be based on a broad analysis of the agricultural sector, and it may include the institution of governmental policies designed to increase the prices paid to farmers or to improve marketing and distribution.

The Bank has financed many agricultural research and extension projects that stress the creation and distribution of technology with direct, practical value to low-income farmers. It was among the first institutions to finance venture-capital companies and programs to support innovation in industrial enterprises in developing countries. By so doing, the Bank has promoted government policies and programs that create a demand for improved technology and local decision-making capacity while avoiding the traditional emphasis on government-owned institutes. It has identified or developed improved, low-cost technology for civil works construction, sanitation, and other critical activities. Most recently, the Bank has assisted in training policy-makers and research managers in the technological aspects of development policy, and it has also begun to assist developing countries in building scientific and technological infrastructures.

The Bank is only one of many agencies that contribute to scientific and technological development in developing countries. Still, this aspect of its work may be less familiar than similar work done by specialized agencies of the United Nations, such as the Food and Agricultural Organization (FAO), the World Health Organization (WHO), and the U.N. Educational, Scientific, and Cultural Organization (Unesco), and by bilateral aid agencies such as the U.S. Agency for International Development.

To scientists and engineers who are accustomed to grant financing, the willingness of developing countries to use large sums of borrowed money to support science and technology may be a surprise, especially since these projects have a relatively long pay-off period. This shows that they consider investment in science and technology to be worthwhile, even with borrowed money. It also indicates that, in the long run, governments expect investments in science and technology to pay their own way, at least in a broad sense.

Mechanisms of Bank Support for Science and Technology

The Bank supports science and technology by four mechanisms.

1) As a service, within the framework of a loan for a development project, the Bank provides technical assistance in the choice, implementation, and operation of technology and in the development of local technological capacity.

2) The Bank lends money, through the projects it supports, for training, research, innovation, development of scientific and technological capacity, and

Charles Weiss, Jr., is the Science and Technology Adviser to the World Bank, Washington, D.C. 20433. This article is adapted from a speech delivered at the Annual Meeting of the AAAS held in New York, 24 to 29 May 1984.

dissemination of scientific and technological information (*2*).

3) The Bank provides grants to international research programs. It does not support individual research projects.

4) The Bank undertakes research and analyzes policies concerning technological development.

Technical assistance. The Bank contributes to the technological development of a borrowing country by participating in the selection, preparation, and appraisal of a Bank-financed investment project and by supervising its implementation. It attempts to ensure that a project is suited to a country's development goals and local conditions. Although the Bank interacts creatively with a borrower at all stages of a project from conception to post-evaluation, the ultimate responsibility for the project lies with the borrowing agency. The extent of the Bank's participation, and thus its influence on project design, depends on the capability of that agency.

Most projects financed by the World Bank use proven technology, which is identified, transferred, and adapted to the conditions of the project and operated by local people, who may receive their training as part of the project. The Bank's staff members often propose technical solutions to problems that might not have been considered by a country's officials. As a result of many of the Bank's projects, existing technology is introduced into a country or region. For example, the Narmada irrigation projects in India will introduce transient-flow hydraulics to regulate the water flow beyond the main reservoir gate, permitting greater efficiency of water conveyance and use.

Bank-financed projects are evaluated after implementation is completed, that is, about 5 to 7 years after they begin. Of 994 projects recently reviewed, 86 percent were achieving their major development objectives (*3*). Where there has been failure, the reviews have occasionally pointed to a flawed choice of technology—usually because of inadequate consideration either of the social situation into which the technology had to fit or of the sustainable technology already used in the project area.

Project lending for science and technology. Some Bank loans aim directly at developing scientific and technological capacity. Agricultural research in developing countries has received $1.6 billion over the years, while about $350 million has gone to scientific and technological education just since 1982.

Support to international research. Although the World Bank does not ordinarily make grants for scientific and technological research, the two exceptions to this rule rank among the Bank's most important contributions to development: the Consultative Group on International Agricultural Research (CGIAR) and the Special Program for Training and Research in Tropical Diseases (TDR). The Bank chairs the CGIAR, which it jointly sponsors with the U.N. Development Program (UNDP) and the FAO, and it contributes 11 percent of the CGIAR's $170 million annual budget, a proportion which will increase to 15 percent. The Bank mobilizes funds for the TDR program, which is executed by the WHO. The Bank will contribute 12 percent of the TDR budget for 1984, about $3.2 million.

Internal research and policy analysis. The Bank focuses on the links between a country's scientific and technological system and the rest of its economy, areas that often elude scientists, engineers, and policy-makers. The Bank urges a country to consider the powerful influences that trade policies, prices, exchange rates, and the competitive climate among local enterprises have on a country's technical development (*4*).

Agricultural Research and Extension

Agricultural research is one of the few areas for which direct economic benefits have been confirmed by careful econometric research. For example, the International Rice Research Institute, an internationally funded agricultural research center in the Philippines, invested in research that was instrumental in developing high-yielding rice varieties. This investment gave an annual rate of return of about 80 percent through 1975 (*5*). In addition to applied research, this economic value extends to basic biological research related to agriculture (*6*).

The Bank also finances the reorganization and reequipping of national agricultural research services, ensuring that the results from agricultural research are brought to bear on farm productivity. These projects promote administrative changes that increase the efficiency of agricultural researchers, free them from political interference, decrease their isolation from their colleagues, and improve their career prospects and their links to the extension service (*7*). Experience has shown that the projects must put emphasis on training researchers to deal with the problems they will face and that, whenever possible, such training should take place in the researchers' home countries.

The Bank also helps make the national agricultural extension services in developing countries more professional, particularly through training and visits. With this approach extension workers perform two primary missions. They deliver timely and useful information to farmers on a regular schedule. They also report the farmers' problems back to researchers, putting the researcher in close touch with problems encountered in the field (*8*). Some aspects of the training and visit approach have aroused controversy (*9*). But a recent evaluation of matched districts in India with and without that program showed faster diffusion of improved practices throughout areas with the program, and the economic rate of return from that program was at least 45 percent (*10*).

International Agricultural and Health Research

The Bank supports CGIAR and TDR with grants that cover only a small percentage of their budgets. These grants stimulate other donors to contribute much larger sums.

The CGIAR funds research at 13 international centers. This research concentrates on maize, wheat, rice, legumes, cassava, livestock, and other major food crops in the developing world (*11*). Two of these centers developed the short-straw varieties of wheat and rice that turned several countries of South and Southeast Asia from importers to marginal exporters of these crops. With this success came the responsibility to keep the new crop varieties resistant to pests and diseases, to collect germplasm from traditional cultivars displaced by the new varieties, and support modern genetic research on traditional crops such as sorghum, cassava, and chick-peas, which do not depend on the use of fertilizer and irrigation that are important for the new high-yielding varieties of wheat and rice.

Some recent successes of the international centers include (i) developing IR-36, a new rice variety with a wide range of geography plus insect and disease resistance; (ii) introducing short-period wheat as a second crop into 10 million hectares of Bangladesh that previously produced a single crop; and (iii) identifying predators of two major cassava pests in Africa, the cassava mealybug and green spider mite, and introducing those predators into the pests' environments.

The TDR concentrates on the control of six major tropical diseases—malaria, schistosomiasis, leishmaniasis, filariasis, trypanosomiasis, and leprosy—for which there are no simple or cheap controls (*12*). Progress in research on malaria and leprosy is particularly striking. Research on a vaccine for malaria is at the stage of producing pure antigen. For leprosy, new drugs, knowledge of the mechanisms of drug resistance, and methods for epidemiological study and field trials are in hand. In addition to managing its own research programs, the TDR is working to improve local research in the countries where these diseases are prevalent.

Education and Training

One quarter of the $5 billion the World Bank has lent for education over the past 20 years has helped buy laboratory and workshop equipment for primary, secondary, and postsecondary schools. The Bank also finances training programs in fields essential to the success of its investment projects; $220 million were allocated for such programs in fiscal year 1983 alone. This training provides a broad range of skills to such people as supervisors for road construction projects; the maintenance staff for water supply projects; and engineers, managers, and researchers for agricultural and industrial projects (*13*). It should be an integral part of each investment project.

The Bank also supports overall scientific and technological development (*14*). For example, a recent $200-million loan is assisting China to build an infrastructure of scientific and technological programs, policies, and institutions. This project aids 26 universities to increase the number of graduates and, thus, the volume of research, raise the quality of graduates and research, and improve management in those universities and the Ministry of Education. A second Bank project in China extends the same approach to 11 agricultural colleges and 8 research institutes, and a third project supports 28 television universities and a system for postsecondary polytechnic education. In a number of countries, a training program based on case studies of Bank experiences builds skills in management of technology and policy planning among senior and middle-level managers in private and public enterprises, government agencies, financial institutions, technological institutes, and research laboratories (*15*).

Support for Industrial Innovation

Several Bank-financed projects encourage private industry to invest in improved technology and innovation. These projects compensate for imperfections in the capital markets and the links between institutions and their clients in the industrial sector (*16*). These projects encourage the development of new lines of business based on either new products or new processes using indigenous or adapted technology. They also promote higher productivity and lower costs through better use of technology. This approach contrasts with efforts in the 1960's and 1970's to inject technology into the industrial sector by establishing laboratories, technological institutes, and engineering firms, few of which established connections with the industrial sector, let alone influenced the technology used there.

This market approach is illustrated by the Korean Technology Development Corporation (KTDC). The KTDC is an autonomous financial institution that works with local industry to identify, promote, and respond to proposals for new lines of business based on local technology. It finances research and development in private industry through loans that are forgiven if a project fails. It also provides equity funds to companies that are set up to exploit the results from R&D. The KTDC reflects the Bank's experience with a similar project in Spain (*17*). In both Spain and Korea, as well as Southeast Asia, the Bank's private-industry affiliate, the International Finance Corporation, supports venture-capital companies that make equity investments in risky ventures in order to launch technologies (*18*).

Through its experience in Spain and Korea, the World Bank has developed the means to identify institutional, programmatic, and policy gaps that impede technological development in industry. As a result, it has assisted the government of Portugal in preparing a 5- to 10-year strategy for the development of industrial technology (*19*).

Energy

The number of Bank loans for the development of energy resources has risen since the first oil price increase in 1973. They now cover power generation and distribution, exploration for and exploitation of conventional energy resources and renewable energy resources, energy sector planning, energy conservation, and petroleum refining (*20*).

To cope with high oil prices, developing countries must develop domestic energy resources to substitute for oil imports. They must reevaluate past exploration efforts and conduct extensive geological, geophysical, and geochemical studies using state of the art technology. The Bank is assisting these countries by encouraging training of local staff and by supporting the introduction of modern technologies, in many cases developed by international oil companies. To help countries with no significant reserves of oil but with substantial supplies of natural gas, the Bank has commissioned studies that have identified economical technologies for using compressed natural gas as a substitute for liquid fuels (*21*). It has also supported the development of natural gas resources. However, a Bank study of market prospects for methanol, a natural gas product, concludes that, at presently foreseen fuel prices, methanol production will not alleviate the domestic energy problems of developing countries (*22*).

The most important support the Bank has given for renewable energy sources has been for farm and community forestry. This support is critical in Africa, where over 90 percent of the energy used comes from fuelwood and charcoal. This emphasis on farm forestry has led the developing countries away from their traditional concern with both maintenance of reserves and industrial forestry for lumber, poles, and paper pulp (*23*). This is especially true for India.

The World Bank is now collaborating with the UNDP in analyzing and demonstrating technologies for exploiting renewable energy sources and in assisting developing countries with their energy planning (*24*). Typically, its energy studies assess different sources of energy, based on techno-economic criteria (*25*). These studies point to conservation as an important "source" of energy, indicating that as much as half of a nation's bill for commercial energy can result from a dozen industrial installations that use energy wastefully. Since traditional, noncommercial energy sources also benefit from energy conservation, the Bank, often in collaboration with nongovernmental organizations, promotes the use of cookstoves that conserve supplies of wood and charcoal. These stoves increase the energy efficiency of cooking by as much as 50 percent in laboratory tests, but institutional and technical problems often complicate their introduction into developing countries (*26*).

Water Supply and Sanitation

Nearly 2 billion people in both cities and rural areas lack water supplies and sanitation services. The World Bank has concluded that, although sanitation technologies are available, cost-effective, and sufficient to basic needs, they are largely unknown to project designers and governments in developing countries. Because a community's culture is critical to its adoption of sanitation technology, engineers must seek the aid of sociologists in calculating the engineering, financial, and social needs of a community (*27*). The Bank and the UNDP have demonstrated the feasibility of low-cost sanitation schemes in many countries. These projects commonly use the "ventilated improved pit" latrine and the pour-flush latrine (*28*). Both are cheap, permanent, high-quality, cost-effective facilities. Both can be constructed locally and maintained, with little or no outside assistance, at a fraction of the cost of traditional, waterborne sewerage schemes.

Labor-Based Technology for Civil Works Construction

In countries where labor is abundant but capital is scarce, labor-based methods often help save capital for those activities where labor is less productive, strengthen community involvement in infrastructure projects, reduce unemployment, and distribute income more equitably. For example, traditional labor-based construction uses thousands of unskilled laborers instead of machines as a way to provide employment. However, these methods usually result in low productivity, and the quality of the results is usually low. In addition, labor-based construction may be more costly than equipment-based construction.

Since about 40 percent of the World Bank's lending finances construction works, chiefly dams and highways, the Bank has compared the efficiencies of labor-based and equipment-based construction methods (*29*). Its research found that, for certain types of construction, particularly in rural areas, labor-based methods can meet requirements just as well as equipment-based methods. Efficiency can be increased by better planning and supervision, better tools, incentive payments, organization of the work, and interventions to improve the health and nutrition status of laborers. As an example of the latter, in Indonesia, the addition of an iron supplement to the diet of the workers raised productivity as much as 25 percent at some sites. The cost for such improvement was only 50 cents (U.S.) per worker per year.

Research and Policy

The World Bank frequently treats technological issues as integral parts of policy analysis and operations (*30*). From the results of economic research, the Bank could inform the development community of the implications of using alternative technologies in city planning, agriculture, and industry, and it has demonstrated how institutional and economic policies influence the choice of technology.

For example, the support for low-cost sanitation schemes mentioned above followed studies that pointed to the need for low-cost solutions for urban sanitation problems in low-income countries. Bank studies aided Singapore in its evaluation of the "area licensing" scheme for controlling private automobiles in congested areas (*31*). Other Bank studies found that appropriate choices of manufacturing technology, especially choices made with an understanding of the efficiency of the alternatives, markedly improve national employment and national income (*32*). In particular, investments in machinery and manpower that upgrade the productivity of existing equipment are often preferable to investments in new machinery. Bank research on the economics of national communication and education has emphasized the necessity of low-cost facilities to meet the needs of poor people—for example, public telephones in low-income areas and educational programs transmitted by radio instead of television (*33*).

Bank research on nutrition includes evaluation of technological interventions. One study found that a heavy infestation of *Ascaris* worms can cause the loss of 25 percent of ingested calories, contributing to malnutrition and reducing the effectiveness of food supplements. The benefits of semiannual deworming can be worth ten times the cost (*34*).

In India, the Bank has shown that tractors would not necessarily increase the intensity of cultivation and, depending on the circumstances, could lead land owners to evict sharecroppers in order to enlarge the area for their own cultivation (*35*). Another study showed the many technical and institutional obstacles to the use of improved tools, and it singled out the wheeled toolbar-carrier as the improved implement offering greatest potential benefit, despite its relatively high cost (*35*).

Conclusion

The World Bank's development assistance loans have been a flexible instrument for the promotion of scientific and technological development. Through such loans, the World Bank complements the roles played by scientists, scientific institutes, and agencies. By emphasizing that scientific activity must serve development rather than itself, the Bank promotes policies and institutions that strengthen the local capacity for technological decision-making, link science and technology with the broader economic system, and encourage research, innovation, and technology suited to local conditions.

The recent advances in microelectronics, communications, biotechnology, and other advanced technologies present a challenge to developing countries to stay apace with the rest of the world. Ironically, however, just as these challenges are increasing, the world economy is slowing down, funds for development assistance are decreasing, and concessional aid funds for the poorest countries are drying up. This confronts developing countries with painful choices regarding the allocation of scarce resources. Under these pressures, the World Bank is reviewing its policies to determine the best response to these new challenges in science, technology, and development.

References and Notes

1. C. Weiss, *Science and Technology at the World Bank* (World Bank, Washington, D.C., 1984); P. Shapiro, Ed., *Technology and Science in World Bank Activities* (World Bank, Washington, D.C., 1982); C. Weiss and N. Jequier, Eds., *Technology, Finance, and Development* (Lexington Books, Lexington, Mass., 1984).
2. The International Finance Corporation, the Bank's affiliate that invests in private industry, also invests directly in technological innovation in the private sector.
3. *Ninth Annual Review of Project Performance Audit Results* (World Bank, Washington, D.C., 1983).
4. C. Weiss, *Science* **203**, 1083 (1979).
5. G. Scobie, *Investment in International Agricultural Research: Some Economic Dimensions* (World Bank Staff Working Paper No. 361, World Bank, Washington, D.C., 1979).
6. R. E. Evenson and Y. Kislev, *Agricultural Research and Productivity* (Yale Univ. Press, New Haven, Conn., 1975).
7. *Agricultural Research* (Sector Policy Paper, Stock No. BK9074, World Bank, Washington, D.C., 1981).
8. D. Benor, J. Harrison, M. Baxter, *Agricultural Extension: The Training and Visit System* (Stock No. BK0140, World Bank, Washington, D.C., 1984); M. Cernea, J. Coulter, J. Russell, *Agricultural Extension by Training and Visit: The Asian Experience* (Stock No. BK0301, World Bank, Washington, D.C., 1984).

9. J. Howell, *Managing Agricultural Extension: The T&V System in Practice* [Agricultural Administration Network Discussion Papers Nos. 8 (May 1982) and 10 (February 1983), Overseas Development Institute, London].
10. G. Feder and R. Slade, *Some Aspects of the Training and Visit System of Agricultural Extension in India: A Comparative Analysis* (World Bank Staff Working Paper 656, World Bank, Washington, D.C., 1984).
11. D. C. Plucknett and N. J. H. Smith, *Science* **217**, 215 (1982).
12. *Venture for Health* (World Health Organization, Geneva, 1984).
13. *Education* (Sector Policy Paper, Stock No. BK9071, World Bank, Washington, D.C., 1980); A. Habte, G. Psacharopoulos, S. Heyneman, *Education and Development: Views from the World Bank* (World Bank, Washington, D.C., 1983).
14. H. Kim, *Building Scientific and Technological Infrastructure in Developing Countries* (World Bank Staff Working Paper, World Bank, Washington, D.C., in press).
15. M. Kamenetzky, R. Maybury, C. Weiss, *Bull. Sci. Technol. Soc.* **4**, 1 (1984).
16. K. N. Rao and C. Weiss, in *Technology, Finance, and Development*, C. Weiss and N. Jequier, Eds. (Lexington Books, Lexington, Mass., 1984); M. Teubal, *Minerva*, in press.
17. Centro para el Desarrollo Tecnologico Industrial (Ministerio de Industria y Energia, Madrid). Original and partial translation available from the author.
18. D. Gill, *Venture Capital Investment: IFC's Strategy* (International Finance Corporation, Washington, D.C., 1981).
19. *Technological Development in Portuguese Industry: An Analytical Summary of the Findings and Recommendations of a Research Project* (Center for Policy Alternatives, Massachusetts Institute of Technology, Cambridge, and Laboratorio Nacional de Engenharia e Tecnologia Industrial, Lisbon, 1983).
20. *Energy Transition in Developing Countries* (Stock No. BK0225, World Bank, Washington, D.C., 1983).
21. *The Utilization of Gas in Developing Countries* (BEICIP, a subsidiary of the Institut Français du Petrol, Paris, 1981).
22. *Emerging Energy and Chemical Applications of Methanol: Opportunities for Developing Countries* (World Bank, Washington, D.C., 1982).
23. *Proceedings of the XVII World Congress of the International Union of Forest Research Organizations* (Vienna, 1981). For other examples of the World Bank's interest in renewable energy, see *Renewable Energy Resources in the Developing Countries* (World Bank, Washington, D.C., 1980); *Alcohol Production from Biomass in Developing Countries* (Stock No. BK9172, World Bank, Washington, D.C., 1980); C. Weiss, *Mobilizing Renewable Energy Technology in Developing Countries: Strengthening Local Capabilities and Research* (Stock No. BK9431, World Bank, Washington, D.C., 1981).
24. *Small-Scale Solar-Powered Pumping Systems: The Technology, Its Economics and Advancement* (Main Report, Sir William Halcrow and Partners and Intermediate Technology Power, Ltd., London, 1981); G. Foley and G. Barnard, *Biomass Gasification in Developing Countries* (Earthscan, London, 1982); *Wind Technology Assessment Study* (Intermediate Technology Power, Ltd., London, 1983), vols. 1 and 2.
25. The United Nations Development Program and the World Bank Energy Sector Assessment Program, *Annual Report* (Energy Assessment Division, World Bank, Washington, D.C., 1984); *Quarterly Information Briet* (World Bank, Washington, D.C., December 1984).
26. F. R. Manibog, *Annu. Rev. Energy* **9**, 199 (1984).
27. J. M. Kalbermatten, D. S. Julius, C. G. Gunnerson, *Appropriate Sanitation Alternatives: A Technical and Economic Appraisal* (Johns Hopkins Univ. Press, Baltimore, Md., 1981); J. M. Kalbermatten, D. S. Julius, C. G. Gunnerson, D. D. Mara, *Appropriate Sanitation Alternatives: A Planning and Design Manual* (Johns Hopkins Univ. Press, Baltimore, Md., 1981); and R. G. Feachem, D. J. Bradley, H. Garelick, D. D. Mara, *Sanitation and Disease: Health Aspects of Excreta and Wastewater Management* (Johns Hopkins Univ. Press, Baltimore, Md., 1981).
28. P. R. Morgan and D. D. Mara, *Ventilated Improved Pit Latrines: Recent Developments in Zimbabwe* (World Bank, Washington, D.C., 1982); A. K. Roy, *Manual on the Design, Construction, and Maintenance of Low-Cost Pour-Flush Waterseal Latrines in India* (World Bank, Washington, D.C., 1984).
29. B. P. Coukis and N. Jequier, in *Technology, Finance, and Development*, C. Weiss and N. Jequier, Eds. (Lexington Books, Lexington, Mass., 1984).
30. See, for example, the following sector papers and country studies published by the World Bank, Washington, D.C.: *Forestry* (Stock No. BK9063, 1978); *Tropical Root Crops* (World Bank Staff Working Paper No. 324, 1979); *Brazil: Integrated Development of the Northwest Frontier* (Stock No. GK9140, 1981); *Brazil: Industrial Policies and Manufactured Exports* (Stock No. BK0156, 1981); and *China: Socialist Economic Development* (Stock No. BK9168, 1983), vols. 1–3. See also (*7*, *23*).
31. E. P. Holland and P. L. Watson, *Relieving Traffic Congestion: The Singapore Area License Scheme* (World Bank Staff Working Paper No. 281, World Bank, Washington, D.C., 1978).
32. H. Pack, *J. Develop. Econ.* **11**, 1 (1982); H. Pack, *ibid.*, in press; M. Nishimizu and S. Robinson, *ibid.*, in press.
33. G. Feliciano *et al.*, *The Educational Use of Mass Media* (World Bank Staff Working Paper No. 491, World Bank, Washington, D.C., 1981); R. Saunders *et al.*, *Telecommunications and Economic Development* (Johns Hopkins Univ. Press, Baltimore, Md., 1983).
34. L. Latham, M. Latham, S. S. Basta, *Nutritional and Economic Implications of* Ascaris *Infection in Kenya* (World Bank Staff Working Paper No. 271, World Bank, Washington, D.C., 1977).
35. K. J. Singh, *Animal-Powered Agriculture and Improved Technology in India* (Agricultural Economics Division Working Paper No. 88, World Bank, Washington, D.C., 1981); P. Duane and C. Downing, *Agricultural Mechanization Issues Paper* (World Bank, Washington, D.C., 1975).
36. I thank Robert Maybury for his assistance in preparing this article.