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PANEL 3: EVOLUTION OF NATIONAL RESEARCH SYSTEMS:  
EMERGING POLICY ISSUES

**ORGANIZER, RAPPORTEUR AND CHAIRPERSON**

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**PANEL DISCUSSANTS**

Financing Agricultural Research: International Investment Patterns and Policy Perspectives *Julian Alston (University of California-Davis), Phil Pardey (IFPRI), Johannes Roseboom (ISNAR)*

International Agricultural Research: On Striving for International Public Goods in an Era of Donor Fatigue *J.R. Anderson (World Bank)*

Agricultural Research Policy Issues in Latin America: An Overview *Ruben Echeverria (Inter-American Development Bank)*

Indian Agricultural Research System: Structure, Current Policy Issues and Future Orientation *Mruthyunjaya and P. Ranjitha (Indian Council of Agricultural Research)*

Private Sector Investment in R&D: Will it Fill the Gap? *Carl Pray (Rutgers University, USA) and Dinah Umali-Deininger (World Bank)*

The Transformation of the Dutch Agricultural Research System: An Unfinished Agenda *Johannes Roseboom and H. Rutten (ISNAR)*

Crafting Smallholder-driven Agricultural Research Systems in Southern Africa *Mandivamba Rukuni (University of Zimbabwe) Malcolm Blackie (Rockefeller Foundation, Malawi), Carl Eicher (Michigan State University, USA)*

This session dealt with the recent development of national research systems, highlighting current policy issues, and their evolution into the 21st century. Four of the discussants emphasized regional or country perspectives – three from the developing world and one industrialized country. The remainder focused on particular themes: trends in financing research at the global level, the international research system and the growing role of the private sector.<sup>2</sup>

<sup>2</sup>The papers presented are being published in full in *World Development*, June 1998.

*Trends in R&D investments*

Alston, Pardey and Roseboom provided global figures on investment in agricultural research. Growth was rapid in the 1970s, averaging over 6 per cent annually in the developing world. However, in the 1980s, the rate slowed and in many cases, especially in Latin America and Africa, investment declined. Almost everywhere, expansion of staff has been more rapid than funding, resulting in a growing proportion of funds being used to pay salaries and an acute shortage of operating funds for undertaking research.

The slowdown reflects the decline in both domestic support and donor contributions over the past decade. The decline in donor support was especially felt in the Consultative Group for International Agricultural Research (CGIAR) system, which witnessed a stagnation of funding in the 1990s, despite an increase in the number of centres and in the scope of its mandate. However, in Africa, donor contributions to national systems have increased in relation to domestic support, so that nearly half of the agricultural research investment in Africa is from donors, including development banks. Rukuni, Blackie and Eicher argued that high donor dependency in Africa has undermined efforts to develop domestic political support for sustainable funding of agricultural research, especially for the smallholder sector.

The decline in funding in part reflects a re-examination almost everywhere of the appropriate role of government, and a worldwide move to privatize public-sector activities. The private sector has, in fact, sharply increased investment in agricultural R&D in recent years, but this has only partly alleviated the gap in public sector funding (Pray and Umali-Deininger). Even after a period of rapid growth in private investment, private R&D typically accounts for only 10–15 per cent of total agricultural R&D in developing countries, compared to about half in the industrialized countries (Alston *et al.*).

The result is that research intensity (R&D investment as a proportion of agricultural GDP) in developing countries remains low, at about 0.6 per cent, and has hardly increased over the past 25 years. This situation is further heightened by the increasing demands being placed on research systems everywhere. During much of the 1970s and 1980s, investment in research was largely motivated by concerns about growing population, a finite resource base, import substitution and food security at both the global and national levels that required a clear focus on increased food productivity. In the 1990s, natural resource management and environmental preservation received much higher priority, along with food safety in industrialized countries. At the international level, especially in the CGIAR system, poverty alleviation is now the main rationale for investment in agricultural research (Anderson). Thus research systems are being asked to do more with less.

*The emerging paradigm for NARS*

Accompanying these trends there has been a parallel shift in the institutional make-up of the national agricultural research systems (NARS). During much of the past 25 years, the public sector has depended on the national agricultural

research organization (NARO) model. In this paradigm, public funds were provided as block grant, usually through the ministry of agriculture, to a centralized research department or institute which then set priorities and executed research through a network of centres under the control of the NARO. A new paradigm is now emerging for thinking about national agricultural research systems. The main elements are summarized below.

*Pluralistic institutional structures* There is recognition of the variety of organizations that have the potential to participate in agricultural research, both for funding and execution. The inclusion of this wider range of organizations in the conception of a NARS enhances the quantity and quality of financial and human resources that can be tapped; for example, potential new funding sources from non-agricultural ministries or farmer organizations, and the considerable scientific talent available in universities.

Coupled with this there has been a trend towards the separation of policy making, funding and execution of research, since each requires different inputs and skills. This trend is most advanced in the Netherlands, where the Ministry of Agriculture now only concerns itself with research policy and funding; research execution takes place in a wide variety of organizations. A similar arrangement is evolving in Zimbabwe (Rukuni *et al.*) where the newly re-vamped Agricultural Research Council is focusing on policy and funding issues, while much of the execution of research is carried out in the Ministry of Agriculture, universities, farmer organizations and the private sector.

*The growing role of the private sector* Pray and Umali-Deininger document the growing role of the private sector in R&D. The worldwide trend towards market liberalization and privatization, and much stronger intellectual property protection for biological technologies, have been major stimulants to private investment in agricultural research. However, they point out that, even with these favourable trends, there are still many factors that limit private-sector investment in R&D, including poor agroclimatic potential, small market size and restrictive policies on technology imports and release. In addition, several of the papers note that private-sector research depends to a large extent on using knowledge, methods and technologies developed in the public sector, especially products of basic and strategic research. Hence strong public support for research, especially basic and strategic research, may be one of the major stimulants to private investment in R&D. The bottom line is that, even with suitable policies in place, private-sector research has the potential to fill the gap caused by dwindling public support only in certain cases, especially in mature NARS and in areas of commercial agriculture. There is also concern about the growing role of multinationals, a concern heightened by several recent mergers of biotechnology, seed and chemical companies that have strengthened the market position of a few large multinationals (Pray and Umali-Deininger, Mruthyunjaya and Ranjitha). A strong public sector focused on more strategic research is seen as a stimulus to the development of local private R&D capacity and a competitive private sector.

A parallel development is the increasing trend towards public-private-sector

partnerships in agricultural research. These take many forms, including joint ventures of public organizations with the private sector to commercialize their technologies, and private funding of research in the public sector to utilize available infrastructure and scientific skills. Farmer organizations are also becoming more active as a source of funding for public-sector research, through the use of levies on commodity output, especially for export crops.

This rise in private-sector research allows the public sector to focus more sharply on public goods and other areas where there are market failures in the provision of technologies. Alston *et al.* define such market failures as arising from several causes, especially lack of appropriability of much agricultural technology, the long-term and uncertain pay-offs to research and environmental externalities of much agricultural technology. However, they also caution that market failures are a necessary, but not sufficient, condition for public-sector intervention, since many interventions, such as the use of general tax revenue to fund research, also incur considerable welfare costs.

*New mechanisms for research funding* The mechanisms for public funding of research have also evolved. There has been a universal move away from providing block grants towards the use of competitive and contractual arrangements to funding research. Alston *et al.* argue that such competitive arrangements, although more costly to manage, are likely to improve the allocation of research resources. The CGIAR system continues with block funding, but Anderson argued that it too should pilot a competitive system of funding that would encourage partnerships and participation of stronger NARS that have a cost advantage in some types of research.

Even where competitive funding is not used, contractual arrangements between research founder and research provider are becoming more common. Essentially, this reflects broader government efforts to enhance accountability and to monitor outputs rather than inputs in government-provided services. Such arrangements are managerially intensive and are most widely used, and perhaps most appropriate, in industrialized countries such as the Netherlands (Roseboom and Rutten).

*Efficiency and effectiveness of public research organizations* While research systems are becoming more pluralistic, public research organizations (the NAROs), where most infrastructure and human resources are concentrated, will continue to play a key, but no longer the central, role in the national research system. All countries are searching for ways to improve the efficiency and effectiveness of their NAROs. In most cases (including India and Zimbabwe), this includes consolidation and rationalization of the existing network of research stations, and in some cases (such as the Netherlands) significant downsizing. Even the CGIAR centres have embarked on consolidation and Anderson noted the potential for more. In addition, highly centralized systems such as the ICAR are exploring options for decentralization by devolving full decision-making authority to individual centres.

Most public research organizations are also attempting to reform their management and governance to allow them more flexibility in financial, human resource and asset management. Many NAROs are attempting to shed their old

bureaucratic style of management and organization, and are taking on more of the characteristics of private firms in their management styles. In some cases, such as in the Netherlands and in several countries of Latin America, NAROs have been set up essentially as private corporations, with a board of governors that represents their major stakeholders (see below). In other cases, reforms are being attempted from within the existing civil service structure, as in Malawi, where task forces are being constituted to follow research on specific high-priority activities (Rukuni *et al.*)

One of the main reasons for reform of public research organizations is to allow them greater flexibility to seek diverse sources of funding support. A common strategy is for public research institutes to commercialize research products and services, applying intellectual property protection as needed. All of the papers presented evidence of moves in this direction. While commercialization can provide valuable funds for operating costs and incentives for scientists, there are also limits to which a public organization can commercialize its products, especially if it is redefining its role to focus more sharply on public goods which by definition are not 'commercializable'.

Commercialization cannot be a substitute for the development of a local political constituency that will support public funding of agricultural research. Rukuni *et al.*, in particular, argue that the major challenge for NAROs of Southern Africa is the development of a political constituency among smallholder farmers, often bypassed by the research system in the past. The mechanisms for achieving political support are varied and include organization of smallholders to give them greater voice, stronger relations between NAROs and ministries of finance, and greater efforts by research organizations to 'market' their achievements.

Within these general reforms, public organizations are also much more concerned about setting priorities to better utilize their existing resources to achieve stated policy objectives. One approach that is being advocated to guide spending is the use of formal economic approaches to analyse trade-offs in research resource allocation and to set priorities (Alston *et al.*). Many NAROs have applied such methods in recent years, although there are, as yet, few examples of effective institutionalization of such capacity.

Another approach is to involve stakeholders in the governance, priority setting, research execution and even financial support of public research organizations in order to promote more demand-driven and responsive organizations. Governing boards of NAROs are being broadened to include major stakeholders, and various types of mechanisms are being utilized to seek farmer input into priority setting: for example, the regional farmer committees in Zimbabwe. Similar trends are appearing at the international level, where developing countries are also becoming members and contributors to the CGIAR, a healthy trend in strengthening both financial and political support and improving effectiveness, given the growing evidence of donor fatigue (Anderson).

*Global scientific linkages* Finally, a common thread in all of the presentations was the globalization of agricultural research and the need for all research organizations to develop strategies to keep abreast of global advances in knowl-

edge. Spillovers of technologies and scientific knowledge across subnational and national borders have always been important, and indeed the CGIAR system was established to foster such spillovers and 'spillins'.

The rapid advances in recent years in biotechnology and informational sciences have reinforced the need for countries to participate in this global agricultural research system, if they are to keep abreast of these advances and maintain a competitive agricultural sector. The fact that many of these advances have occurred in the private sector considerably complicates access to much of the emerging knowledge and technology. This has important implications for developing countries as regards implementation and enforcement of intellectual property rights, as well as for the CGIAR centres that might play an intermediary role in helping client countries gain access to the new technologies.

The development of strong national capacity, public and private, in the agricultural sciences will be necessary for countries to exploit these scientific advances. Investment in human resources will be integral to this strategy. Even a strong NARS, such as India, has seen its human resource quality decline in recent years (Mruthyunjaya and Ranjitha). Another approach evident in several countries has been to establish national centres of excellence in basic and strategic research. One implication of the growing complexity of science is the need for research organizations to develop partnerships to gain access to complementary skills, and to participate in research networks that promote exchange of knowledge. Such partnerships and networks are rapidly increasing at both the national and international levels (Anderson).