

# STRUCTURAL ADJUSTMENT AND AGRICULTURAL RESEARCH IN INDONESIA: THE 1980s EXPERIENCE

*Alirahman and Steven R. Tabor*

*Until the mid-1960s, Indonesia was among the poorest countries in the world. Over the past 25 years, however, economic growth has averaged almost seven percent per year. This is comparable to many of the newly industrializing economies of East Asia.*

*Government policies have made a strong contribution to Indonesia's robust economic performance. During the oil boom of the 1970s, the country invested heavily in rural development and periodically devalued its currency to prevent extended periods of overvaluation. When oil prices fell in the 1980s, the government undertook a program of structural adjustment aimed at restoring a balanced budget and diversifying the economy.*

*The government was highly selective in its application of macroeconomic policy, or adjustment measures. Programs with a high poverty alleviation impact were protected from the budget cuts that affected other public investments. Because of its impact on low-income farmers, agricultural research fell into this category. Nonetheless, adjustment strongly influenced Indonesia's agricultural research system. Adjustment inspired an increase in private sector participation in research. It prompted reforms in research management. And it led the research system to play a more direct role in the design of adjustment policy. However, adjustment handicapped the system in two ways. First, salaries were frozen while inflation eroded the real wages of scientists. Second, the increase in donor financing of research led to a skewing of agricultural research priorities.*

*This Briefing Paper, the second in a series on the effects of structural adjustment on agricultural research, takes a closer look at the impact of some of these issues. It is based on a study conducted by ISNAR.*

## The Oil Shock and the Adjustment Response

**I**n the early 1980s Indonesia was the second largest petroleum producer in Asia. Petroleum generated nearly a quarter of the gross domestic product (GDP), more than 70 percent of government revenues, and 82 percent of all export earnings. In addition to petroleum, Indonesia exported mainly raw

materials, both agricultural and mineral, in return for manufactured goods.

In the early to mid-1980s petroleum prices weakened and then fell. At the same time, Indonesia's other traditional agricultural exports were battered by deteriorating world

market conditions. Palm oil prices fell by 64 percent, copra prices by 63 percent, coffee prices by 59 percent, and rubber prices by 55 percent. World market prices for plywood and tuna also began to fall, while Indonesian producers were confronting agroecological limits to sustainable resource use. From 1981 to 1986 Indonesia's terms of trade deteriorated the equivalent to a loss of about 3.4 percent of the gross national product (GNP) annually. During 1986-89 the decline was more severe, equivalent to a loss of 14.3 percent of GNP annually.

The government reacted promptly to these developments, undertaking a program of structural adjustment aimed at balancing the budget and diversifying the economy. Adjustment measures included devaluing the currency, slashing public-sector spending, revamping the tax system, liberalizing trade and investment, and involving the private sector in infrastructure provision

and management. The adjustment measures triggered rapid growth in private investment, particularly in non-traditional exports and manufacturing.

The credibility of the reform program was firmly established by 1987. Buoyant growth contributed to economic diversification, higher living standards, fiscal balance, creditworthiness, and a renewed public investment effort. Manufacturing led the recovery, with output increasing more than 12 percent annually. Agricultural growth, although volatile, was a respectable 3.8 percent annually. The combination of currency devaluation and industrial trade reform combined to offset the fall in agricultural commodity prices and maintain the terms of trade between agricultural and nonagricultural commodities. In so doing, the macroeconomic reforms helped to mold an incentives environment conducive to agricultural growth and investment.

Table 1: Key Macroeconomic Indicators

Fiscal year	1975-83	1983-87	1988-90	1991	1992
<b>Average growth rate (% per annum)</b>					
GDP	6.5	5.0	6.7	6.6	5.8
Oil/LNG	2.2	3.3	2.3	8.2	2.9
Agriculture	3.5	3.3	3.8	1.3	3.6
Manufacturing	10.6	12.0	12.4	10.6	9.7
Construction	10.8	1.1	11.1	10.9	11.9
Other services	8.6	6.0	7.9	6.7	6.3
Consumption	8.9	4.0	6.0	7.5	—
Fixed investment	10.7	-3.7	13.2	2.5	—
- Public	12.6	-9.1	9.3	11.9	—
- Private	9.1	0.6	15.5	-0.6	—
Nonoil exports	10.5	12.2	14.1	24.0	20.4
Nonoil imports	10.7	-3.7	13.2	7.8	9.7
<b>Values in current billion dollars</b>					
Total exports	16.2	18.7	23.9	29.8	33.4
Total imports	9.7	12.7	18.2	24.8	27.2
Gross aid disbursement*	1.4	2.2	4.2	4.6	—
Net official inflows*	0.6	0.7	1.4	1.1	1.4
Foreign investment approvals*	1.2	1.4	5.9	8.8	—
Memo items:					
Fixed investment/GDP	25.1	19.2	21.4	23.0	—
Public expenditures/GDP	23.5	22.2	18.6	18.6	18.0
Development expenditures/GDP	12.1	9.9	7.5	8.3	8.1
Revenues/GDP	19.8	17.6	17.8	18.3	18.1
Fiscal deficit/GDY**	-4.3	-2.8	-0.8	-0.3	0.1
Current account/GNP**	-7.8	-2.6	-2.6	-5.2	—
Debt service ratio**	16.8	34.8	31.1	30.1	—
Inflation (% per annum)	16.2	7.9	7.8	8.1	10.0

\* figures listed for 1975-83 refer to the period 1980-1983.

\*\* figures listed for 1975-83 refer to the period 1982-1983.

Source: Ministry of Finance, Nota Keuangan, various issues, Central Bureau of Statistics, Statistical Yearbook, various issues, and World Bank.

## Public Expenditures on Agricultural Research

The Indonesian government was highly selective in its application of fiscal restraint measures during the adjustment period. Programs that were considered to have a high poverty alleviation content, such as investments

in small-farmer agriculture and agricultural research, were subject to less restraint than were those, such as public works, that were viewed as being less selective in development impact.

Within the agricultural sector fertilizer subsidies bore the brunt of the adjustment burden, although reductions came relatively late in the adjustment period. With the achievement of rice self-sufficiency in 1984, the government was initially reluctant to raise fertilizer prices. During 1984-87 fertilizer subsidies averaged 6.9 percent of total development outlays. After 1987, however, subsidies were reduced sharply to only 1.5 percent of development spending during 1988-92. Despite the fall in subsidies, fertilizer use continued to increase, reflecting both the profitability of fertilizer application and the well-developed distribution systems. Other agricultural subsidies, on irrigation and improved seed varieties, remained in place throughout the adjustment program.

Total spending on agricultural research fluctuated around US \$50 million per year. Almost all of these funds were channeled through the Agency for Agricultural Research and Development (AARD). However, sharp budget cutbacks were introduced in 1989, with the research budget falling in real terms by 30 percent in a single year. Since that time spending has recovered to about the same level as in 1983 (table 2).

About 0.6 percent of public-sector development funds was spent on agricultural research before the adjustment period. During adjustment, when other outlays were sharply curtailed, the share of agricultural research spending increased to 1.1 percent. While this was still not a very high level of spending compared with neighboring states—Indonesia's agricultural research intensity ratio remained around 0.27 percent of agricultural GDP—it did represent a conscious attempt to protect agricultural research during a period of budgetary consolidation.

During the latter half of the 1980s, special agricultural research adjustment funds were provided to complement domestic spending and project aid. These special funds were used to meet research operating costs and to augment financing for the repair and maintenance of research stations. In 1989, at the peak of the adjustment period, such financing accounted for close to a quarter of all agricultural research outlays.

Table 2. Budget of the Agency for Agricultural Research and Development (AARD) (billion rupiah: current prices)

Year	Government spending		Donor assistance		Total research outlays
	Routine	Development	AID projects	Adjustment projects	
1980	5.5	2.4	2.8	—	78.4
1981	7.4	3.8	31.6	—	87.3
1982	8.1	8.1	24.0	—	74.8
1983	8.7	9.9	45.3	—	106.6
1984	7.6	11.7	47.9	—	103.0
1985	9.5	22.5	34.8	—	98.2
1986	11.5	10.2	55.8	—	104.3
1987	11.3	6.3	69.7	9.5	119.2
1988	12.8	3.6	60.8	23.1	116.9
1989	14.1	5.6	43.1	10.1	80.1
1990	16.5	9.6	54.6	7.8	88.5
1991	19.7	25.8	65.6	—	100.6
1992	24.1	31.0	71.7	—	106.2

Source: Ministry of Agriculture, Organisasi, Sumberdaya dan Program Penelitian, 1992 Jakarta, 1993.

## Agriculture and Agricultural Research

The government's strong support for agriculture and agricultural research was largely a continuation of pre-adjustment policies. The years 1978-81 marked both the peak of the oil boom and the rapid adoption phase of Indonesia's green revolution in rice. At this time systematic investments were made to improve the agricultural research system. Rice especially was an early focus, both through the research system's long-term collaboration with the International Rice Research Institute (IRRI) and

through its own developing research capacity in rice breeding, plant protection, and post-harvest processing. The agricultural sector responded to this investment, recording historic growth rates of 6.1 percent annually in the early 1980s.

When Indonesia embarked on its structural adjustment program in 1983, the national agricultural research organization, AARD, was less than 10 years old. Further,

the research system as a whole was in the midst of an ambitious program of development. It had established cooperative links with major international agricultural research institutes, mounted large-scale training programs for scientists, and had undertaken to expand its research presence off the country's main island, Java. Its past investments in rice breeding and pest resistance had proved enormously successful in terms of raising yields, improving small farmer incomes and helping to eradicate rural poverty, but the mandate of the research system had expanded far beyond rice in wetland Java.

Public investments were designed to strengthen and diversify the national research capacity both in terms of geography and commodities. Compared with the size and breadth of the agricultural economy, the research system was relatively small in terms of scientific staff (400 with advanced degrees), number of research sta-

tions (50 stations and about 200 research farms and ponds), and in terms of total spending on agricultural research (0.2 percent of agricultural GDP).

During adjustment, the agricultural growth rate declined modestly, mostly due to a slowdown in foodcrop production increases. This can be attributed to Indonesia's achievement of self-sufficiency in rice and slower growth in domestic demand for foodstuffs. Strong growth continued, however, in other agricultural subsectors, namely, tree crops, livestock, and fisheries. This reflected the positive effects of devaluation on the competitiveness of traditional exports, diversification of the rural economy in favor of high-value cash crops, and the increased involvement of the private sector, particularly in fisheries, edible oil, poultry, and horticulture production.

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## Positive Effects of the Structural Adjustment Program

### *Increased private sector participation in agricultural research*

Liberalization inspired increased private sector involvement in agriculture and agricultural research. Commodities that registered the most rapid growth during the post-1983 adjustment period were poultry, oil palm, shrimp, and potatoes. These, in fact, were the commodities for which private-sector technology transfer and research played a dominant role. It is estimated that the private sector spent about US \$1.5 to \$2 million yearly on research during the mid-1980s. About the same amount was spent on technology scanning and on the collection and adaption of technologies already in use in other countries.

These investments yielded remarkably high payoffs, judging by the speed at which the technology was adopted and by the phenomenal growth registered in the commodity subsectors targeted by the private sector. The private sector entered into first-generation biotechnology research in the early 1990s, in anticipation of future large-scale horticulture investments. This also significantly raised the costs and contributions of the private sector to agricultural research.

### *Reforms in public sector research management*

A combination of factors including rapid institutional growth, structural change in the agricultural economy, the demonstrated capacity of the private sector to undertake effective agricultural research, and a growing perception that better use could be made of the established scientific capacity, prompted AARD's leaders to undertake a series of management reviews and reforms during the adjustment period. While many of these reforms predated adjustment, the fiscal pressures of adjustment added a sense of urgency to the management

reform process. Possibly no other agricultural research system was so intensively reviewed and evaluated, both internally and externally, during the 1980s.

Between 1984 and 1987 a series of in-depth reviews were conducted in collaboration with the International Service for National Agricultural Research (ISNAR). These covered research planning, budgeting, manpower, facilities, results, management, communications, and impact. Reviews were to be an evaluation and management reform tool for both AARD senior management and the heads of the various research institutes and stations. Several hundred recommendations were made to improve the operation of the research service. In 1987 another review was conducted to evaluate the extent to which recommendations were put into practice. This review determined that nearly 50 percent of all of the management reform recommendations had, in fact, been implemented, and that implementation of the remaining measures was constrained primarily by a lack of financial resources. Many of these financial reforms, moreover, were addressed in the context of a World Bank loan for agricultural research in 1990.

### *Participation in adjustment decision making*

AARD was closely involved in monitoring and analyzing adjustment policies as they affected the agricultural sector. During the 1970s, socioeconomic research within AARD was concentrated largely on small-farmer technology impact assessment. Starting in the early 1980s, AARD's then Center for Agro-Economic Research (CAER) sharpened its focus on food policy analysis. In cooperation with the International Food Policy Research Institute (IFPRI), ISNAR, and various universities, studies were conducted on rural living conditions, farm enterprise status, pricing policy, irrigation investment, estate crop investment, and subsidies. These studies

were used to monitor farm conditions, to track the impact of public policy on the farm sector, and to assess the likely impact of policy changes. Internally, this and other policy analysis provided research management and staff with a broader view on the process of policy

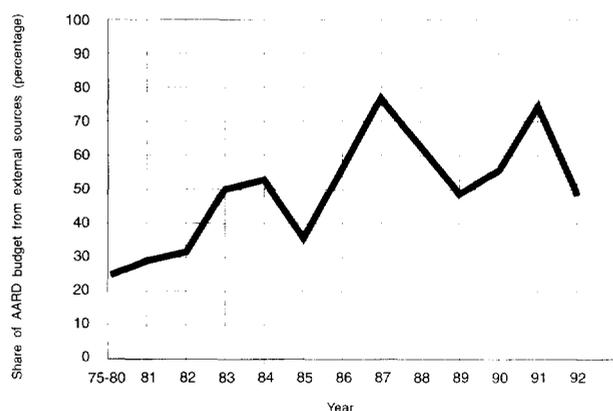
reform in agriculture and, more specifically, on the setting of future research priorities. Such studies were used in the formulation of agricultural trade policies, subsidy policies, and establishing public investment priorities for agriculture.

## Adverse Effects on the Research System

### *Dependence on external financing*

The Indonesian government was able to protect the agricultural research budget largely through increasing the amount of foreign assistance provided to the agricultural research institutes. During the latter half of the 1970s, the Indonesian government provided three-quarters of all funds for research. During the adjustment period, however, the share of foreign financing increased rapidly, reaching a peak of 77 percent of total agricultural research spending in 1987 (figure 1). Most of this assistance was provided by only a few donors. The World Bank provided two US \$50 million loans to the sector during the 1980s. Other major donors were the USA, Australia, the Netherlands, Japan, and Canada.

Figure 1. Foreign Source Expenditure Share



Source: World Bank, Agricultural Research Management Project, 1989 and Departamen Pertanian, Organisasi, Sumberdaya dan Program Penelitian, 1992.

The growing dependence on donor resources came during a period when the planning and priority-setting capacity of AARD was at an early stage of development. Furthermore, AARD found itself with a rapidly widening mandate as Indonesia's agricultural development effort shifted from a rice to a crop-diversification focus, and from a concentration on agriculture in Java to more of a nation-wide approach. The combination of an expanding mandate, rapid growth in manpower and physical facilities, and limited internal capacity to set priorities, led individual donor agencies to define their own priorities and particular areas of assistance.

The combination of donor-defined priorities and a high dependence on foreign assistance had adverse effects on the development and operation of the national research

system. First, project-related counterpart spending absorbed a large part of the limited domestic resources available. Second, research priorities were compromised in return for securing foreign financing of specific activities. Third, because of the rising importance of foreign aid, a considerable amount of researchers' time was spent seeking grants and providing documentation to donor agencies. Finally, dependence on foreign funding subjected the research institutes to the risk that a reduction in aid would compromise long-gestating research programs.

### *Wage restraint and skill-intensive service*

Pay policies for agricultural researchers were outside the influence of those managing agricultural research institutes. It was in this area that the structural adjustment program had its most adverse effect on the performance of the research system. For close to eight years, civil service salaries were capped in nominal terms as the Indonesian government endeavored to reduce fiscal outlays by slowing growth in the public sector wage bill. This resulted in an erosion of about one-fifth of the real earnings of researchers during 1984-91. In dollar terms the fall was more pronounced. Senior researchers who had earned the equivalent of US \$332 per month in 1985 received only US \$189 per month in 1991. Junior researchers saw their monthly wages slide from the equivalent of about US \$200 per month in 1985 to as little as \$116 per month in 1991—dangerously close to the poverty line (table 3).

As the linkage between salaries and performance began to dissipate, so did the various mechanisms used to enforce accountability and encourage effectiveness. Declining wages resulted in a weakening of researcher morale and a rise in absenteeism, moonlighting, and the use of research facilities for non-research tasks. In areas where private-sector agribusiness was booming—such as shrimp, commercial poultry, and oil palm production—agricultural researchers were frequently employed as project managers or advisors. In West Java, where industrial activity was experiencing double-digit growth, agricultural researchers were able to find many opportunities to augment their salaries in a variety of non-research pursuits.

### *Measures of improvement*

The government has endeavored to overcome these adjustment-induced deficiencies in the operating environ-

Table 3. Researcher remuneration, 1977-93 ('000 rupiah or US dollar per month)

Year	Senior researcher			Junior researcher		
	Current rupiah	Constant 1990 rupiah	US dollars	Current rupiah	Constant 1990 rupiah	US dollars
1980	279	610	445	162	354	258
1985	369	542	332	226	332	203
1990	369	369	200	226	226	123
1991	369	334	189	226	205	116
1992	449	376	225	285	239	143
1993	1005	766	488	494	376	240
<b>% change</b>						
1984-87	32	6	-17	40	12	-13
1984-91	32	-22	-30	40	-18	-27
1991-93	172	1	29	158	119	107

Source: Government of Indonesia, Peraturan Pemerintah 51, 1992; Badan Administrasi Pegawai Negara #15/85; and Daftar Penyempurnaan Gaji Pokok Pegawai Negeri Sipil Dari PP.51 Tahun 1992 Ke Tahun 1993.

Note: Salaries are defined as the sum of the monthly wage plus the monthly salary supplement. For senior researchers, the recorded salary is that of a class IVb civil servant with 12 years of experience in government. For a junior researcher, the recorded salary is that of class IIIc civil servant with six years of government experience. In 1992, more than 80 of all agricultural researchers fell within class III and IV of the civil service pay scales. Real salaries are defined using the 17 cities average CPI to deflate nominal salaries. US dollar equivalents are defined using average mid-year bilateral exchange rates.

ment of the research system. Starting in 1990, government made a significant increase in its contribution to investment in agricultural research, prompted in part by the various reviews of the agricultural research system, and by a series of agreements struck between external donors and government during 1987-90.

Starting in 1992 and again in 1993 government implemented a series of civil service compensation reforms designed to improve the competitiveness of public-sector employment. As a result, some senior agricultural researchers saw their real wages more than triple. Greater awards were provided to the more highly trained researchers. In dollar terms, the 1992-93 wage accords returned the research service to a compensation level similar to that prevailing in the late-1970s, and far closer to that prevailing in the private sector.

The main means by which government improved researcher compensation was the revised salary supple-

ment scales adopted in January 1993. The salary supplements were to provide an additional incentive for civil servants to augment their knowledge and gain specialized skills and experience. During 1984-91 the value of the salary supplement of the most senior agricultural researcher fell, due to inflation and currency realignment, from the equivalent of US \$243 per month to \$128 per month. In 1993 the salary supplement system was revised and special supplement-scales, designed to provide improved incentives for skilled workers in government, were developed for researchers and scientists. After the 1993 revision, the value of the salary supplement for senior researchers increased to some US \$430 per month, well in excess of that provided at the start of the adjustment process. The salary supplement adjustment of 1993 was also used to help broaden the band between salaries provided to senior researchers and those provided to more junior staff, as a way to stimulate performance within the research service.

## Conclusions and Future Priorities

Indonesia's macroeconomic adjustment program has been highly successful in restoring economic growth and stimulating economic diversification. A combination of conservative fiscal management, competitive exchange rate management, and trade and financial market liberalization has provided a major impetus to private investment, particularly in nontraditional, export-oriented industrial products. After a decade of structural adjustment, Indonesia's economy is far less

reliant on petroleum than at any other time in the past three decades. It is also far less reliant on agriculture as a source of income and employment.

However, the structural transformation of the Indonesian economy is far from complete. A large share of the labor force is still involved in agriculture. The agricultural economy is still dominated by low-value foodcrop production. The economy as a whole still lumbers under

a heavy debt. And, finally, future growth hinges on continued large, often volatile, inflows of foreign capital and expertise.

While agriculture has become a relatively small contributor to total national output, it still employs a large segment of the labor force and is dominated by small-holder producers. Thus there remains a need for continued government support, particularly for research and extension, at least until a large segment of the small-holders are absorbed into nonagricultural activities.

The very success of Indonesia's structural adjustment program has changed the nature of the challenges facing agriculture and, in turn, the challenges facing the agricultural research system. The emphasis in agricultural research efforts has shifted from poverty alleviation and rice self sufficiency to improving productivity and enhancing the commercial orientation of the sector. Reflecting the increasing call of urbanization and industrial activity on prime agricultural land in Java, the geographic focus of agricultural research has shifted to the more sparsely populated islands of "Outer Indonesia". Both in Java, where intensive agriculture and rapid industrialization compete for the same resources, and in the fragile soils and forests off-Java, the degree to which agricultural production systems can be sustained is assuming increased importance.

These changes in the role and function of agriculture in the economy, resulting largely from the successful structural adjustment effort, raise new and important challenges for Indonesia's agricultural research system. Continuing adjustments will have to be made in the orientation and management of the research system. As the private sector is called upon to shoulder more of the research burden, AARD must make more effective use of its own resources. Indonesia's experience under structural adjustment in the 1980s gives reason to believe that policymakers are cognizant of the need to maintain an enabling incentives environment for agriculture and to protect programs supportive of small farmers from the vagaries of budget fluctuations. Still, even Indonesia's highly successful structural adjustment program has been unable to fully tackle the problems associated with stimulating more effective operation of the agricultural research system.

A decade of research reviews and evaluations, together with lessons learned during Indonesia's structural adjustment program, provides valuable guidance for

further reform of the research system. Improvements in the use of existing research resources, to meet the changing constellation of agricultural sector challenges, may require attention in at least six areas.

- **Financing:** to provide adequate funds to maintain competitive salaries for scientists; to cover operations, maintenance, and replacement of research stations; and to meet the costs of technology search and field research. Over time, the portion of research under domestic financing should be restored to the levels prevailing in the late 1970s.
- **Coordination with universities:** to marshal the talents of scientific personnel in the universities for agricultural research projects and to inject a greater degree of competitiveness in the agricultural research process.
- **Human resource management:** to anticipate the manpower needs associated with managing, modernizing, and maintaining a steady-state work force of government agricultural scientists.
- **Decentralization:** to establish mechanisms for local-government administration and supervision of some portion of the research agenda, especially off-Java where technical capabilities are scarce.
- **Accountability:** to tighten management procedures for the selection and implementation of research activities to ensure relevance, cost effectiveness, and transparency in resource use.
- **Effectiveness:** to involve users in determining financing, setting the research agenda, and evaluating the usefulness of research findings.

The very success of Indonesia's structural adjustment program has created an added urgency to improve the performance of the nation's agricultural research system. Rapid economic growth, growing pressure on natural resources, an export-oriented development strategy, and the need to address off-Java agricultural challenges have placed new demands on agricultural service institutions to provide appropriate agricultural technology in a timely and effective fashion. The degree to which Indonesia's agricultural research system can meet these challenges will be an important determinant of the future success of Indonesia's efforts in economic diversification and balanced economic growth.

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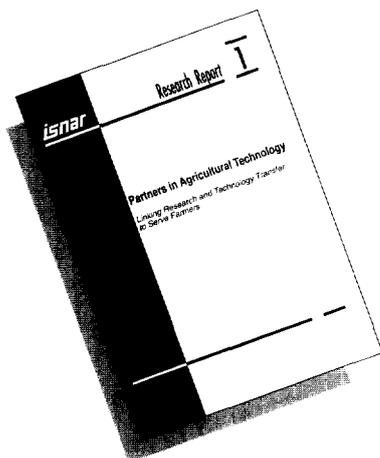
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out under an ISNAR project to examine the effects of structural adjustment on the agricultural research systems of developing countries. A Briefing Paper and case study on the effects of structural adjustment on agricultural research in Ghana is also available from ISNAR.

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## Available from ISNAR...



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## Partners in Agricultural Technology: Linking Research and Technology Transfer to Serve Farmers

by Thomas Eponou

ISNAR Research Report No. 1

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This book examines the capacity of the agricultural technology systems in developing countries to establish and manage linkages between researchers and technology transfer agents. The effectiveness of such linkages strongly influences the extent to which farmers are able to gain access to and use agricultural technologies developed. Four key areas are emphasized: the technology-system context in which linkages operate, effects of the system's organization and structure, resources for linkages, and the management of linkage mechanisms. An annex provides general guidelines for handling most linkage problems.

Single copies of this publication are available free of charge, at ISNAR's discretion, to individuals working in developing countries in agricultural research or in related areas of policy, organization, and management. Requests should be addressed to ISNAR Publications Services at the correspondence address below. Others may purchase copies for US \$14.00 each, plus shipping, from Winrock International AGRIBOOKSTORE, 1611 North Kent Street, Arlington, VA 22209-2134, USA.

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benefit producers and consumers in developing countries and to safeguard the natural environment for future generations. A nonprofit autonomous institute, ISNAR was established in 1979 by the Consultative Group on International Agricultural Research (CGIAR). It began operating at its headquarters in The Hague, the Netherlands, on September 1, 1980.

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