6. Policy impacts

The economic transformation of South Asia in recent years and the huge success of the GR have necessitated some major changes in agricultural policies. With market liberalization, the established roles of the state in marketing, storing and distributing food, providing farm credit and modern inputs, and regulating international trade and agro-industry have all been challenged. The rapid emergence of high-value agriculture and the seriousness of some of the environmental problems associated with agriculture have also required new policy responses. As governments have sought to navigate these turbulent waters, there has been an important opportunity for policy research to help inform the debate.

A vast policy research literature written during this period in South Asia is testament to the prolific response of the region's own researchers. The CGIAR centers have also been active participants, including through networking endeavors, such as that created by IFPRI in the Policy Analysis and Advisory Network for South Asia (PAANSA), described in an evaluative manner by Paarlberg (2005; http://www.ifpri.org/impact/ia24.pdf). ICRISAT, IRRI, and IWMI, for example, have contributed many policy studies for improving adoption of improved technologies, NRM, and IPM (Pingali et al., 1997; Pingali and Rosegrant, 2001). IWMI has contributed to improved understanding of water policies from river basin management to management of irrigation schemes to water management in farmers' fields. ICRISAT has worked on policy issues related to mechanization, risk and technology design, herbicides and equity, marketing, credit policies, and watershed management. IFPRI has contributed to many of these issues and to a wide range of other policy issues, including market and trade policy reform, public investment, food subsidies, and environmental issues. Other external agencies such as the World Bank and Asian Development Bank have also made many important analytical contributions.

It is difficult to tease out the impact of all this policy research, and even more so to try to attribute any impact to the CGIAR centers. Many of the policy reforms are not yet complete (e.g., the phasing out of key input subsidies and reform of water policies), and some might have been implemented regardless without the benefit of policy research. Fortunately, a few impact assessments have been undertaken that shed some light on the value of policy research in South Asia in recent years.

Water policy

IWMI's work on IMT has already been reviewed in Section 5.3. Giordano et al. (2007) show that this work led to significant impact on water policies in Sri Lanka and had some success in affecting the employment of improved techniques in Pakistan and Nepal. They also report high demand for IWMI's guideline publications on IMT.

Bangladesh: Changing the course of food and agricultural policy

During 1989–1994, IFPRI placed a small team of researchers in Bangladesh to collaborate with the Ministry of Food on a set of research activities to guide aspects of the market liberalization program. The impact of this program is reviewed by Babu (2000). A study of the comparative advantages of different crops guided the development of a new strategy aimed at diversifying agriculture. Studies of rice and wheat markets found that the government could turn grain procurement and sales over to the private sector without harming the food security of the poor. When the government opened the grain markets to private-sector participation, it saved US$37 million by lowering the official procurement price.

An IFPRI study of the rural food ration program uncovered poor management and substantial leakages. The government had long been aware that the ration program was not effectively reaching its intended beneficiaries – the rural poor – and the study put hard numbers to the govern-

ment's suspicions. By eliminating the program, the government saved US$60 million. Some of these savings were used to increase expenditures on other better targeted food and nutrition programs, including the innovative 'Food for Education' program. Later evaluations found that this program raised school attendance by about 30%. Besides these policy changes, the research resulted in other more effective programs and strategies and saved the government at least US$100 million, many times the research cost of less than US$5 million (Babu 2000; Ryan and Meng, 2004). Moreover, the collaboration increased the body of knowledge on food policy in Bangladesh and the number of people equipped to make use of it, by producing more than 70 research reports and providing training in food policy analysis to over 200 individuals.

Pakistan: Examining the effectiveness of subsidies

In collaboration with the Pakistan Institute of Development Economics (PIDE) and the Pakistan Ministry of Food and Agriculture, IFPRI's research and policy dialogue were instrumental in changing the direction of food and agricultural policies in Pakistan. The impact of the program is reviewed by Islam and Garrett (1997). From 1986 to 1994, this collaboration produced a large body of research – over 80 journal articles and research manuscripts – that policymakers drew on as they made policy decisions. IFPRI's research, from 1986 to 1991, resulted in over US$200 million in savings to the government. The total cost of research for the entire period was only about US$6 million.

IFPRI's work on the wheat ration shop program provides a clear example of the changes Pakistan made in its food policies. In this program, poor consumers were able to buy subsidized wheat from special shops. By the 1980s, the government was spending millions on a program that was, by most accounts, corrupt and ineffective. Policymakers wanted to know if the program helped the poor or not, and what the effects on the poor would be if the program were eliminated. In a national survey, IFPRI-PIDE research showed that well over half the wheat never reached the target population. Only 19% of the population in cities and 5% of the population in rural areas, where most of the poor lived, even used the ration shops. The research put numbers to the program's failure to reach the poor, a finding that was expected but until then had been based mostly on conjecture, anecdotes, and one small study. The research provided solid data to drive the final nail in the coffin of the ration shop system. The government abolished the wheat ration shops in 1987.

7. Conclusions

The post-GR period has seen profound changes in the economic situation in South Asia and evolving challenges for the agricultural R&D system. The priorities have changed from a narrow focus on the productivity of foodgrains to a need for more work on NRM and sustainability issues; increasing the productivity and quality of high-value crops, trees and livestock; agricultural intensification in many LFAs; more precise targeting of the problems of the poor, including enhancing the micronutrient content of food staples; and analysis of policy and institutional options for achieving more sustainable and pro-poor outcomes in the rural sector.

The available evidence suggests that both national and international systems have responded well to these changing needs in terms of their budgetary allocations and the kinds of research they have undertaken. Moreover, market liberalization has enabled a more diverse set of agents to engage in agricultural R&D, and private firms and NGOs have helped ensure that important research and extension needs have not been overlooked.

There is also reasonable evidence to show that agricultural R&D has been broadly successful in achieving many of its new goals.

Productivity impacts

The economic returns to crop improvement research have remained high and well in excess of national discount rates. Public investments in crop improvement research have also given higher returns than most other public investments in rural areas. There is little credible evidence to suggest these rates of return are declining over time.

Given the patchy nature of the available impact studies and the fact that few have attempted to make any direct attribution to the work of the CGIAR centers, only a few inferences can be offered about the returns to CGIAR investments. One approach is to attribute to CGIAR investments the same rates of return as those achieved at national levels for aggregate measures of public research expenditure. This would suggest an annual rate of return of between 25–50% (Table 4). Assuming a sustained annual investment of around US$65 million (see Section 2.3), this leads to an annual average payoff of between US$17.5 million and US$35 million. But this estimate is much lower than the payoffs suggested for recent years by Fan (2007), Lantican et al. (2005), and Morris et al. (2003). As discussed in Section 3.3, these studies suggest annual payoffs from the CGIAR's research of between US$432 million and US$2304 million for rice, US$560 million to US$1710 million for wheat, and US$45 to US$62 million for maize research. Even without including the CGIAR's other lines of research, the estimated payoff already exceeds US$1 billion each year, which is more than enough to cover the costs of the CGIAR's entire global program, let alone the US$65 million or so spent in South Asia each year. These kinds of calculations are at best indicative, but they do suggest that, from a narrow productivity perspective, the CGIAR's research in South Asia continues to be a sound investment, much as Raitzer and Kelley (2008) have shown at the global level.

Social impacts

Research has made important contributions to reducing poverty in South Asia, but it has done less well in reducing inter-household and inter-regional inequities. Often, favorable poverty impacts arise from the indirect benefits of increases in productivity, such as the reductions in food prices that arise from technologies that reduce farmers' growing costs per ton of output. Indirect growth benefits in the nonfarm economy are another example. Measured at these levels, agricultural research can be a cost-effective way of reducing poverty, both relative to other public investments and in terms of the cost per person raised out of poverty.

Within adopting regions, the impact evidence is more mixed and there is insufficient evidence to conclude whether or not the more deliberate targeting of agricultural research to the problems of poor households and women – including use of participatory research methods – is paying off. This is an area of impact assessment that warrants further attention, especially as the rural poor have diversified their livelihoods and are less easily helped through agricultural productivity growth.

Environmental impacts

There has been a rich research agenda targeting environmental problems associated with agriculture and a demonstrated potential for favorable impacts in farmers' fields. Many improved technologies and NRM practices are also win-win, in that they halt or reverse environmental problems while increasing yields and/or reducing modern input use and cost. Despite this, there are virtually no impact studies from South Asia that estimate a return to a research investment corrected for environmental costs and benefits. The closest is the Bantilan et al. (2005) study of ICRISAT's groundnut improvement technology for the semi-arid areas of India. The high internal rate of return of about 25% reported by Joshi and Bantilan (1998) in an earlier study is seemingly robust to within a percentage point or two, even when corrected for possible positive and negative environmental outcomes that affect yield and production costs (Bantilan et al., 2005). But many environmental problems cannot be captured through productivity impacts and hence are not so easily quantified. Other studies measure productivity impacts from new technologies, but limit their environmental analysis to qualitative statements about environmental impacts. For example, the Kerr et al. (2000) study of watershed development projects in India. This may be the most that can realistically be hoped for, and if there were greater agreement on the environmental indicators to use it would be possible to at least allow for research investments to be ranked in different dimensions.

Given the popularity of alternative farming approaches and their competition for R&D funding, more rigorous assessments are needed. While their approaches seem to work well in LFAs, they have proved disappointing in GR areas. There is no evidence that organic farming or low external input approaches can match current high yields in GR areas whereas more precision approaches to modern inputs seem to offer significant steps in the right direction.

Another challenge facing researchers in South Asia is the generally poor adoption rates by farmers of many improved NRM practices that reduce environmental damage. There are several possible reasons for this, including high levels of knowledge required for their practice, perverse incentives caused by input subsidies, labor constraints and insecure property rights, difficulties of organizing collective action, and externality problems. Additional policy research on these issues might be able to help leverage additional impact from past and future technology research.

Policy impacts

A vast amount of policy research has been undertaken in South Asia since the GR, and several CGIAR centers have been active participants. Case studies show favorable returns to policy research, though the conditions under which it leads to policy change are not well understood. Additional policy research is needed to identify more practical solutions for overcoming some of the constraints to adoption of more environmentally favorable technologies and NRM practices.

Emergent issues

A number of issues have arisen in this study that warrant further attention. These include questions of research policy and measurement issues in impact assessment studies.

Reaching marginal farmers

Given that agriculture now plays a relatively small part in the livelihoods of many marginal farmers in South Asia, is it still worthwhile to target agricultural R&D to

their problems, or are there less costly approaches? There are two aspects to this question that need to be considered. Firstly, many more workers are going to have to exit from agriculture in South Asia as the economic transformation proceeds. Agriculture's share in GDP is already much lower than its employment share, implying that the average productivity of agricultural workers is already lower than that of nonagricultural workers. This is reflected in widening per capita income gaps between farm and nonfarm workers and between rural and urban areas. Unless South Asia is to become a much larger exporter of agricultural goods, the gap can only be reduced if the number of agricultural workers declines. This exit is a normal part of the economic transformation of a country and is driven by increasing opportunities for workers to move to faster-growing sectors in manufacturing and services. In this context, investments in the farming activities of large numbers of marginal farmers could simply end up delaying the inevitable, much as happened in Europe during the 20th century.

The second aspect to consider is that, while some types of agricultural research can be targeted at marginal farmers, it would be too expensive to develop technologies that have to be tailored to fit with their individual and very diverse livelihood strategies. Further work is needed to identify the kinds of research that can still provide public goods on a sufficiently large scale to justify their cost, and which are cost-effective compared to alternative ways of assisting marginal farmers. This issue becomes even more pressing as R&D resources are directed at increasing the empowerment and social capital of the poor.

Food price and growth linkage effects

Has market liberalization and economic growth weakened food price effects and growth multipliers to the point where agricultural R&D can no longer make large reductions in poverty? Lower food prices and growth linkages to the nonfarm economy have played a large role in reducing poverty in South Asia in the past, but may be less important now that food prices are aligned more with border prices and agriculture is a relatively small motor of national economic growth. There is some evidence for this in the form of declining poverty impacts per dollar spent on agricultural research in India, but this is an issue that warrants further study. A related issue stems from the observed decline in TFP growth for some crops. This implies that unit production costs are unlikely to fall at the same pace as in the past, leaving less room for future price reductions.

Impact assessment issues

While far from perfect, the literature contains a wealth of empirical studies that link agricultural research investments to productivity outcomes, with established analytical procedures for calculating rates of returns to investment and benefit–cost ratios. What is lacking is a similar body of empirical studies linking agricultural research investments to poverty and environmental outcomes. Apart from needing these kinds of studies to assess the economic value of poverty and environmentally oriented research, they are also needed to better understand the potential tradeoffs and complementarities between productivity, social, and environmental goals in agricultural research and for determining the kinds of research that offer the best win-win-win outcomes.

There are very few impact studies from South Asia that estimate a return to a research investment corrected for environmental costs and benefits, or that calculate the research investment cost associated with an observed reduction in the number of poor. Many environmental problems cannot be captured through productivity impacts and hence are not so easily quantified. Other studies measure productivity impacts from new technologies, but limit their environmental analysis to qualitative statements about environmental impacts. This may be the most that can realistically be hoped for, and if there were greater agreement on the environmental indicators to use, then it would be possible to at least allow for research investments to be ranked in different dimensions. Much the same goes for assessing poverty impacts. While in principle it is possible to convert changes in the mean

and distribution of income into a single social welfare measure for benefit–cost analysis, it is generally more practical and insightful to work with a broader range of poverty indicators, not all of which need to be quantitative. Again, agreement on a set of indicators would be helpful for more systematic and comparative ranking of research investments in different dimensions.

Finally, very little has been said in this report about regional spillovers and spill-ins from agricultural research in South Asia, yet these are important issues. IRRI, for example, does work on rice problems that cut across Asian rice systems, and much the same can be said about the commodity work of CIMMYT and ICRISAT. Shiferaw et al. (2004) have characterized some of these spillovers for South Asia, and Maredia and Byerlee (2000) have developed a model for quantifying their impacts, but still missing is a comprehensive analysis of their benefits and implications for calculations of the economic returns to agricultural research in South Asia.

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