Report of a Seminar

Women and Agricultural Technology: Relevance for Research

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User Perspective in IFPRI Research:

Relevance to Agricultural Technology and Women as Users

by

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1. OVERVIEW OF IFPRI RESEARCH

The primary focus of IFPRI research is the analysis of national and international policies that influence food production, consumption and trade. This work is highly complementary to the work of other CGIAR centers that are engaged in the development of suitable technologies to boost food production. It is well acknowledged that while the availability of improved technologies is an essential prerequisite, appropriate policies and strategies are also necessary to achieve the adoption of these technologies for increasing food production and assuring food security for all segments of the population. Implicit in IFPRI's research program is a recognition of the complex interrelationships between technological change in agriculture, and the socio-economic policies that accompany it must be analyzed and understood. This can provide a concrete and scientific basis for countries to learn from cumulative experience and to adopt the most suitable policies.

To achieve this end, there are three sets of policy issues of relevance to technology adoption that are being addressed. These are: the nature of incentives for adoption of new technologies, the impacts of adoption, and supplementary measures that can be used for using food aid or other means of improving food security.[1]

2. CLARIFICATION OF THE USER ORIENTATION IN IFPRI RESEARCH

The direct users of IFPRI research are national policy-makers and other agencies, including international organizations that influence or implement policies and programs. This is similar to the situation faced by other CGIAR centers whose primary users are the national agricultural institutions. However, for the system as a whole, the ultimate users are the producers and consumers who are affected by the changes and possibilities introduced along with the technological change. The focus of IFPRI research is also these ultimate users, the farmers and consumers, and they are designated as "users" throughout this paper.

Gender is only one of a complex set of user characteristics that are analyzed at IFPRI. While those who may directly use the technologies are the most obvious "users", i.e. the farmers, others who may be impacted upon are also "users" in various indirect ways. In the first instance, the direct users of agricultural technology may be characterized by a series of producer characteristics that require analysis for appropriate policy measures in the technology adoption process. These include area level, household level, and intrahousehold level attributes of farming households. Second, users can also be characterized by their links to the agricultural production process. This extends the concept beyond the farmers themselves to agricultural laborers, other consumers, indirect beneficiaries via production linkages, and in some instances, even farm household members other than the farmer himself (or herself) upon whom the technology adoption can impact.

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[1] See Annex 1 for more details on these three sets of questions.

Table 1 outlines some characteristics of these two types of users and gives examples of policy measures that would influence adoption of improved technologies and related impacts for these user categories. While farmers themselves are the direct users, all others impacted upon may be seen as the indirect users.

3. THEORETICAL BASES OR UNDERPINNINGS OF IFPRI's USER ORIENTATION

The primary theoretical basis for IFPRI's user orientation derives from the capacity of technological change in foodgrain production to provide an engine for overall development via an employment-oriented development strategy (Mellor 1976, Mellor and Lele 1973). In such a formulation, the direct users of improved farming technologies are only one part of the process that is necessary for the adoption to be a success. Also, if one accepts the view that improved foodgrain technologies are employment-generated - directly in their production via a wage goods effect and through consumption linkages for non-farm products - then concentrating only on the benefits to the immediate users may provide a misleading assessment of the situation. Fully consistent with this construct is the notion that small farmers, though risk averse, are more efficient users of capital, are more likely to substitute labor for capital, and should be targets for improved technologies.

The users from this standpoint are both the direct and, more significantly, the indirect users. The research implications of this are largely reflected in the work of the Food Development Strategies Program and the Production Policies Program, much of which is conducted jointly with the Food Consumption and Nutrition Policies Program. More specifically, these studies examine impacts of technological change on both the direct and indirect users by examining changes for different segments of the population. Also in the same context, policies that facilitate this process, such as irrigation, infrastructure creation and provision of services, are also examined for ways in which the size and distribution of benefits may be improved.

An additional user perspective has been derived from the differential commodity mix for producers and consumers from different segments of the population. Accordingly, technology for "commodities primarily produced by low-income farmers and which occupy a larger share of the budget of low-income consumers" (Pinstrup- Andersen, de Londoño, and Hoover, 1976) may be most effective for expanding real incomes for poor farmers and consumers. This suggests that a more targeted approach, focusing on characteristics of low-income households in devising strategies for growth, is necessary for both production and consumption problems. Implicit in this formulation is the expectation that crops grown by the low-income producers would improve with use of improved technologies, raising their income and consumption. In addition, the reduction in unit cost of production for these crops would be transmitted to other low-income non-producing households via lower prices and lead to improvement in their real income and consumption as well. The user orientation of this approach also includes both direct (small farmers) and indirect (low-income consumers) users. The work so far has been focused more on the consumption side, but work has begun recently in semi-arid West Africa on income distribution and consumption impacts of increasing millet/sorghum production.

Table 1 - User Orientation in IFPRI Research

	Examples of Policies
1. Technology Diffusion and Adoption By Farm Characteristics	
Area Level	
Ecological conditions	Agricultural and crop research priorities Pricing policies
Infrastructure and services	Infrastructure investment and service provision policies Irrigation policies Private sector incentives
Household Level	
Scale of production	Price of capital intensive large scale technologies Cash/export vs. food/subsistence crop policies Agricultural and crop research priorities
Risk, capital, and other constraints	Price support policies Crop insurance Types of credit, input subsidies Integrated programs for raising productivity of labor Irrigation pricing and management Extension and training policies Location and management of services
Intra-Household Level	
Intra-household division of labor and crops produced	Consumer preferences/import policies Relative crop prices received Crop and farming systems research Extension and training policies Input and credit policies Crop technologies for local storage and processing Access to credit and labor saving technologies for women
2. Impacts of Technologies By Link of Agricultural Production	
Farm household members	Policies influencing adoption pattern
Hired workers	Labor-intensive strategies Selective mechanization policies for increasing labor productivity Food subsidies
Consumers	Food prices and subsidies
Non-farm sector enterprise	Incentives for farm-nonfarm growth linkages

The question of women as users fits into the overall framework primarily as part of the concern of reaching low-income producers and consumers. In addition, on the food consumption side, women's overriding role in child nutrition via their allocation decisions for income, food, and time has also been recognized (Kumar, 1978; Tripp, 1982). As a consequence, the study of the allocation of income and time by women is also incorporated in some of IFPRI's work on food consumption and the effects on nutrition of household production and income increments. On the agricultural and food production side, the intra-household issues are less clear cut. For the most part, women's issues are addressed in relation to their access to technology as part of the group of low-income producers or in relation to the production implications of their time allocation patterns (e.g. as a result of time required for fetching fuel-wood, water, and fodder).

4. USER ORIENTATION IN IFPRI RESEARCH AND THE TECHNOLOGY ADOPTION PROCESS

IFPRI research is broadly concerned with both the processes of adoption and the effects of technologies. Policies play a key role in the adoption of technologies and in the distribution of their effects. While a given technology by itself may or may not be neutral to user characteristics of scale, resources, farming system constraints, ecology or sex of farmer, it is seldom neutral after interaction with policies. Often policies are dictated by limited time and budgetary resources and a generally imprecise knowledge of the implications. A wide-ranging set of policies are relevant to the adoption and impact of agricultural technologies. A simple illustration (Figure 1) shows the different types of policies relevant for the technology diffusion process and its differential impacts being analyzed at IFPRI.

In order to describe the work at IFPRI that is relevant to this process which also incorporates a household or individual user perspective, the process shown in Figure 1 is grouped into three component parts:

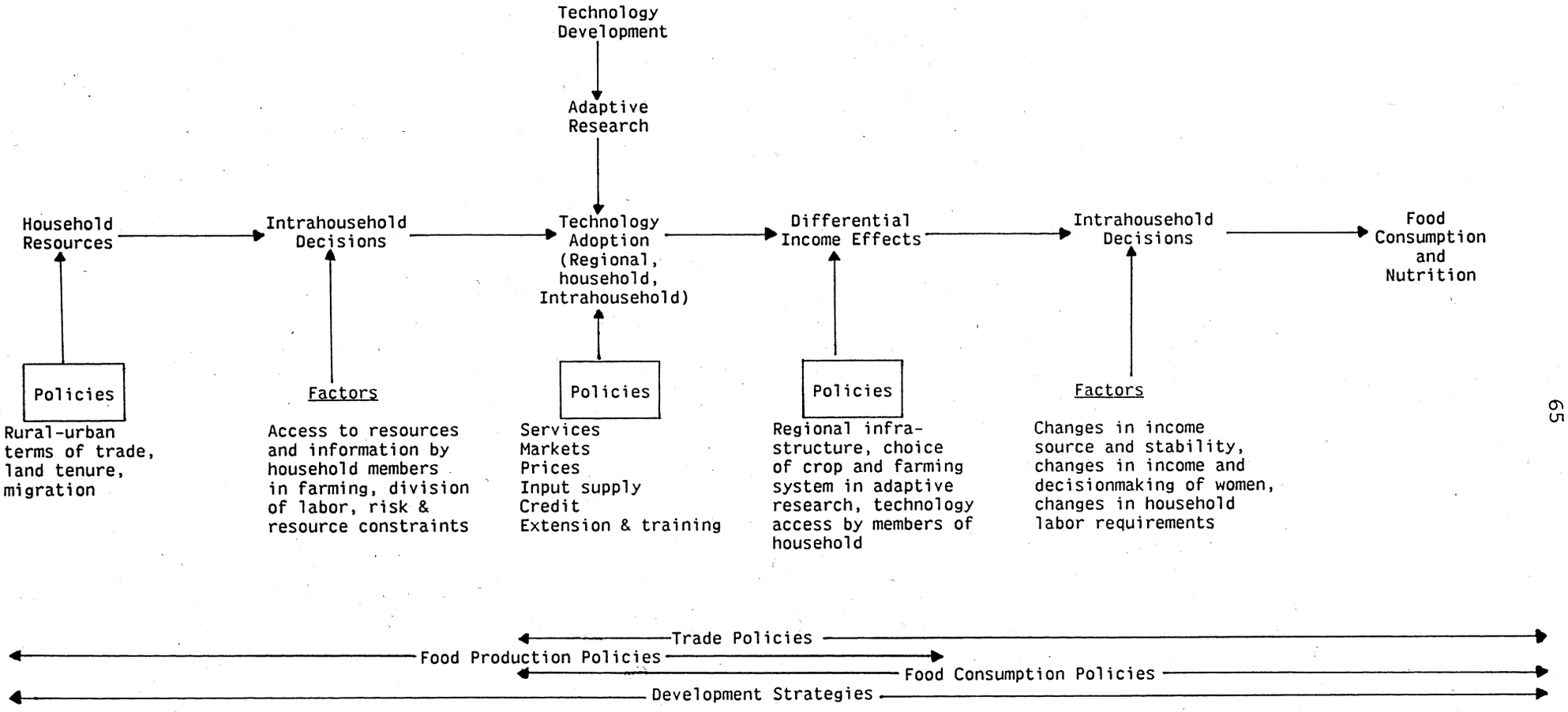
i) The technology adoption process. This includes the role of household resources, policies, and decisionmaking in the adoption and use of new technologies. In examining this process, there are three broad types of studies: the examination of specific options; the specific constraints of small farmers; and the comprehensive nature of incentives required for successful adoption.

ii) The effects of technological change on households and the distribution of impacts. These studies examine the household income, employment, and consumption implications for different types of households.

iii) The intra-household decisionmaking process in resource allocation. These studies examine the influence of intra-household factors which may accompany technological change on outcomes such as women's labor allocation, income food consumption, and children's nutritional status.

In the following sections, some examples of the nature of work undertaken to analyze these processes and impacts are given.

Figure 1 - Technology Diffusion Process, Policies and Effects in IFPRI Research



5. THE SPECIFIC RELEVANCE TO WOMEN OF THIS USER PERSPECTIVE

Two general observations can be made of the user perspective in IFPRI research of relevance to technology adoption. First, equal if not greater attention is given to the indirect "users" in terms of impact assessment. Second, IFPRI research seldom focuses exclusively on population subsections. A basic premise underlying this is that there are so many interdependencies among different groups that often changes occurring for one group - for example, employment - cannot be explained or even understood without knowing what changes are occurring for other groups.

There are two levels at which women are incorporated in the user perspective in IFPRI research. First, as members of households, and second, as individuals. At the first level, which is probably the most relevant, the research is concerned with low-income households, both landless and small farmers, and in examining changes in incomes and explicit welfare or nutritional outcomes. It is generally accepted that in most developing countries, the majority of rural women who are economically active are from the landless and smallholder categories. Time allocation studies have shown the exceptionally heavy work burden that may be faced by women in these households, as well as other household members, compared with households in higher income groups. Furthermore, households headed by women fall in these poverty groups virtually without exception. In studies conducted in areas with a high prevalence of women-headed households, in parts of Africa and Latin America, this factor is also incorporated in the analysis. Within the context of the household, the allocation of women's time has important welfare and production implications, and excessive time constraints are often an impediment for any improvements in either. All of these issues are incorporated in many of the studies.

At the second or individual level, the issues addressed concern the decisionmaking role of women and their influence on production and consumption behavior. As mentioned earlier, this is presently a much more exploratory field of investigation. Most of the work under way at this time is concerned with food consumption and child nutrition. Work is under way on both improvement of theoretical or analytical and empirical bases of intra-household decisionmaking in the allocation of resources for consumption. It is expected that as there is progress in understanding the relevance of intra-household factors to resource allocation in production behavior in different situations, this will also be reflected in the IFPRI research agenda.

6. ADOPTION OF NEW TECHNOLOGIES

The process of technology adoption involves the complex interaction of household and area level resources, policies, availability of technologies, and household or farmer decisionmaking. The work described here is only that which can be related specifically to different segments of the farming population. Even though indirect inferences may sometimes be made on the basis of aggregate analysis, this work is not discussed here. As mentioned earlier, the three types of work in this general area that can be related to categories of users are: examining specific policy options; constraints of small farmers for technology adoption

and/or intensification of production; and examining the comprehensive nature of incentive policies required for successful adoption of improved technologies.

Specific policy options that have been examined for their impact on production and different size farmers are, for example, crop insurance schemes for risk improvement in Panama and Mexico and crop storage loans in Brazil. Results of both these studies concluded that these options were not only ineffective in meeting their overall objectives but were also ineffective in reaching the small farm sector.[1]

Current work on irrigation policies, rural infrastructure, and risk management is also studying the scope of specific options in the process of technology adoption, both in the aggregate and by farmer characteristics. Where feasible, the differential income impacts of such options are also examined beyond the direct user or farmer households. A study on irrigation systems is examining the productivity of alternate forms of irrigation investment on groups of agricultural producers: their labor and input use, and the distribution of income.[2] Another study is examining impacts via the employment and growth linkage effects on incomes, food consumption, and nutrition as a result of creating rural infrastructure in Bangladesh.[3]

Several studies are ongoing which would identify the diverse nature of constraints faced by smallholders in different locations. A major effort is under way in the Sahel on constraints and incentives for millet/sorghum producers, which also incorporates the role of household food security concerns in technology adoption.[4] Earlier work completed in the Sahel determined that incremental returns from ox cultivation alone were insufficient to overcome costs of labor and capital investment in ox equipment for small farms. It highlighted the importance of additional technological measures to improve labor productivity, such as suitable new varieties, in transforming smallholder agriculture in these areas.[5] Other work is focusing on the role of differential household-level labor and food constraints as well as mechanisms for effective access to services for improving production by different types

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1 Peter Hazell, Carlos Pomareda, and Alberto Valdés (ed.), Agricultural Risks and Insurance, Johns Hopkins University Press, forthcoming; Roger Fox, Brazil's Minimum Price Policy and the Agricultural Sector of Northeast Brazil, IFPRI Research Report No. 9 (Washington, D.C.: International Food Policy Research Institute, June 1979).

2 Ongoing project: "Investment Policies for Irrigation Development in Southeast Asia."

3 Ongoing project: "Linkage Effects of Rural Infrastructure."

4 Ongoing project: "Product Mix and Producer Incentives in SAT West Africa."

5 Christopher Delgado and John McIntire, "Constraints on Oxen Cultivation in the Sahel", 1982.

of farmers. In this regard, ongoing work in Zambia has identified both labor and foodstocks as possible constraints for small farmers. It also shows that women farming independently face greater constraints and have lower yields than all other farmers.[1]

In the Asian context, which is usually seen as labor surplus, seasonal bottlenecks may also occur. These may be more critical for small farmers who have a limited capacity to hire workers. The significance of the additional labor required of women to meet needs for fuel-wood, water, and fodder with deforestation and its implications for seasonal labor available for production is being examined in a hilly area of Nepal, which is generally a food-deficit area.[2]

Several studies have been completed on the comprehensive nature of incentives required for optimum production response. While some of this work does not relate specifically to small farmers, the lessons derived are certainly relevant. A study in Bangladesh of agricultural price policies shows the combined effect of producer prices, institutions, technology, and infrastructure on increasing production. For example, fertilizer use was predicted to be five times larger when all of the factors cited were more favorable than with the influence of producer prices alone.[3] Work on the fertilizer subsidy in the Philippines showed that without credit facilities the subsidy was not effective in increasing fertilizer use by small farmers.[4] The role of institutions and services in stimulating rural development has been analyzed. A study in India concluded that government services which facilitate growth in production induce development of private trade and services in a complementary fashion.[5]

7. EFFECTS OF TECHNOLOGIES ON DIFFERENT HOUSEHOLDS

In practice the adoption of new technologies and growth are intricately linked with their impacts on different segments of the population.

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1 Ongoing project: "Food Consumption and Nutrition Implications of Maize Marketing Policies in Zambia."

2 Ongoing project: "Energy Resources, Time Allocation, and Nutrition in Nepalese Subsistence Economy."

3 Raisuddin Ahmed, Agricultural Price Policies under Complex Socio-Economic and Natural Constraints: The Case of Bangladesh, IFPRI Research Report No. 27 (Washington, D.C.: International Food Policy Research Institute, October 1981).

4 Mark Rosegrant and Robert Herdt, "Simulating the Impacts of Credit Policy and Fertilizer Subsidy on Central Luzon Rice Farms, the Philippines", 1981.

5 Sudhir Wanmali, Service Provision and Rural Development in India: A Study of Miryalguda Taluka, IFPRI Research Report No. 37 (Washington, D.C.: International Food Policy Research Institute, February 1983); Sudhir Wanmali, "Household Patterns of Service Use in Rural India: A Study of Miryalguda Taluka", IFPRI Research Report (Washington, D.C.: IFPRI, forthcoming).

Therefore, it may appear somewhat artificial to examine effects independently from the processes leading up to them. However, all studies of technological change do not examine effects, especially insofar as some of the "indirect users", who were discussed earlier, are concerned. While several of the studies mentioned in the previous section are also concerned with effects, this is the primary focus in studies mentioned in the section. However, it should be noted that in the case of these studies as well, it is impossible to dissociate the technological change process from its effects: not only do the characteristics of the process itself contribute to the effects, but the effects themselves may influence the process of change.

The work described in this section explicitly addresses the process of growth with technological change and its household level impacts, in some cases extending all the way to the consumption effects. One study which has been completed reviews post-independence agricultural policies in India and analyzes their effects on agricultural growth and on interpersonal and interregional disparities. It concludes that the new technologies helped accelerate growth in agricultural production, with landless and small farmers gaining in real income even though income disparities widened.[1] Another study integrating production and consumption implications of promoting coarse grain production in West Africa is also under way. This study incorporates the approach of Per Pinstrup-Andersen mentioned earlier and examines both the supply and demand responses by different segments of the population to predict the magnitude and distribution of technology adoption and its impacts.[2]

The effects on income, food consumption, and energy-protein deficiencies of selected technological change related projects are also being analyzed. Among these studies, there are three cases: an irrigation/double-cropping scheme for rice in Malaysia, adoption of high-yielding varieties in India, and evaluating the impacts of improved rice varieties in Colombia. In addition to assessing the ex-post effects on low-income calorie and protein deficient households, these studies will also be used to test an ex-ante assessment method for predicting consumption improvements by vulnerable households with technological change.[3] Also related to this work is the work on household food acquisition behavior, which cuts across several (if not most of the studies in the food consumption area, as well as a methodological study of demand parameters for disaggregated analysis.[4]

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1 John Mellor and Gunvant Desai (ed.), "Growth and Equity: Policies and Implementation in Indian Agriculture" (Washington, D.C.: International Food Policy Research Institute, forthcoming).

2 Ongoing project: "Substitution in Production and Consumption Between Millet/Sorghum and Other Foodgrains in SAT West Africa: Case Studies and Policy Issues".

3 Ongoing project: "Food Consumption and Nutrition Effects of Technological Change in Agriculture and Related Public Policies and Projects".

4 Harold Alderman, "The Effect of Income and Food Price Changes on the Acquisition of Food by Low-Income Households" (Washington, D.C.: International Food Policy Research Institute, 1984).

A group of studies currently under way are examining the growth linkage effects of technological change in agriculture and conditions that influence the degree to which this effect occurs. The primary intent here is to measure the degree of employment and income generation outside agriculture that can be attributed to growth in the agricultural sector, as well as their distribution within the population. Results of work completed in Malaysia suggest that the volume of economic activity generated outside agriculture may be comparable to the amount of increase within agriculture alone. However, the distribution of most of these benefits goes to the middle-income households, or those with the access to some source of capital assets.[1] Further work is under way in Africa, where initial results based on work in Nigeria suggest that there are fewer linkages between agricultural and nonagricultural sectors in Africa than in Asia.[2] The purpose of these comparative studies is to develop a fuller understanding of the prerequisites for enhancing these linkages.

Another question that is related to impacts on low-income households is that of production instability and fluctuations. The role of technology in this regard has been examined. Even though this analysis is not at the household level, indirect inferences on consequences for different household-level characteristics is possible from this work.[3] Current work planned on seasonal fluctuations would explicitly link the role of technological change to income and consumption flows for different types of households.[4]

8. INTRA-HOUSEHOLD FACTORS

Most of the work that has been undertaken either classifies households by the characteristics of the households themselves, such as assets and income, or by the characteristics of the head of household, such as occupation, education, and gender. However, in light of the increasing evidence that intra-household factors may be important in shaping

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1 Clive Bell, Peter Hazell, and Roger Slade, Project Evaluation in Regional Perspective (Baltimore, Md.: Johns Hopkins University Press, 1982).

2 Peter Hazell and Ailsa Roell, Rural Growth Linkages: Household Expediture Patterns in Malaysia and Nigeria, IFPRI Research Report No. 41 (Washingtonn̄,D.C.: International Food Policy Research Institute, September 1983).

3 Shakuntla Mehra, Instability in Indian Agriculture in the Context of the New Technology, IFPRI Research Report No. 25 (Washington, D.C.: International Food Policy Research Institute, July 1981); Peter Hazell, Instability in Indian Foodgrain Production, IFPRI Research Report no. 30 (Washington, D.C.: IFPRI, May 1982); and ongoing project: "Instability in Foodgrains Production".

4 Ongoing projects: "Seasonal Dimensions of Household Food Security: An Overview Analysis", and "The Impact of Seasonal Fluctuations in Food Production, Prices, and Incomes on Household Food Security in Northern Nigeria."

outcomes for different household members, it would also appear that different household members may not be equal "users" of technological change. This is still an exploratory area of work at IFPRI, and much of the current work aims at contributing toward a better understanding of this process. The processes determining food consumption and nutrition are primarily under investigation at this time and, to a much smaller extent, the intra-household factors influencing technology adoption. A clarification of issues involved in the latter area is necessary, and this seminar could conceivably contribute to that.

Studies on agricultural change in Bangladesh and Zambia and shifts from food to cash cropping in India, Kenya, Philippines, Guatemala, Gambia, and Rwanda[1] are under way, which focus on the intra-household factors or consequences in the labor allocation, food consumption, and/or nutrition of different household members. This is also accompanied by work on a more vigorous theoretical framework for incorporating intra-household factors in household resource allocation and human capital formation.

9. IMPLEMENTATION OF RESEARCH

Perhaps the most significant feature in the implementation of research with a user perspective is that the majority of it involves primary data collection and the need to obtain not just household but individual level data as well.

Almost all IFPRI field research is conducted in a close collaborative arrangement betwen IFPRI and national institutions. This cooperative nature of research is of importance not only in ensuring the content and quality of data but also for the use of results which are described in the following section. Many studies involve a three-way collaboration which also includes other specialized international centers[2] and other CGIAR centers in addition to national institutions.

The precise nature of data required obviously depends on the research questions, but income and employment (including labor or time use) by individual are also important. It has been commonly observed that this individual level information, though it often forms the basis of the household figures, is often not retained in final data sets. The problem in this case, therefore, is not so much data collection as data management, which becomes more cumbersome the more disaggregated the form in which it is retained. Other individual level data, such as budget allocation and decisionmaking, food consumption, and nutrition, need

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[1] Ongoing projects: "Production and Distributional Implications of Dairy Development Projects in Selected Indian States"; "The Food Consumption and Nutrition Effects of Shifts from Semi-Subsistence Maize to Sugarcane Production in Kenya and Philippines"; "Economic and Nutrition-Related Program and Policy Implications of Increased Commercialization of Semi-Subsistence Agriculture in Guatemala, Gambia, and Rwanda".

[2] For example, an in-depth study investigating intra-household impacts of agricultural policies in Guatemala includes collaboration with the International Center for Research on Women (ICRW).

varying degrees of additional survey effort, and choices need to be made depending on the hypotheses, costs, and feasibility of obtaining reliable data. In many instances where intra-household issues are unclear, input by anthropologists is being used by IFPRI to assist in the investigation. In one case - the Guatemala study of shifts from subsistence to cash cropping - the anthropological study precedes the full-scale survey and helps to establish the precise issues and data collection requirements to address these in a larger study.

One of the main problems with conducting this type of intensive field-based research is the need for large research budgets for primary data collection and all associated costs, such as travel, data processing, and support for national personnel to participate in the research. Since IFPRI core is unable to cover most of the out-of-station costs, special project funding has been sought for practically every study mentioned here in order to cover part or all of the costs involved. Inevitably, this means that often choices in content, scope, methodology, and location of studies may be influenced by the avialability of special project funding. Even though this does not necessarily have to occur, there is potential that relatively narrowly defined or short-run concerns may dictate special project funding and influence the research programs. In order to reduce the need for special projects and still carry the present volume of work by the research staff, a rough estimate would indicate that an additional $2 million annually in core allocation would allow 16-20 in-depth studies in three years by the present staff without need for special project funds.

10. USE OF RESULTS

Dissemination of IFPRI research utilizes several direct ways, in addition to the published research reports, abstracts, and newsletters, to encourage discussion of results with policy-makers, research scientists, and administrators. This is carried out both in-country where the research is conducted and through international seminars for policymakers and advisors. In addition, several research networks have been established to help incorporate lessons from IFPRI research and exchange of ideas with developing country scientists. The objectives are: to draw the maximum utility from the research results for policies and future research implications for the country in question, to extract policy implications from groups of studies that would be relevant for other countries to consider, and finally, to facilitate similar research in countries and by institutions where IFPRI cannot directly undertake research. Given the high cost of conducting in-depth studies, each of these is considered essential.

National consultations are an integral part of most studies and it would be difficult to describe all of them. The discussion and dissemination of research results at the national level is greatly facilitated by the collaborative nature of the studies with national institutions and researchers. As a result of this, in several instances research results have been incorporated into policy and program measures even prior to the final report preparation.

An ongoing process of consultations with policymakers has led to the incorporation of results from a forthcoming research report[1] on household patterns of service use into planned programs in the Indian state of Andhra Pradesh. The study recommends selected mobile services to better reach the weaker sections of the population (e.g. small farmers and those in ecologically poorer areas). This finding was analyzed and extended by the state planning department for application in all districts of Andhra Pradesh for the seventh five-year plan period beginning in 1985. Thus, presence of a local capacity enhanced the ability to utilize research results effectively. Use of results is also often made by non-governmental agencies, including donor agencies, in their country programs (for example, by USAID in Egypt). The general observation at this level is that the user perspective is extremely well received.

Several policy seminars and conferences have been organized by IFPRI as a means of directly utilizing research results. These usually focus on selected policy issues and are based primarily on several studies completed here, supplemented with selected pieces of commissioned research by non-IFPRI researchers. While distributional questions may be more significantly featured in some of these (e.g. "Growth and Equity: Policies and Implementation in Indian Agriculture" and "Consumer-Oriented Food Subsidies"), they remain an integral though smaller element in the primarily growth-oriented conferences (e.g. "Accelerating Agricultural Growth in Sub-Saharan Africa" and "Agricultural Price Policies"). Both household and some intra-household level issues represented in IFPRI research have been successfully incorporated both at national and international level policy discussions.

Also significant are the research networks, including those with other CGIAR centers (e.g. on Nutrition and Agricultural Research) and national research centers (on Food Consumption and Nutrition Effects of Shifts from Subsistence to Cash Cropping). A similar network with the International Commission on Anthropology of Food led to a symposium on Household Food Distribution at the International Congress of Anthropological and Ethnological Sciences in 1983. Though some of these

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[1] Sudhir Wanmali, "Household Patterns of Service Use in Rural India: A Study of Miryalguda Taluka". Research Report (Washington, D.C.: International Food Policy Research Institute, forthcoming). Experience by Dr. Wanmali has also shown that an ongoing dialogue between researchers and policymakers leads to a gradual reduction in the lag time between availability of research results and their practical application. Two previous studies by Dr. Wanmali in Andhra Pradesh were incorporated into the state's programs during the 1975-80 and 1980-85 plan periods. Local institutional capacity was a key factor in the effective use of results. Since most in-depth studies are limited to small samples, the use of results to cover larger administrative areas requires an extension of the analysis (in this case, from a single district to the entire state of Andhra Pradesh), involving either a minimal replication or qualitative analysis for other areas not covered. This follow-up was done by the state level planners with some guidance by the researcher.

networks are in their initial stages, they have demonstrated a means for effectively utilizing and incorporating IFPRI research results for further work. Other forums are also used to disseminate IFPRI research approach, methodologies, and results. An example of our active involvement of particular interest to this workshop may be a keynote speech and panel presentation by IFPRI staff at the Women in Development Conference of 1983.

REFERENCES

Mellor, John, 1976.
The New Economics of Growth: A Strategy for India and the Developing World. Ithaca: Cornell University Press.

Mellor, John and Lele, Uma, 1973.
"Growth Linkages of the New Foodgrain Technologies". Indian Journal of Agricultural Economics, Vol. 28, No. 1, January-March.

Pinstrup-Andersen, Per, de Londoño, Norha Ruiz, and Hoover, E., 1976.
"The Impact of Increasing Food Supply on Human Nutrition: Implications for Commodity Priorities in Agricultural Research and Policy". American Journal of Agricultural Economics, Vol. 58, May.

Kumar, Shubh,1978.
Role of the Household Economy in Determining Child Nutrition at Low Income Levels: A Case Study in Kerala. Occasional Paper No. 95. Ithaca: Cornell University.

Tripp, Robert, 1982.
"Farmers and Traders: Some Economic Determinants of Nutritional Status in Northern Ghana". Food and Nutrition, Vol. 8, No. 1.

ANNEX-1

(Abstracted from "The Role of IFPRI Research in Reaching the Overall Goals of the CGIAR", by R. Ahmed and R.H. Adams, 1984)

IFPRI Research and the Role of Technological Change in Agriculture

IFPRI's research program is based on the recognition that if the food needs of the developing world are to be met, the complex interrelationships between technological change in agriculture and the socio-economic policies affecting such changes need to be examined more thoroughly. Policy analysis at IFPRI provides at least three important ways to maximize the socio-economic benefit of the technologies being developed at other CGIAR centers. First, policy analysis at IFPRI relating to the character of incentive structure, institutional development, and investment can play an important role in accelerating the spread and dissemination of new technology. Second, the effect of this technology on different socio-economic groups has to be evaluated in order to protect the status of disadvantaged low-income groups. And third, policy analysis at IFPRI provides the means to study those areas that are more indirectly related to the problems of the new technology, yet are vitally important to the solution of the food problems of the developing world. Each of these relationships between policy and technology will be examined here.

IFPRI Policy Analysis and the Spread of New Technology

Policy analysis aimed at facilitating the spread and impact of new technology must deal with several problems. One of these is: How can this new technology be made profitable to farmers? In the short run, higher profitability is perhaps assured in the sense that any technological improvement in the factors of production reduces the costs of production. But in a dynamic world, this increased profitability may not last. Over the long run, technologically-induced changes in input and output prices, and extraneous changes in these prices as well, may reduce net profitability.

Policy analysis has a wide range of instruments at its disposal to increase the profitability of new technology. In the external market, export, import, and foreign exchange policies can encourage - or discourage - the adoption of new agricultural technology. Research at IFPRI has shown that these policy instruments have economy-wide implications. For example, Research Reports 24 and 36 show that, trade and exchange policies in Colombia and Argentina have generally slowed the rate of technological change in agriculture. This has retarded the growth of Argentinian and Colombian agricultural production as well as the rate of growth of their economies as a whole.

In the domestic market, farm level incentives, stocking policies, and public marketing mechanisms can also stimulate the spread of new technology. A good deal of IFPRI research has focused on the use, and the impact, of these policy measures. For example, Research Report 27 found that in Bangladesh farm-level price incentives must be carefully

integrated with other policy measures - including infrastructure and institutional development - in order to stimulate technological change in agriculture. Similarly, Research Report 38 on India called attention to the interaction between domestic stock policies, procurement and issue prices, and farm level incentives. Citing the high cost of Indian foodgrain stock policies, this report emphasized the need to balance producers' incentives with a concern for the welfare of low-income consumers.

A second problem that policy analysis must address in this area is: How to make farmers aware and convinced of the need to adopt new technology? Institutional mechanisms - agricultural extension and credit institutions - can plan a pivotal role in solving this problem. Yet since effective research on these and similar mechnisms needs to focus on local institutions, IFPRI generally leaves such research to the national institutes. But in the broader area of the provision of rural services, IFPRI has been able to do useful work. For example, Research Report 37 pinpoints the need for the public sector to lead in providing a wide range of rural services, including transport, marketing, and the development of infrastructure. According to this report, the government's provision of such services encourages the private sector to grow and invest in the countryside, thereby facilitating the broader processes of rural socio-economic development.

A third problem that policy analysis must address in facilitating the spread of new technology is: What kind of inputs are needed to complement the use of this technology? Past research has shown that expanding the supply of fertilizer, water, and other inputs is crucial to accelerating the rate of adoption of new agricultural technology. Much work at IFPRI has, in fact, focused on the importance and complementarity of these inputs. Research Report 31, for example, analyzes the factors affecting the growth of fertilizer use in the developing world. Stressing the supply side factors which influence such growth, this report notes that domestic fertilizer production needs to be increased sharply, and local-level distributional channels expended and upgraded. Other IFPRI woirk emphasizes the need to expand the amount of irrigated land throughout the developing world. Research Report 20, for instance, states that the extension of irrigation systems contributes significantly to the type of growth in cropping intensity that is needed to sustain a high rate of technological change in agriculture. Concern with the effect of such expanded irrigation systems on different types of farmers led IFPRI to join forces with IRRI and the Asian Development Bank in the collaborative research project on irrigation described above.

Policy Analysis Needed for Technological Evaluation

Policy analysis is needed to evaluate technology in order to identify problems in the process of generating technology and to assess its overall impact. IFPRI is evaluating several different levels of technology.

A first level relates to mechanisms for generating new agricultural technology. National and international research centers require adequate

funding, manpower, and institutional support in order to generate new technology. In an important collaborative work, mentioned above, IFPRI and ISNAR evaluated the status of national agricultural research systems in 51 developing countries. The results of this work suggest that while the amount of public resources allocated to agricultural research is slowly rising in the developing world, the distribution of these allocations remains quite uneven. According to this study, 62% of all expenditures on agricultural research in the developing world is concentrated in just five countries. Other IFPRI research pinpoints the need to improve the management and the funding of national agricultural research systems in the developing world. Research Report 17, for instance, shows that problems of poor research management, staff inadequacy, and high personnel turnover have greatly hindered the performance of the Nigerian research system.

A second level of evaluation relates to how the new technology is actually performing. In recent years IFPRI has been evaluating the effect of the new seed-fertilizer technology on aggregate production and yield variability. Research Reports 25 and 30 show that aggregate production instability in foodgrain production in India has increased since the introduction of the new seed varieties. Comparison with data from the United States and other major food producing countries yields similar conclusions. The new technologies are partially responsible for this increase in instability, but probably more because of their role in increasing yield correlations between farms and regions than because of increased variability at the farm level. IFPRI is currently analyzing these and similar questions in more depth, in order to identify policies that can reduce these production variabilities.

A third level of evaluating new technology focuses on the critical question of the direct socio-economic impact of this technology. How has the adoption of new technology affected aggregate production, and what type of socio-economic groups have benefited from the spread of that technology? Of particular importance here is the differential impact of technology on various types of producers and consumers. Over the years IFPRI has in fact paid much attention to this problem, as its work on food subsidy programs shows. In many developing countries subsidy programs often represent the most effective means of protecting those poor consumers who lack purchasing power in either a technologically dynamic or stagnant environment. For example, Research Reports 8, 13 and 40 analyze the important effect that food subsidy programs have had in protecting the nutritional status of the poor Bangladesh, Sri Lanka, and Egypt. Yet results from some of this research suggest that the efficiency of several existing subsidy programs could be improved. For example, Research Report 32 shows that present food subsidy policies in Brazil are not the most efficient in increasing the calorie intake of poor consumers. According to this report, if the goal is to increase the calorie intake of the poor without increasing government costs, the present subsidy on wheat should be replaced by one on rice.

A fourth level of evaluation - one not commonly analyzed - is the size of the indirect effect of new technology on overall growth and equity. Given its concern with broad questions of agricultural and rural growth,

IFPRI is attaching much importance to this analysis. Past research indicates that the direct and indirect growth linkages effects of technological change in agriculture are quite large. For example, Research Report 33 found that a 1% increase in the growth rate of Indian agriculture raised the industrial growth rate by 0.5%. Similarly, IFPRI work at the regional level in Malaysia showed that each dollar of income generated among farmers by an irrigation project generated a similar amount for the region through indirect linkage effects, mainly of household demand for consumer goods. In addition, current IFPRI research is evaluating the distributional consequences and the direct and indirect income and employment effects of high-yield varieties of rice in India.

Complementary Areas of Policy Analysis

The previous sections have attempted to demonstrate the salient role that IFPRI policy analysis has played in maximizing the socio-economic benefit of the technologies being developed by other CGIAR centers. Yet it should be recognized that the search for policies to solve the pressing food problems of the developing world encompasses questions not directly related to the use of the new agricultural technology.

For this reason, IFPRI policy analysis is geared to a broad definition of the food problem. For example, food aid, world trading arrangements, and special food security schemes may have a substantial effect on food production and availability throughout the developing world. It therefore seems useful to present some of IFPRI's work in these areas under the heading "complementary areas" of policy analysis. Work in these "complementary areas" focuses on those policy measures that are not directly related to questions of the new technology, yet are equally important to the solution of the food problems of the developing world.

Policy analysis can make an immediate and lasting impact on the magnitude of the world food problem. A good example of IFPRI policy analysis on the global problem is its food security work. IFPRI Research Reports 4 and 18 played an important role in identifying the character of the food security problem, and in demonstrating the inadequacy of traditional solutions (for example, international grain reserves) of this problem. Other IFPRI research showed that variability in the volume of food imported - and not the world price of food - explained most of the variability in food import costs for developing countries. As demonstrated in the IFPRI reprint "The Role of Research in Policy Development: The Creation of the IMF Cereal Import Facility", these and other pieces of IFPRI research ultimately played an important role in the creation of the IMF cereal import facility.

IFPRI has also analyzed the effect of developed-country policies on the character of agricultural performance in the developing world. Research Report 14, for example, examined the effect of domestic price policies in wheat exporting countries on price and supply fluctuations in the international wheat market. This report noted that, although the sharp rise in international wheat prices in the early 1970s was not caused by the policies of developed-country, such policies contributed significantly to the size and duration of this crisis.

IFPRI's work on trends in the production, consumption, and trade of the major food commodities has done much to identify the magnitude and location of emerging food gaps in the developing world. Certainly, IFPRI Research Reports 2, 3 and 11 helped establish the pressing need to do more research on the unique character of Africa's food production problems. The findings of these reports also paved the way for IFPRI's recently concluded conference on agricultural policy in Africa, a conference that was attended by researchers from a large number of CGIAR centers.

In many developing countries the food gap problem takes on an added dimension because of the inability of local economies to absorb the high costs of commercial food imports. The policy analysis of food aid becomes particularly relevant to these countries. On the one hand, food aid is generally viewed as an important short-term tool for alleviating the problems of starvation and malnutrition in the developing world. Yet at the same time food aid has often been accused of having a strong disincentive effect on domestic agricultural production. IFPRI is currently examining the effects of these forces in order to improve the character of its recommendations to policymakers.

In the poorest countries of the world, food aid in the short run and technological change in agriculture in the long run may represent the most effective way to increase food supplies. But what policies can facilitate the delivery of these food supplies to the poorest members of society? This is a formidable question, one that arises even in those countries not experiencing a net increase in food supplies. At the crux, it is a question that focuses attention on the need to provide food and income supports to those members of society who are bypassed by the income-multiplying effects of technological change in agriculture. Several IFPRI studies on the ability of food subsidy programs to protect the nutritional status of the poor have already been cited above. Yet others should be noted. Research Reports 7 and 13, bring out the significant finding that the consumption and nutritional effects of food subsidy income on the poor are significantly larger than most other forms of income. Research Report 8 demonstrates that even though a larger proportion of the subsidized food in Bangladesh goes to better-off urban areas, the nutritional status of the poor would be much lower without such a program. In February 1984 the results of these and similar pieces of IFPRI research will be shared with other CGIAR centers at a workshop on incorporating nutritional goals into the process of international agricultural research.