

# Extension Strategies for Poverty Alleviation: Lessons from China and India

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**ABSTRACT** *This paper discusses the transition from a national focus on food security during the last half of the 20th century to an emerging strategy on helping small-scale farm households increase farm income to reduce rural poverty. The basic proposition is that if extension is going to help increase farm incomes and rural employment, then it must shift from being a 'supply-driven' to a more 'market-driven' extension system. This shift requires at least three major institutional changes. First, extension must give higher priority to high-value, labor-intensive crops/products where there is real demand in domestic and/or export markets. Second, small-scale producers must get organized into groups to achieve economies of scale and to become linked with the 'value chains' that supply these markets. Third, extension planning and decision-making must become decentralized to determine the most suitable crops and/or enterprises vis-à-vis the interests and resources of different farmer groups, in light of agro-ecological conditions and available markets for different products.*

**KEY WORDS:** Extension strategies, Poverty alleviation, Market-driven, Social capital, Decentralization, China, India

## Introduction

### *Post-Second World War: National Extension Systems Focused on National Food Security*

The post-Second World War period was characterized by a rapid growth in the world's population, particularly in developing countries, with slower growth in the overall world's food supply. Food surpluses expanded in North America and Oceania, but food deficits became more commonplace in Asian and African countries due to rapid population growth. For example, both India and China encountered major food shortages during the late 1950s through the 1960s until the full effect of the Green Revolution was realized during the 1980s.

During the last half of the 20th century, the primary focus of public research and extension systems was largely on developing and transferring technologies associated with the major food crops, with the goal of achieving national food security. Therefore, agricultural research and extension systems focused on the major cereal

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crops, roots and tubers, plus some oilseeds and/or protein crops. To help address these technology needs, a system of international agricultural research centers (IARCs) was created by the international donor community to provide technical support and backstopping to national agricultural research centers (NARCs). The current system of 15 IARCs was founded on the early successes of the International Maize and Wheat Improvement Center (CIMMYT) and the International Rice Research Institute (IRRI) that created the so-called 'Green Revolution' across much of Asia.

By the 1980s, the Green Revolution, which began in the 1960s, had successfully solved the food security problems in most Asian nations. Although hunger persisted in many countries, such as India, most claimed some degree of food self-sufficiency. As a result, by the 1990s, government support for public research and extension in most developed and developing countries began a slow decline. Also, with a few notable exceptions, international donor support for research and extension systems in most developing countries also declined during the 1990s.

#### *Privatization of Research and Extension in Europe and North America*

Changes in US and international patent law (TRIPS or Trade Related Intellectual Property Rights) gave life-science companies increased patent protection and intellectual property rights (IPR) for new plant varieties and other biotechnologies. As a result, there was increasing private sector investment in research and development (R&D) in Europe, North America, and Oceania. In the process, large transnational corporations (TNCs), such as Bayer, Syngenta, BASF, Monsanto and Dow, or their subsidiary companies, began investing more heavily in both R&D and the 'transfer' of these 'proprietary technologies' to farmers, especially large, commercial farmers worldwide.

In the process, public research and extension in Europe and Oceania became increasingly marginalized and lost political support. As a result, many European countries have partially or wholly privatized their extension systems. In the US, there has been a slow, but steady, decline in federal support for agricultural extension. The public extension system continues to function, but with a substantially reduced role in agricultural technology transfer.

#### *Globalization and Liberalization of the World Economy during the 1990s*

As TNCs increased their research capacity and technological dominance for many of the important food and feed crops in North America, Europe, and Oceania, their influence began to spread across many developing countries during the 1990s. Developing country governments were encouraged to liberalize their economies and to open their doors to increased foreign trade and investment. As a result of this transition, many TNCs began establishing or entering into joint ventures for the production and/or sale of seed, chemicals, machinery, and other agricultural technologies. In addition, some TNCs began establishing R&D and/or technology transfer activities in many of these new and expanding markets for production inputs.

At the same time, many developing country governments began to reduce their investment in public research and extension for a combination of reasons. First, given

Green Revolution and other agricultural technologies, many governments felt confident that they would be able to maintain food security over the near term. Second, with the arrival of foreign life-science firms in many developing countries, farmers had alternative and, possibly, better sources of agricultural technology. Third, since the cost of private sector R&D and technology transfer is passed on directly to farmers, governments soon realized that public funds being used for research and extension could be reallocated to more pressing areas of need, such as education and health services. Fourth, public research and extension were slow to realize that they were being incrementally displaced by the private sector and that they needed to identify a new mission that could justify the continuing investment of public funds (Swanson et al., 2003b).

This period of globalization and trade liberalization was also characterized by the rapid expansion of large multinational firms that now dominate the world's commodity and food markets. On the commodity side, firms such as ADM, Unilever, Cargill, Bunge, Zen-Noh, Tyson, ConAgra, and Smithfield increasingly dominated the worldwide trade of agricultural commodities. In terms of food retailing, the global supermarket giants, such as Wal-Mart, Carrefour, Ahold, and Tesco, are dominating the worldwide procurement and sale of all food products, including fresh fruit, vegetable, dairy, and meat products (Mekay, 2004). The goal is to supply consumers with consistently high-quality, low-cost food products. Given their worldwide access to different suppliers and their market power, they dictate quality and food safety standards and procure products from the 'least cost' supplier. Therefore, suppliers must be highly competitive and efficient if they are to retain market access.

#### *New Market Opportunities for High-Value, Labor-Intensive Agricultural Products*

Fritschel points out in the IFPRI Forum (2003) that the globalization of the world's food system represents both an opportunity and threat for small-scale farmers. Without immediate assistance from public research and extension, small-scale farmers will be increasingly marginalized by globalization and will soon lose access to even their traditional domestic markets. At the same time, the growing demand of urban consumers worldwide for high-value fruits, vegetables, fish, and livestock products throughout the year has created new market opportunities for high-value, labor-intensive products from developing nations.

The critical issue is 'Who will capture these domestic and global markets for high-value, labor-intensive products?' Without direct and immediate assistance from public research and extension, these emerging markets will be supplied by large-scale producers who utilize modern production, processing, and logistics, and who will exploit landless and marginalized farm families in rural areas. On the other hand, if extension is properly structured and focused, it can organize and train small-scale producers to utilize local resources to first serve urban consumers in domestic markets and, possibly, high-end consumers in international markets. It is recognized that this approach will not be a permanent solution, but it will enhance the skills and knowledge of rural people, especially the youth, so they are better equipped to eventually take off-farm jobs and escape rural poverty.

*Recognition that Hunger is a Money Problem, not a Food Problem*

Although most countries are now self-sufficient in basic food staples, many nations are still struggling with the problem of large numbers of malnourished people. The Food and Agriculture Organization (FAO) of the United Nations estimates that world hunger increased to 852 million people in 2005. For example, India is self-sufficient in food, yet over 200 million people continue to suffer from malnutrition. Worldwide, it is estimated that about 16,000 children/day (one child every five seconds) die from some form of hunger, especially chronic malnutrition (Bread for the World, 2005). It is abundantly clear that achieving food security does not eliminate hunger. Or, to put it most succinctly, *hunger is a money problem, not a food problem* (Swanson, 2004). Therefore, some national extension systems are beginning to shift their focus from ‘increasing food production’ to ‘increasing farm incomes and rural employment’, especially among the resource-poor farm households. However, this transition is occurring too slowly, since most research and extension leaders have spent their entire careers pursuing the goal of food security and they are reluctant to reallocate extension resources to new, unfamiliar program priorities where they have little or no experience.

*The Need to Refocus Extension*

The premise of this paper is that policy makers and extension leaders need to recognize that: 1) achieving food security does not mean the end of hunger and malnutrition among the rural poor; 2) hunger is a money problem and not a food problem; and 3) the global food system is rapidly changing, and small-scale producers, if properly organized and supported, may have a comparative advantage in supplying some of these emerging markets. These assumptions suggest that both research and extension must become more ‘market-driven’ and, collectively, they need to refocus more program resources on high-value crops/products that can be successfully grown by small-scale farmers and that will increase farm income and rural employment (i.e. poverty alleviation). A growing body of experience in China and India, as well as in other developing countries, suggests that small-farm households can be successfully mobilized and trained to supply these new, high-value domestic and international markets.

**Elements of a National Strategy to Alleviate Rural Poverty within a Global Economy**

Given these significant changes in the global agricultural economy, including increased investment in private sector R&D and declining public investment in national research and extension systems, there appears to be an urgent need for national extension systems to redefine their mission, with a major emphasis on increasing farm income and rural employment. If this mission is properly carried out, it could bring small-scale and marginal farmers more fully into the global economy and help reduce rural poverty. The major elements of such an extension strategy are the following:

- Agricultural research and extension systems must become more market-driven
- Building social capital or organizing farmer groups and linking them to markets
- Decentralization of extension planning and program implementation

Each of these elements will be explained briefly in this paper, drawing lessons and examples from experiences in China and India.

*Agricultural Research and Extension Systems Must Become More Market-Driven*

The first step in assisting small- and medium-scale farmers to produce high-value crops and livestock products is to refocus program priorities within both the public agricultural research *and* extension systems. First, the research system needs to begin developing, testing, and/or disseminating both production and post-harvest technologies for high-value crops and livestock products that would be suitable in supplying these high-value domestic and/or global markets. Second, extension needs to redirect its efforts toward organizing and training small-scale farmers and then helping to link them to these emerging new value-chains, so they can successfully produce and market their crops and products. To do this will require careful analysis and strategic planning.

How and where does this process begin? The approach described below tells how the Indian extension system helped small farmers expand the production and marketing of high-value crops/products to different high-value domestic markets in urban areas. The goal was to identify specific areas within a country, down to the district and block level, which might have a comparative advantage in producing specific, high-value crops, livestock or other products for different domestic and/or international markets.

It should be noted that many factors affect comparative advantage, including agro-ecological conditions, local resources, distance to potential markets, the transportation infrastructure, and so forth. Therefore, research and/or extension need to carry out a systematic analysis of these different factors in developing a strategic plan that will determine which high-value crops, products or enterprises have the highest potential for the different agro-ecological zones (AEZs) within a country (Swanson et al., 2001).

*The case of refocusing the agricultural extension strategy in India*

The strategic planning process followed in India was developed in connection with two World Bank-funded projects. The first project was the Diversified Agricultural Support Project (DASP) that was implemented in Uttar Pradesh. The second project was the National Agricultural Technology Project (NATP) that was implemented in seven states across India. A similar approach was followed in both projects. First, research and extension jointly conducted a Participatory Rural Appraisal (PRA) in each project district and then analyzed the findings using a modified SWOT analysis (strengths, weaknesses, opportunities, and threats).

A key aspect of each PRA was the identification and analysis of 'success stories' that represented the efforts of entrepreneurial farmers who had already identified markets for high-value products and who were already successfully supplying these markets. In each case, the entrepreneur had already acquired and adapted the production technology needed to successfully produce the crop or product in response to market demand. In addition, they had worked out a functional supply chain (i.e. transportation and logistics) to move this product to market. The question

that was addressed by the research and extension team regarding each success story was whether it could be replicated to include a larger number of farmers within a specific district (or AEZ), given the potential size of market for this product at the district, provincial, national and/or international levels.

In addition, these success stories for high-value products could also involve innovative ideas or post-harvest technologies. For example, one group of farmers in a district of Maharashtra found that by packing perishable squash and similar horticultural products individually in low-cost plastic sleeves or bags, they not only reduced product loss due to bruising during shipment, but consumers were willing to pay more for products that were attractively packaged. Other examples of success stories include farmers that began producing flowers for special festivals at nearby temples or unique crops that had not been produced locally before. Success stories also reflect the resources available to different households. For example, landless women farmers learned how to collect dung from roadsides and then produce vermi-compost for sale to local nurseries or the production of mushrooms within their homes for sale in local markets.

In some cases, successful practices generated by success stories were taken up by too many farmers, creating potential problems and new opportunities. For example, one farmer's success in producing papaya was duplicated by all of his neighbors. The local and regional market for papaya became saturated and market prices dropped sharply. However, rather than discontinuing papaya production, these farmers joined together to establish a value-added enterprise that would process papaya into meat tenderizer. Soon, the papaya supply in the local village was inadequate to meet the growing demand, so farmers in surrounding villages were contracted to produce sufficient quantities of papaya to meet the growing international demand for this value-added product.

It is essential that researchers and extension specialists integrate technical and market information if they are to assist small-scale farmers to produce and supply high-value products to domestic or global markets (see Singh and Swanson, 2006). Specifically, the following aspects of each success story must be investigated before providing technical support to small-scale producers and businesses about a particular commodity or product:

- Compile and analyze market demand for specific crops or products, including information on important competitors who are supplying these different markets; wherever possible, identify possible 'windows of opportunity' where local producers may have a competitive advantage over other suppliers.
- Develop and/or test production technologies (e.g. varieties, planting dates, agronomic practices) that are appropriate in producing high-quality products for specific production windows in these different markets.
- Assess the requirements of potential markets and then develop and/or test appropriate post-harvest handling technologies (e.g. pre-cooling, drying, packaging, and/or storage) that can maintain product quality and increase shelf life.
- Advise producer groups on the types of investments that may be needed to develop an efficient supply chain to supply these high potential markets.

- Compile and disseminate information on the quality assurance (QA) and food safety procedures that are desirable or mandatory in supplying different markets. This is especially true in the case of global supermarket chains, such as adhering to EurepGAP farm certification standards, when shipping products into the European Union (EU).

### *Building Social Capital*

Building social capital is the second step of the extension strategy outlined in this paper. Social capital is the ability to facilitate collective action for mutual benefit through the organization and participation of farmers and rural people. Harl (2000) sees the implications of social capital in the need for producers to forge alliances to achieve countervailing power. Others see the benefits of social capital in allowing farmers to ‘capitalize on the volatile, virtual possibilities of today’s business environment’ (Cohen and Prusak, 2001: 93). However, as Harl (2000) also notes, historically farmers have been unwilling to accept such a disciplined approach to gaining bargaining power and have also been reluctant to sacrifice independence of action in order to bargain collectively. From the perspective of organizers of new, collaborative, farm-based alliances, social capital is viewed as being economically useful since individuals acting collectively can achieve economies of scale and avoid being exploited by local traders who can easily take advantage of small-scale farmers who have very little market information and bargaining power.

Putnam (2000) has differentiated social capital into two primary categories: *bonding and bridging*. Bonding is the process of creating a network of people who come together for a common purpose, for example, a women’s self-help group (SHG) or a farmer association. The focus is on group formation, building trust or a type of glue that holds a group of people together.

Bridging social capital is the process of creating linkages with outside groups for a common purpose. In short, bridging social capital is externally oriented and seeks to add value through linkages with other groups (e.g. exporters) who share a common interest. In this paper, the concern is with both types of social capital, but especially in linking producer groups to external groups (wholesale markets or exporters) that can open up new market opportunities. In this section, we will discuss examples of how producer groups in China and India have been organized to pursue new markets, sources of technology, and political support.

### *The development of farmer associations in China*

As China moved toward a market economy, the structure of its agricultural sector changed to reflect these new market opportunities. Over the past 20 years, specialized farm households (SFHs) have steadily formed to focus on a wide variety of higher-value crop and livestock enterprises, such as vegetables, apples, pigs, ducks, mushrooms, and so forth. Most of these new SFHs were initiated by younger (<35 years of age), better educated farmers (many with nine years of technical education) who have specific interests in different high-value enterprises. To assist these SFHs in gaining access to new technology and markets, the Ministry of Agriculture conducted research studies and organized study tours and

conferences to determine the most effective ways of organizing these SFHs into Farmer Associations (FAs).

In most cases, these specialized FAs started at the village or township level and would be a type of 'bonding' social capital. Given the legacy of the communal system, organizing these village and township FAs was not difficult. However, since these local-level FAs were interested in marketing their products, they soon affiliated or merged with other FAs at the county, prefecture, or provincial level (i.e. bridging social capital), to develop *commodity specific supply chains* that could supply different urban markets. In addition, many of these FAs also purchased production inputs collectively to reduce production costs. By 2001, the ASSP project office at the Ministry of Agriculture (MOA) reported that 13,360 new FAs had been organized at the village and township levels in the 700+ project townships or an average of about 18 FAs/township. The MOA estimates that there are over 100,000 FAs throughout China.

Farmer Associations are viewed in China as a participatory mechanism that can improve linkages with and feedback to extension and, thereby, improve extension programming. At the same time, FAs have become important in sharing some extension costs associated with specialized, high-value commodities. Although FAs commonly use the township extension station's (TATES) classroom for monthly meetings, their need for advanced technical, marketing, and management information frequently outstrips the capacity of the subject matter specialists (SMSs) at the county agro-technical extension centers (CATECs). Therefore, many FAs contract with university professors or specialized consultants who can provide training and technical assistance to their members on specific problems. In these cases, the FAs finance the cost of consultant's fees and travel from their own funds. In the process, FAs have required the local extension service to become increasingly farmer-centered and market-driven. As a result, FAs in China can be characterized as largely multifunctional and 'bridging' types of social capital, providing effective links with markets, input suppliers and different technology sources.

#### *Mobilizing women's self-help groups in India*

India has become increasingly successful in creating social capital among rural women. The process generally begins by organizing rural women into self-help groups (SHGs). These SHGs first become a type of 'savings club' whereby each member contributes an agreed upon amount regularly to the club's account, so that individual members can take out small loans to start some type of economic activity. These self-help groups reflect a bonding type of social capital. Once organized, however, these groups can also be effectively linked by extension to new market opportunities. The following success story, which occurred in one district of Orissa India, illustrates how women's groups can be mobilized around the production of high-value crops and products.

In the Khurda District of Orissa State, most village ponds (called 'tanks') lay idle, serving largely as a watering hole for village livestock. After landless women in this district had been organized by extension into village self-help groups, these groups were assisted in leasing their respective village pond from the village panchayat for conversion into a fish tank. The different women's groups worked under the guidance

of the fisheries extension officer (FEO) to clean, prepare, and fill these tanks with water. In addition, the FEO arranged for the purchase and delivery of fingerlings from a reliable fish nursery. Four months later, the groups began selling their first crop of fish.

As more groups of landless women began producing fish, there was enough to begin supplying major cities within the state and eventually to ship fish by rail to Calcutta. In the process, these village-level groups began linking-up at the block and eventually at the district level. As some groups gained more experience, they began diversifying into polyculture fish production, which resulted in the production of higher-value products, such as freshwater shrimp, for different high-end markets. Next, profits from the sale of fish were used by the women's groups to diversify into other high-value products. For example, one group purchased dairy cows that improved nutrition within the family, with the excess milk being processed into cheese that was sold in the local market. Other groups began leasing land for the production of horticultural crops, thereby diversifying into a different set of high-value and/or value-added products. In short, the district-level extension staff soon converted 'bonding' types of social capital at the village level into 'bridging' social capital that linked producer groups to different markets.

#### *Decentralization of Extension*

The third, and final, step in designing a new extension strategy aimed at poverty alleviation is the decentralization of extension systems. First, some form of decentralization of extension appears to be needed in achieving broad-based rural development. Second, decentralization produces more efficient and equitable service delivery by actively engaging rural people in development and making better use of local resources and knowledge. Third, decentralization leads to greater stakeholder participation resulting in a better understanding of the government's role which, in turn, helps improve the image of extension (Bird, 1994). Finally, decentralized extension systems have shown evidence of increased resource mobilization, reduced strain on central finance, greater accountability, and more responsive administration (Bird, 1994). Decentralization of extension systems can achieve three major goals (Swanson and Samy, 2002).

#### *Decentralization serves the interests of rural people*

Decentralization provides rural people with greater control over local extension programs in terms of planning, implementing, and monitoring. It has the potential to be a powerful tool for improving extension services by seeking contributions from various groups at the local level. For example, in Venezuela, decentralization of the extension system allowed rural communities and poor farmers to participate in planning and implementing extension programs and to demand services to meet their needs (Savioff and Lindarte, 2002). Enhancing the representation of a wide variety of political, religious, ethnic, and other social groups in planning and carrying out of extension programs will, in turn, improve equity in the allocation of resources and the delivery of services (Silverman, 1992).

*Decentralization improves extension management*

An important goal of decentralizing extension is to strengthen managerial capacity by reducing administrative overload and congestion in the communication channels. Improving managerial capacity improves technical capacity to deliver services at field levels as well as permit timely reaction to emerging problems. Several examples have mentioned decentralization as a main force behind improving management capacity of extension systems in such cases as China, Ghana, and Nepal (Amezah and Hesse, 2002; Nie et al., 2002; Thapa and Ojha, 2002). Improved performance can also be expected to result from improved information about local resources and conditions, and from the participation of the users in planning, implementing, and monitoring of extension programs.

*Decentralization improves the financial performance of extension*

Decentralization can contribute to improving the financial performance and maintaining the fiscal stability of agricultural extension systems at the local level. To achieve this goal, extension administrators at the local level can use a number of financial and managerial tools, including rational decisions to balance expenditures with revenues, reforming the mechanisms for managing and recruiting staff, providing incentives and motivation, and increasing the revenue for public extension. The central government can help improve financial performance at the local level by providing clear financial guidelines and promoting transparency and accountability. Moreover, empowering farmer groups through active participation will allow farmers to watch over the implementation of extension programs including the utilization of extension funds.

*Decentralization of the Chinese agro-technical extension system*

In China, prior to the economic reforms that began in 1979, there were many separate agricultural development agencies serving farmers at the county and township levels, including the Extension Station, Agro-Research Institute, Crop Cultivation Station, Plant Protection Station, Seed Station, Soil and Fertilizer Station, and the Agro-Technical School. These individual agencies were weak, duplicated efforts, and were generally inefficient. To develop a strong, grassroots extension system, these different stations were integrated into a new County Agro-Technical Extension Center (CATEC). This new integrated approach created many efficiencies and allowed more resources to be focused on extension priorities within each county. This approach was pilot tested in 29 counties during the early 1980s and subsequently expanded throughout the country during the 1990s. At the present time, over 80% of the counties in China have adopted the CATEC model (Swanson et al., 2003b).

As CATECs and Township Agro-Technical Extension Stations (TATES) became established, they began taking on increasing responsibility for crop-related science, technology, and education activities within each county. First, the county government, through the Department of Agriculture, took increasing responsibility for funding county extension activities (Maalouf et al., 1991). By 1993, when the 'Law of

the People's Republic of China on the Agricultural Techniques Extension' was passed, each level of government (national to the township levels) became fully responsible for providing both capital (facilities and equipment) and operating funds for their own respective extension activities (Nie et al., 2002; Swanson and Samy, 2002).

In addition, other county-level government offices began collaborating with CATECs to allocate funds for development projects and/or to provide training for farmers. For example, CATECs began submitting proposals to the County Department of Science and Technology (Nie et al., 2002). If these proposals focused on promising technologies, addressed real needs and had the political support of farmers within the county, then they were likely to be funded. CATECs also cooperated with other government offices, such as the County Women's Federation (CWF), in providing training for women farmers. By partnering with these different government offices, CATECs were able to gain access to new sources of operating funds and to build strategic alliances within the county for the benefit of rural farm households (Swanson et al., 2003a).

At the village level there are large numbers of very small farmers that need to be reached with extension programs. During the 1980s, as the CATEC system was being established, CATECs and TATES focused their efforts on demonstration farm households (DFHs) as the key focal point in each village to demonstrate new food crop production technologies. In demonstrating new technologies, these DFHs were supported and monitored by village-level farmer technicians (FTs). These FTs are not regular extension staff; they are farmers with technical agricultural education who work 50% time on extension activities for a modest stipend (Nie and Wu, 1993 ).

During the 1990s, as the agricultural sector began to diversify, younger, better-educated farmers began to specialize in higher-value farm products, such as fruits, vegetables, and specialized livestock. This new generation of farmers, designated as specialized farm households (SFHs), is more aggressive in seeking out promising technologies and new markets for their products. As described above, in an effort to solve input supply, technical, and/or marketing problems, these SFHs began organizing 'commodity specific' Farmer Associations (FAs). In townships or counties near larger cities, there may be 10 or more different FAs, with each group focusing on a different high-value commodity. These producer groups are becoming increasingly important now that China has joined the World Trade Organization (WTO) and are now competing for high-value overseas markets. For example, the apple growers of China now dominate the world market for apple juice.

### *Structural Change and Decentralized Decision-Making in India*

In India, during the Training and Visit Extension period, most extension activities, particularly, at the block and village level, were carried out by the Department of Agriculture (field crops) through its 'agricultural extension' service. Other departments, such as Animal Husbandry, Horticulture, Soil Conservation, Forestry, Fisheries, and Sericulture, had extension responsibilities, but lacked the field staff at the block and village levels to carry out these duties. Under the World Bank-financed National Agricultural Technology Project (NATP), village-level extension

workers (VEWs) became responsible for all subject-matter areas (single-window delivery) that are important in their respective service area, with technical backstopping and training being provided by Block Technology Teams (BTTs). The staffing composition of BTTs reflect those subject-matter areas that are important to sustainable agricultural development within each block, with agriculture (field crops) and animal husbandry officers being common to all teams. All BTT officers have a minimum of a university degree and some officers have post-graduate education (Sharma et al., 2001, p. 3).

In addition, Farmer Advisory Committees (FACs) were established at the block level in most project districts to establish formal stakeholder involvement in program planning and to increase accountability. The composition of these FACs is clearly specified to ensure that all socioeconomic groups of farmers, including women, schedule castes, and tribal groups are represented in the program planning process. In addition, at the block level, BTTs develop extension program plans and these plans are reviewed, modified, and/or approved by block-level FACs (Sharma et al., 2001).

Decentralized program planning and program integration is further strengthened at the district level through a new mechanism called the Agricultural Technology Management Agency (ATMA—meaning ‘soul’ in Hindi; therefore, this new ‘bottom-up’ agency is expected to address the broad-based interests of rural communities or to become the *soul* for agricultural development activities within each district). In each project district, ATMAs were created as ‘registered societies’. In India, registered societies are outside of the normal governmental structure, but these new quasi-governmental, autonomous institutions can receive, allocate, and spend government funds. The heads of all governmental departments concerned with agricultural research and extension within a district make up each ATMA Management Committee. The ATMA Governing Board (GB), which is composed of a cross-section of stakeholder representatives from across each district, reviews all block-level research and extension plans, and approves all block- and district-level research and extension funding requests (in addition to funding extension programs within the district, the ATMA also provides modest funding for those research activities that the Governing Board considers to be a priority within the district). This combination of an integrated research-extension structure, combined with ‘bottom-up’, program-planning mechanisms and procedures, represents a fundamental institutional and procedural innovation within the Indian extension system (Sharma et al., 2001).

As noted earlier, joint research and extension teams in each NATP district utilize PRA procedures to carrying out systematic ‘bottom-up’ needs assessment procedures. The results of these PRAs were then used in developing a Strategic Research and Extension Plan (SREP) for each district. Subsequently, BTTs use SREPs to develop more ‘location specific’ extension work plans for each agro-ecological zone within their respective block (called Block Action Plan or BAPs). These BAPs are prepared annually by the BTT and these plans are reviewed and must be approved by the FAC before being submitted to the district-level ATMA Governing Board for funding (Singh et al., 2006).

The main objective of district-level SREPs in India is to identify opportunities and to develop a strategy for increasing farm incomes through the diversification and

intensification of farming systems within each agro-ecological zone of the district. As described earlier, during the PRAs, the district teams look for ‘success stories’ that have the potential for further replication/expansion within the district. The block-level extension plans, in turn, outline how this strategy will be implemented through a systematic extension program. The Head of the Krishi Vigyan Kendra (KVK) within each district is a member of the ATMA Management Committee (known in English as Farm Science Centers; most KVKs are affiliated with a state agricultural university [SAU] and are staffed with junior-level faculty members. In addition to organizing training courses, most KVKs carry out on-farm research and demonstration programs on promising technologies within the district). Therefore, researchers from this district-level research institution also play an important role in the initial PRA in developing the SREP for the district, and then in developing and/or testing technical packages for high-value crops/products that can be successfully produced and marketed within the district (Sharma et al., 2001).

### **The Challenge Ahead for National Research and Extension Systems**

As noted in the first part of this paper, governments in both developing and industrially developed countries are reducing their investments in public agricultural research and extension. At the same time, as a result of the consolidation of transnational life-science companies, investments in agricultural R&D are being focused on a limited number of production problems associated with the major crop and livestock enterprises that are being produced worldwide. In addition, to maximize profits, these companies are organizing distribution and technical support systems that will directly transfer these proprietary technologies to large commercial farmers worldwide. This situation poses a major challenge for public research and extension, as well as for the one billion small- and medium-scale farmers that are being marginalized by the globalization of the world’s food system.

Public research and extension leaders need to recognize that TNCs have far more capacity and resources to develop and disseminate a range of technologies that will continue to increase the ‘production efficiency’ of many of the world’s major crops and livestock systems. Therefore, extension leaders should concentrate their limited resources on those crop and livestock systems that are economically important within the country and that will be largely ignored by the private sector. Based on these findings, it is recommended that policymakers refocus more of their public research and extension resources on more specialized, high-value, labor-intensive crop and livestock systems that can increase farm income and rural employment. Large input supply firms are less likely to invest in these types of technologies, since the potential profitability is far less and technology transfer is more difficult.

In addition, public research and extension systems need to expand their programs in the area of natural resource management, since this area will continue to be largely ignored by the private sector. In following this ‘public goods’ strategy, research and extension leaders can help alleviate rural poverty, maintain the country’s natural resources, and help improve the competitive position of the nation’s economy. In the process, the extension system can build social capital in rural communities and contribute to human resource development (leadership, technical and management

skills/knowledge) that will enable rural young people, over the long term, to secure non-farm employment and escape rural poverty.

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