

27502-002

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Outlook
ON
AGRICULTURE

This article is an offprint from
the journal *Outlook on Agriculture*,
a major long-established resource for
reviews and analysis of developments
in agricultural science and
related disciplines

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Beyond technology dissemination: reinventing agricultural extension

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Abstract: *This paper examines the challenges in reforming agricultural extension in India to meet the complex and heterogeneous demands of agricultural and rural development. While extension can and should play a much wider role in engaging with these issues, its performance remains restricted to the traditional one of technology dissemination. Fresh theoretical perspectives on the nature of innovation and appropriate institutional reform are opening up new vistas for extension. But the implementation of many of these necessary changes is hampered by outmoded understanding of its role and function, lack of partnerships among the different actors, limited expertise and lack of an explicit agenda on institutional learning.*

Keywords: *extension; innovation systems; policy; institutional reforms*

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Agricultural extension in India is at a crossroads. A decade after the end of the Training and Visit (T&V) System, the Department of Agriculture (DoA), the main Indian extension agency, is struggling to find a fresh direction and approach. At the same time, the nature of Indian agriculture becomes ever more complex. New opportunities (and threats) for trade in international markets join older concerns of supporting the rural economy, in which agricultural production and employment support the livelihoods of many of the poorest in society. The public sector, including both agricultural research and extension organizations, has also seen the emergence of new imperatives such as cost recovery, decentralization and privatization. The number and types of extension service providers have also increased. While many of these new initiatives are important, they have only a very limited presence considering the size of the country and its farming population. The great majority of extension remains publicly funded and publicly delivered. Although the requirements of farmers and rural families often go beyond agricultural production technologies, the emphasis continues to be on dissemination of crop production technologies, while more recently issues related to natural resource management have also been included.

The shortcomings of public sector extension

arrangements in India are well documented (Farrington *et al.*, 1998; Indian Council of Agricultural Research (ICAR), 1998; Department of Agriculture and Co-operation (DAC), 2000) and some reform measures have been implemented. But unfortunately, planning and evaluation of such programmes is based on a very narrow view of the proper role of extension, equating it to an agency for technology dissemination. This is certainly a role that extension can play. However, it is widely acknowledged that there are other important facilitating functions that it could perform to help create a stronger agricultural innovation system adapted to evolving rural economies and the agendas of stakeholders, especially the poor. To remain relevant, Indian agricultural extension has to reinvent itself. This will require considerable institutional and organizational changes in both the public research and extension arenas. This paper explains the restrictions that a technology dissemination focus places on the debate of extension reform and provides a more holistic viewpoint to help reconsider critical policy questions facing India's public research and extension organizations.

Since the core contention of this paper is that the underlying challenge facing extension is a theoretical underpinning that relegates it to a simplistic technology transfer role, we begin by reviewing the theoretical perspectives that have informed extension practice both

in India and internationally. We take this opportunity to explore fresh theoretical perspectives that conceptualize innovation in holistic systems terms, and which provide a framework for visualizing an expanded role for extension better suited to the complex and diverse needs of the modern Indian rural economy. In the remainder of the paper, these theoretical perspectives are used to reflect first on the history of extension in India, and then secondly to look forward, reviewing the implications of this fresh thinking for the implementation of India's new vision for extension. In the final sections, some principles for reinventing Indian extension are explored and an alternative vision of extension as a rural innovation management agency is proposed. While the paper's emphasis is on Indian conditions, it is believed that the lessons from this country may have equal validity in many other parts of the underdeveloped world.

In search of a paradigm: evolving theoretical perspectives in extension and innovation

The linear paradigm

The role identified for extension has been to disseminate technologies generated by public sector research organizations through appropriate dissemination strategies such as field visits, farmers' meetings, demonstrations, use of media, etc. The theoretical paradigm supporting this approach had been that of the 'diffusion of innovation' model suggested by Rogers (1962). This tradition evolved in a particular institutional context, based on well known case studies, notably the adoption and diffusion of hybrid corn in the USA in the 1950s. Diffusion studies helped show agricultural extension workers how to communicate new technological ideas to farmers, and thus how to speed up the diffusion process. It assumed that agricultural technology would diffuse from more progressive farmers to less progressive farmers over a period of time. Diffusion research and the theories and practices that it helped establish were greatly appreciated by extension service workers. Consequently the diffusion model became the main theory guiding efforts to transfer new agricultural technologies to farmers (Rogers, 1983).

This model of technology transfer is widely referred to as the linear model as it assumes a linear relationship between research, extension and farmer with organized publicly sponsored science as the source of innovation (both technical and institutional). Technology has been viewed as a product, (eg a new seed variety or a new type of farm equipment) or a process (eg correct spacing or weed control) that is developed by scientists, transferred by extension personnel and adopted by farmers. Many innovations in extension, notably the T&V approach, which is discussed below, tended to reinforce the linear transfer of technology models by focusing attention on ways of improving the efficiency of technology transfer. This left unquestioned the way the wider innovation process actually operated.

The myth of the smooth progression of research to adoption and diffusion among farmers still continues to influence the theory and practice of extension. Even though this *transfer of technology or linear model of*

innovation has been widely discredited (Biggs, 1990; Roling, 1994), efforts to dislodge it have been unsuccessful (Ruttan, 1996). The result of this is that tasks of technology development (research) and technology transfer to farmers (extension) are performed by two completely separate organizations with tightly defined and mutually exclusive roles. Such organizations also sit separately from other public agencies with allied roles in the rural development sector.

The systems paradigm

While the practice of extension may have remained stuck in the diffusion of technology model, more general thinking on the nature of agricultural technology development and promotion has, however, advanced considerably in the last 20 years. This includes the recognition that: innovation (technical and institutional) comes from multiple sources, including farmers (Biggs, 1990); and that how the agendas of different stakeholders are represented affects the 'appropriateness' of new technologies developed. Farmer participation in technology development and participatory extension approaches have emerged as a response to such new thinking. They have often failed, however, to challenge the wider institutional and political context in which 'participation' takes place. During the last decade, the extension literature has been notable for holistic ideas such as the Agricultural Knowledge and Information System — AKIS (Roling, 1994). This recognizes a wider set of information sources and the value of creating systems that assist in the generation and dissemination of knowledge, especially in the context of sustainable agriculture and progress towards an ecological knowledge system (Roling and Wagemakers, 1998).

More recently the notion of extension as part of a wider system has emerged. For example, the 'interdependence model' (Bennet, 1992) and the innovation systems framework (Lundvall, 1992) offer more inclusive ways of thinking about the actors and the institutional context in which the generation, diffusion and use of new knowledge takes place. This system of actors and process not only includes research and extension, but also technology users, private companies and non-governmental organizations, and supportive structures such as markets and credit.

The innovation system framework, in particular, places emphasis on the importance of learning as a means of evolving new arrangements specific to local contexts. This relates to the recognition that innovation is a social process, and innovations emerge from and are being defined by specific institutional and historical contexts. As such, it explicitly denies the value of blueprints and points to the value of the growth of diversity in approaches and practices. The political economy in which these processes and activities take place is viewed as a key contextual element, in which investigating and managing stakeholder agendas can help address the asymmetry of conventional research-extension-farmer relationships. Advocates of this approach suggest that its use for evaluation and planning of technology development and promotion activities is the only way to build locally adapted, collective operational capacities through which institutional concerns such as a poverty

focus can be monitored and sustained (Biggs and Smith, 1998; Hall *et al.*, 2001).

While these systems ideas clearly provide important insights for policy, they have not yet achieved widespread application. They do, however, have particular significance at this critical time for extension. As will be discussed in later sections, current imperatives for agricultural and rural development concern developing and engaging systems of production and marketing that are inclusive to the needs and agendas of the poor. This requires coordination of different sectoral efforts linked by effective relationships between different agencies and actors, accompanied by appropriate institutional development that strengthens the negotiating position of historically disadvantaged social groups. New technology certainly sits at the centre of these new systems, but the processes that produce it need to be much more closely integrated into the institutional innovations that emerge to diffuse and use it.

That is precisely the perspective that the innovation systems framework brings. It moves away from the old distinctions between research, technology transfer and technology use, and places policy emphasis on developing ways of making these three elements operate in an integrated fashion. It thus represents a shift from an emphasis on technology alone, to an emphasis on the wider process of innovation including the emergence of new ways of producing and applying technology. Inevitably this wider process is shaped by the institutional and political context in which it sits, and an important contribution of the innovation systems perspective is that it recognizes and manages that context. For policy, this gives three analytical principles that can be used to explore ways of strengthening innovation processes:

- (1) the extent and nature of links and relationships between different elements of the innovation system;
- (2) the policy and institutional factors that are not allowing relationships to form, or are skewing relationships that do not allow identified goals to be achieved — eg poverty reduction, export development, etc; and
- (3) the ability of the system to learn and innovate with new working practices relevant to specific social, economic, political and physical contexts.

The remainder of the paper examines Indian extension from these different theoretical perspectives. We return in the concluding sections to hypothesize about what extension might look like if the innovation system framework were applied.

Evolution of the Indian extension system

To understand the Indian extension system as it exists today and to plan its future, it is important to trace its evolution. The following sections review its development through the theoretical perspectives that informed its development (mainly the diffusion of technology model) and look to the future through the lens of recent innovation system thinking and relating extension to contemporary imperatives in rural development. The implementation of the Training and Visit (T&V) system of

extension during the late 70s through to the early 90s marked a pivotal period of change and, in a sense, defines the phases of extension in the country over the last five decades — the period before T&V, the T&V period and the period after T&V.

Pre-T&V period

As in many other developing countries, extension services in India have traditionally been funded and delivered by government. Organized attempts in this direction started after the country became independent in 1947. Pre-Independence efforts had been largely local attempts, driven mainly by the humanitarian essays of a few individuals and organizations. These were area-specific and had limited impact. Independent India acknowledged the relevance of extension quite early, a decade before organized attempts to strengthen agricultural research were initiated in the country. External aid for agricultural development emphasized extension in the 1950s. The so-called 'extension bias' until the mid-60s was mainly attributed to the overall importance given to extension in the Community Development, National Extension Service and Intensive Agricultural District Programme (IADP). There were two reasons behind this extension bias (Goldsmith, 1990). The first was a misplaced confidence in the relevance of modern technology; and the second, the view that peasant farming was economically irrational and that ignorance made small farmers hold on to traditional methods. Both assumptions led to the conclusion that the first step in agricultural development should be to establish mechanisms to diffuse the inventory of modern knowledge directly to end-users. Informing this was the 'diffusion of innovation' idea of Rogers (1962).

With no significant improvement in agricultural development, however, such views started changing in subsequent decades, and the need for the development of relevant technologies through research began to emerge. The strengthening and re-organization of research, the establishment of state agricultural universities and research stations, and institutional developments associated with the green revolution, while correcting the extension bias, also generated a lot of goodwill for extension, helping it to become firmly established as an inevitable arm of agricultural development. The discipline of extension education also grew and spread along this trajectory (Singh, 1973). Until the 1960s, agricultural extension was purely a function performed under the guidance of the state Department of Agriculture (DoA). A few voluntary organizations were also doing effective work in their limited areas of jurisdiction. The Indian Council of Agricultural Research (ICAR) became involved in extension activities in 1966, with the National Demonstration Programme. ICAR's involvement increased considerably in the later years, with the initiation and spread of *Krishi Vigyan Kendras* (KVKs — farm science centres). ICAR also initiated programmes such as the 'Lab to Land' programme and the Operational Research Programme, which were merged with the KVKs in the 90s. Since the 1960s, State Agricultural Universities (SAUs) have initiated training programmes (for officials and farmers), demonstrations and exhibitions, and these were strengthened with the establishment of the

Directorate of Extension in each SAU. Establishment of radio, and later television stations, led to special rural extension programmes through these media. Organizations for the development of special areas (Command Area Development Authority) and commodities (Commodity Boards) also started giving emphasis to extension.

T&V period

T&V extension was introduced in India in the mid-70s with World Bank funding. The approach was a response to the perceived inefficiency of extension to deliver messages to farmers. It did not fundamentally question the linear logic of the diffusion of technology model of innovation, but instead sought to strengthen it. T&V thus assumed the lack of management orientation of extension officers and their poor links with research as the main reasons for inadequate transfer and adoption of technology. The key elements of research and technology transfer remained operationally separate tasks, but efforts were made to improve communication from the producers of new knowledge — research — to extension and then to farmers. A key element consisted of protocols to increase the intensity of interaction of extension with research, as well as with farmers and between farmers, with contact farmers assuming an informal extension role.

By the mid-80s, T&V had spread to about 18 states. It certainly improved funding and manpower intensity, and introduced a number of organizational changes, including a unified command for the service. To improve research-extension linkages, T&V institutionalized monthly workshops involving research scientists and extension officers. One of the critical failures of T&V, however, was that it was a centrally devised and planned approach, with operational targets, protocols and conventions that ignored local contexts, imperatives and opportunities. Once again India was faced with implementing an institutional innovation that had been developed in a different institutional and cultural context. In other words, it was an externally generated blueprint. Partly for this reason, T&V remained blind to the agroclimatic and socioeconomic diversity of the country and, as a consequence, produced mixed results. A review of evaluation studies of the system, for example, revealed its impressive gains (in terms of productivity) in irrigated areas and its limited impact in the majority of the rainfed areas. Moreover, T&V operated largely in an interpersonal mode without planned and optimum utilization of information support and with low levels of involvement of farmers. Nor did extending the T&V approach to natural resources management and integrated pest management meet with success (DAC, 2000). The poor performance of T&V in the majority of rainfed areas was explained by the extension profession as reflecting the lack of viable, need-based and appropriate technologies to disseminate. The research profession viewed it as another indication of a weak extension system that was failing to disseminate technologies that it had produced.

The role of extension in T&V was to transfer the 'messages' (practices to be adopted by farmers) generated by researchers and presented to them via workshops. Its performance was also thus evaluated in terms of productivity or areas under adoption of improved technologies. Poor research-extension linkages were

identified as being among the major weaknesses of T&V extension (World Bank, 1985). Although extension has to maintain effective linkages with several systems (with each system comprising organizations holding different pieces of information), only the research-extension linkages were emphasized. Information flow was mostly top-down (Macklin, 1992) and weak feedback did not result in any fundamental change in the way research priorities were set at research stations (Jha and Kandaswamy, 1994). Finally this period also witnessed the emergence and increasing role of NGOs, agro-input industries and agro-processors in agricultural extension activities. A diverse number of extension services are being provided by input agencies, especially fertilizer companies. Farmers' associations and producers' cooperatives in selected crops and commodities also started becoming involved in extension activities, primarily for the benefit of their member farmers.

Post-T&V period

With external support drying up, states started to downplay the rigour of T&V, and the 90s saw many experiments in extension service provision. These included decentralization (extension planning and control under elected bodies at the district/block level); contracting NGOs for some extension activities; adoption of a group approach (instead of the earlier individual approach); use of para-extension workers (as substitutes for field extension workers from the DoA); setting up multidisciplinary teams of scientists from state agricultural universities at the district level; setting up agro-clinics; and the formation of a registered society, the Agricultural Technology Management Agency (ATMA) at the district level, by integrating the functions of key stakeholders involved in agricultural development in the selected districts. Another trend has been the formation of new, quasi-government organizations to implement specific agricultural development programmes. This has been a reflection of the increasing inability of the line departments (especially the DoA) to deliver results because of their strictly enforced hierarchies, inappropriate reward structures, lack of accountability to clients, weak partnerships with allied organizations and limited expertise. Although a number of examples of innovation within the public sector can be found, few of these have been monitored or evaluated in ways that would answer questions on their impact, on whom, and under what preconditions.

Despite their perennial weaknesses (diminishing operational support and the poor technical background of the majority of its employees), village extension workers (VEWs) from the DoA are still an important source of information for farmers in India, even though information is clearly targeted at grain production, visits are irregular, and the service is preoccupied with the implementation of public sector schemes linked to subsidies and subsidized inputs. The deteriorating fiscal condition of states has also been reflected in the performance of the DoA. With about 85% of the resources going on salaries, there has not been enough left for operational expenses, and this has resulted in underutilization of existing facilities and personnel (Swanson, 1996; Sulaiman and Sadamate, 2000).

In the more remote and difficult areas, the DoA has considerable difficulty in recruiting and retaining field staff, and these areas often have large numbers of vacancies and frequent staff turnover. The main extension function performed by the state DoA is the delivery of technical messages to individual farmers or farmer groups through visits to specific locations in the VEW's circle/area. The degree of satisfaction with the information support provided by the DoA varies widely. Farmers' dependence on other farmers and input dealers as sources of information also continues to be high.

The nineties witnessed a number of new initiatives from the private (profit and non-profit) sector (Shingi and Priya, 1998; Sulaiman and Sadamate, 2000; Chandrashekhara, 2001). With farmers willing to pay for services, private consultancy services in agriculture have started gaining ground. Producer cooperatives, NGOs and input companies are presently experimenting with new initiatives. However, there has not been any coordination of activities among the various agencies at district level. Even within the research and extension system, intra-system linkages between different organizations working in the same crop/commodity/enterprise/geographical area have been weak. This has severely restrained the performance of these organizations, especially the performance of the public sector research organizations on which the public extension system has relied heavily for technological support. Case studies on the horticultural system have amply illustrated this (Hall *et al.*, 1998 and 2001). Inter- and intra-department coordination for extension programmes in both ICAR and SAU systems also appear to be weak (ICAR, 1996). In the case of extension, linkages between *Krishi Vigyan Kendras* and the State Department of Agriculture in most cases is less than satisfactory. Although a number of new organizations have been formed to do extension in selected regions, crops and enterprises, the DoA continues to operate alone, ignoring the presence of these organizations, which can potentially complement and supplement its efforts.

DoA field workers are implementing programmes for the distribution of subsidized inputs and have little time left for analytical field visits or participatory problem solving with farmers. This is not a surprising outcome, since it has been estimated that administration for scheme implementation and meetings with higher officials consume 60% of the working day for both agricultural officers and assistants (Jinraj, 1999). Although enforcing a minimum qualification of graduation in agriculture at entry level is to be welcomed, the fact remains that agricultural graduates lack many of the social science skills necessary for field extension work. Banning all future recruitments in the new cadre without creating another cadre of qualified manpower is not the solution. Nor is dependency on para-extension workers going to deliver results. Evidence from Rajasthan reveals that para-workers, though addressing the thin spread of DoA manpower, are constrained to deliver the same technologies and information that the VEWs deliver (Sharada *et al.*, 1996).

Finally the much publicized group approach embraced by the DoA resulted in the formation of a number of such groups, but most of these remain dysfunctional and

inactive due to lack of clarity of purpose and follow-up support for the groups' activities (Jinraj, 1999).

Emerging imperatives in extension and rural development

There is an increasing realization that 'public extension by itself cannot meet the specific needs of various regions and different classes of farmer' (DAC, 2000). The draft Policy Framework for Agricultural Extension also affirms that 'the policy environment will promote private and community driven extension to operate competitively, in roles that complement, supplement, work in partnerships and even substitute for public extension'. Although the above policy declaration seems to portray a genuine response to the changing times, the practical level of preparedness by the public sector to work in a multi-institutional environment looks not at all encouraging (Alsop *et al.*, 1999). A number of developments, namely tighter government finances and economic reform policies (liberalization, redefining the role of state and private sector) are forcing governments to think along new lines of funding and delivering extension. Over the last decade, there has been an increasing realization of the importance of tasks such as community mobilization, conflict management, problem solving, education and human development, and the need for extension staff to acquire social science skills to perform these tasks (van Beek, 1997; Farrington *et al.*, 1998; Sulaiman and van den Ban, 2000).

In addition, changing rural development agendas now demand that extension plays a major role in reducing the vulnerability of the poor (Christoplos *et al.*, 2000; Berdegue and Escobar, 2001). Solutions for reducing vulnerability rarely lie in the transfer of production technologies as such, but often in improved access to information on wider livelihood choices and institutional support (such as micro-finance, micro-enterprises, entrepreneurship development, market access, etc). Extension needs a higher level of flexibility and a wide range of expertise to assist the poor with these various options (Sulaiman and Holt, 2002).

To meet farmers' changing needs for information and advisory support (van den Ban, 1998), extension should engage with a wide range of issues related to agriculture. These include markets, credit and insurance, in addition to technology and research services and making arrangements for the supply of inputs. An organizational development role is also envisaged as a way of strengthening the negotiating position of farmers in this arena. The best extension practitioners have always known the importance of collective learning in devising successful, locally relevant extension agendas and approaches.

In India, although extension practices have changed over time, their role and relationship with research thus remain stuck in the institutional design of technology dissemination. Moreover, the continued obsession with dissemination can also be seen in more recent initiatives. For example, under the National Agricultural Technology Project (NATP), initiatives exploring new extension approaches fall under the theme of *Innovations in Technology Dissemination*. This narrow focus has restricted the emergence of a more broad-based role and the

potential contribution this could make to strengthening rural livelihoods, the agendas of which include but often go beyond agriculture. While these types of observation suggest that the system concepts discussed earlier would be useful as a way of rethinking extension on a broader canvas, the reform process in India has not been so expansive. Accordingly we shall now examine new policy goals from the standpoint of these systems perspectives.

New policy goals

The national agricultural policy (NAP) emphasizes the need for broad-basing and revitalizing the extension system. It also calls for the regionalization of agricultural research, strengthening research-extension linkages and bringing in innovative and decentralized institutional changes to make the extension system farmer responsible and accountable. NAP demands a renewed emphasis on a watershed approach, the involvement of farmers and landless labourers for the development of pastures/forestry programmes on public wastelands, sensitization of the farming community to environmental concerns, integrated pest and nutrient management, agroforestry, evaluation of traditional practices, greater emphasis on horticulture, floriculture, roots and tubers, plantation crops, aromatic and medicinal plants, bee-keeping and sericulture. Greater attention is to be given to the development of marketing infrastructures and techniques of preservation, storage and transportation with a view to reducing post-harvest losses and ensuring a better return to the grower. It also talks about collaboration between producer cooperatives and the corporate sector to promote agro-processing facilities.

To meet the challenges facing Indian agriculture, all the above goals need to be addressed squarely. Extension can and should play a greater role, especially in enhancing the capacity of farmers in accessing technological solutions, managing common property resources and in gaining greater control of the whole value chain from production to value addition and eventual sale to the consumer within the country and overseas. New strategies need to be evolved through a series of learning approaches. Playing a technology dissemination role at the end of an innovation process is no longer sufficient. The NAP does not specify the type of institutional and organizational changes required to meet the above policy goals. Some of the changes suggested include encouraging different agencies (KVKs, NGOs, farmer organizations, cooperatives, the corporate sector and para-technicians) to organize a demand-driven production system, skills upgrading for public extension functionaries, cost recovery of extension services, and improving women farmers' access to inputs, technology and farming resources. These alone are not enough. The Policy Framework for Agricultural Extension (PFAE) of the Department of Agriculture and Co-operation spells out in more detail the current thinking on addressing the new challenges.

Policy Framework for Agricultural Extension

The policy discussion document released by the DAC in late 2000 envisaged a number of significant changes in the provision of publicly funded extension in India (Table 1). It must be noted that the primary responsibility to

provide extension lies with individual states, not with central government, and so much will depend on the degree of acceptance of these ideas by the states. The fact that central government support is envisaged for certain types of change will undoubtedly enhance the prospects of ideas being implemented. However, implementation is likely to be slow and uneven, and there is as yet little recognition of the fact that many of the proposed ideas have already been tried with little success, and that others have limited prospects. Nevertheless, this represents an effort to place extension debates into a much wider policy context, and so merits close consideration.

The rhetoric of reform and the reality of implementation

Although the broad contours of policy change suggested are well considered and relevant, the PFAE underplays some crucial implementation problems of introducing reforms. In particular, the wider institutional framework of public extension imposes a number of restrictions on the introduction of change and the development of new approaches. *First*, as extension performance is still judged in technology adoption terms, the prescriptions for its reform continue to focus predominantly on improving the efficiency of dissemination. *Second*, because extension is administered as a centralized hierarchy (at the centre and at state levels), reform guidelines are both centrally generated and universal. The consequence is that the institutional innovations necessary to produce new, locally generated organizational forms are likely to be stifled by blueprints and targets for uniform implementation of programmes. Other issues include the prevalence of civil service behavioural norms across the hierarchy, including the pursuit at all levels of what may be locally inappropriate targets, rigid interpretations of norms leaving local workers with little room for manoeuvre, the absence of substantive rewards linked to performance in responding to client needs, frequent transfers and reluctance to serve in what are perceived as punishment postings.

Third, centralized financing and accompanied monitoring and evaluation also restrict the need to develop local accountability. The large size and diversity of the country and the division of responsibility for research and extension between centre and states also impede feedback on new requirements, responsiveness to them and accountability to the users of new technology. A related element is that both national and donor agencies have been eager to commit substantial funding for major programmes, but have been reluctant to make modest investments in the systematic institutional evaluation of earlier programmes to draw out generic principles that govern the relative success of particular programmes. *Fourth*, because the understood role of extension is highly restricted, even where reform prescribes training, there is no recognition of the need to develop the skills to innovate (technologically and institutionally) and generate new location-specific approaches. Lack of cross-learning and the presence of permanent civil servants across all levels of the extension hierarchy further impede any chance of innovation. Capacity-building efforts for greater extension effectiveness also have to include many other organizations and cannot be restricted to the training of extension personnel alone.

Table 1. Main provisions of Central Government's policy discussion document on agricultural extension.*At the policy level*

- A move towards a farming systems approach.
- Partnerships with private and other public agencies in extension provision, including: public funding of private provision; cost-recovery for some services; skill enhancement among farmers; linking of technology advice to new market opportunities; and local-level accountability of extension workers to farmers.

Institutional restructuring

- Some reduction in the number of village-level extension workers, and instead a focus on small Block towns (a Block being an administrative unit of some 70 villages) where single-window extension services will be provided, using the Agricultural Technology Management Agency (ATMA) model.
- Using participatory Strategic Research and Extension Plans (SREPs) to drive local-level technology generation.
- Extension delivery at the Block town level complemented by strengthened farmer-interest groups capable of creating 'demand pull' on the system.

Financial reforms

- Central Government will contribute towards operation and management costs in future, though salary costs will remain the responsibility of the states.
- Additional public funds will go into a number of new areas, including the payment of honoraria for para-extension workers, and support to NGOs involved in local-level group formation.

Strengthening research-extension linkages

- Preparation of SREPs, with efforts to reactivate existing interactions, such as biannual meetings between state DoAs and the SAUs, and the national pre-season meeting between ICAR and the DAC.

Capacity building and skills upgrading

- Central Government will support training for extensionists once the states have formulated a Human Resource Development policy for extension.
- Such training will include social science and information technology (IT) components not previously incorporated into training.
- All agencies (public and private) will be networked electronically to state headquarters, the SAU, and MANAGE.

Mainstreaming women in agriculture

- Women's access to extension and training will be enhanced.
- Male extension workers will be sensitized to the needs of women farmers.
- Civil service rules will be examined for gender bias.
- Access by female extensionists to training will be improved.

Use of media and information technology

- Provision of online market information.
- Support to the private sector to establish IT information kiosks.
- Wider use of mass media for extension.
- More farmer participation in mass media programmes.

Financial sustainability

- Provisions to privatize the 'private goods' elements of extension, especially in more favoured areas.
- Provisions for cost recovery.
- Co-financing of extension via farmers' organizations.
- Liberalization of the regulations governing commercial activities by training centres, etc to allow profits to be retained.

Changing role of government

- The role of government is seen largely in the neo-liberal terms of provision of public goods, and the creation of an enabling environment for efficient functioning of the private sector, with separate provision to make good any market failures not otherwise addressed.

Source: DAC, 2000.

Finally, it is not just the public extension system that needs reform. A new (and much needed) relationship with public agricultural research organizations cannot emerge until they too undergo considerable institutional change. The same is true for the broader set of public agencies allied to rural development. The deep-rooted perceptions of social status that place research above extension and many categories of rural poor (scheduled castes, scheduled tribes and other backward castes) at the bottom of the hierarchy, are also limiting effective interaction among different agencies and groups. To meet emerging challenges, extension needs to overcome the constraints imposed on it by the conventional understanding of its role and function. The reforms suggested

in the PFAE will not by themselves reinvent Indian agricultural extension unless they are accompanied by a much more explicit agenda of institutional learning and change for the public agencies involved. How then might this be approached?

Principles for reinventing agricultural extension

- The PFAE already contains one of the first key principles for reinventing agricultural extension, namely a much expanded role. Farmers need a wide range of services, with improved access to markets, research, advice, credit, infrastructure and business-development services.

- A second principle is a more explicit acknowledgment of the changing rural development agenda, particularly the demand for extension to play a major role in reducing the vulnerability of the poor.
- A third premise bringing together these two principles is the need to re-map different elements of agricultural innovation systems in ways that address conventional service-client asymmetries. Clearly this is something that has to be devised locally, with arrangements evolving over time.
- The fourth related principle therefore concerns the adoption of a learning approach where interventions are inherently experimental and iterative.

However, these principles will not be operationalized unless there is a more inclusive conceptual approach covering all the different actors involved in technology generation, transformation, diffusions and use, and the institutional context in which it happens. An innovation system framework provides fresh theoretical perspectives for reinventing agricultural extension. But what does this mean from a practical perspective?

Reinventing agricultural extension from an innovation systems perspective

Extension within the innovation system is going to be one node (potentially a central node) among the wide range of nodes whose interactions produce, diffuse and use economically useful knowledge. Ideally extension should be able to:

- (1) identify the different nodes in the innovation system and evolve mechanisms to bring them together around its objective and facilitate capacity building among these actors;
- (2) negotiate and manage a series of relationships at different levels with diverse organizations;
- (3) provide information on the wider livelihood choices and institutional support available;
- (4) act as bridging organizations that can access (and also fund) knowledge, skills and services from a wide range of organizations to meet the needs of clients;
- (5) organize producers and rural poor to form viable economic organizations;
- (6) promote information flow, sharing perspectives and facilitate learning among the different actors; and
- (7) experiment with and learn from new technological and institutional innovations.

Our studies on the emerging institutional arrangements have revealed a number of cases in which organizations have played many of these roles. For instance, the International Development Enterprise (IDE), an NGO that promoted treadle pumps in Eastern India and Bangladesh could succeed only because it established relationships and developed the capacity of the manufacturers, dealers, service and repair firms in addition to generating demand for these pumps through appropriate communication strategies. Similarly in the ongoing project on developing a packaging technology for tomatoes in Himachal Pradesh, the IDE's apparent success has been due to its ability to negotiate and manage a series of relationships with IIM, Ahmedabad, other NGOs, cardboard manufacturers, transporters, commission agents and

farmers (Clark *et al.*, 2001). The success of the Kerala Horticultural Development Programme in supporting vegetable and fruit growers in Kerala has been due to its adoption of institutional learning as the key management tool (Sulaiman and Hall, 2002).

The goal of extension must therefore move from technology dissemination to 'system management', 'building coalitions of different stakeholders', 'leading the innovation agenda' and 'building new learning organizations'. Clearly the public extension system in India will have to undergo enormous institutional and organizational change and capacity development to adopt this new role. However, some of the underlying principles of decentralization, institutional learning and change, shifting the skill base and organic growth of extension innovations will clearly need to be part of the future if we do not want to be stuck in the past. Extension scientists in ICAR and SAUs can facilitate this process of change if they can broaden their role from the promotion of technologies to facilitating technology development (contributing crucial social science perspectives) and application (experimenting with institutional innovations and facilitating linkages within the innovation system).

Conclusions

To meet the goals of the NAP, extension has to play a wider role than it did in the past. It needs a much larger degree of flexibility, a learning environment and a wider range of expertise to fulfil this expanded role. Special attention needs to be given to understanding the difficulties of implementing new ideas in an old and rigid institutional hierarchy. Only then will new initiatives be successful and sustained. The innovation system framework provides fresh perspectives to organize agricultural technology development and promotion activities to achieve the goals of the NAP. Although the reform process takes into account these changes, planners must face up to the need for considerable institutional change and learning if extension is to escape from the shackles of a technology dissemination role.

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