

Challenges in Indian Agriculture and its Implications for Organizing Extension

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Abstract

India's economic security is heavily dependent on agriculture. About half of India's population is either wholly or significantly dependant for their livelihoods on some form of farm activity – be it crop agriculture, horticulture, animal husbandry or fisheries. Although the Green Revolution increased production and productivity of food crops, improved food security and raised rural incomes, India still has a large poor (27.5 per cent of the population living below the poverty line based on 2004-05 data) and malnourished population.

Producers in far-flung and interior areas and those regions that are less integrated with markets still suffer from lack of access to appropriate services (credit, inputs, market, extension etc). Slackening growth in rain fed areas has also resulted in widespread rural distress. Increasing de-regulation of trade has added new challenges to Indian farmers, who are forced to compete on quality and prices on several products not only in the export market, but also in domestic markets. However, quite often only the large farmers are able to integrate their production to suit the demand cycles and quality standards and small and marginal farmers are left out of these arrangements. All these developments have led to the expansion of contract farming arrangements — most of them led by agri-business companies. Indian agriculture is essentially small farm agriculture with the majority of farmers owning less than 1 ha of land. Small and marginal farmers now constitute over 80 percent of farming households in India.

Agricultural extension services can and should play an important role in addressing many of these challenges. Perhaps, there is no agency at the ground level, other than agricultural extension services that can provide knowledge support to farmers and other intermediaries who are supporting farmers and at the same time support

programme implementation. Considering the changing nature of agriculture and the evolving challenges, producers currently need a wider range of support, including organizational, marketing, technological, financial and entrepreneurial. To be successful, farmers require a wide range of knowledge from different sources and support to integrate these different bits of knowledge in their production context. So, a multi-agency Extension service is needed to meet these challenges.

Keywords: Marketing, technological, financial, entrepreneurial

“Expansion of farm incomes is still the most potent weapon for reducing poverty” (Planning Commission of India, 2011).

India’s economic security is heavily dependent on agriculture. About half of India’s population is either wholly or significantly dependant for their livelihoods on some form of farm activity – be it crop agriculture, horticulture, animal husbandry or fisheries. Although the Green Revolution increased production and productivity of food crops, improved food security and raised rural incomes, India still has a large poor (27.5 per cent of the population living below the poverty line based on 2004-05 data) and malnourished population. Though food grain production has touched a new peak of 241 million tones in 2010-11, growth in agriculture in the Eleventh Plan (2007-12) is likely to average only about 3.3 percent per year (Planning Commission, 2011). The Draft Approach Paper to the 12th. Five Year Plan argues the need for ensuring a minimum of 4 per cent growth in agriculture during the XIIth. Plan (2012-17). Larger agricultural regions with low and uncertain rainfall (arid and semi-arid regions) are yet to witness significant improvements in productivity and rural income. Producers in far-flung and interior areas and those regions that are less integrated with markets still suffer from lack of access to appropriate services (credit, inputs, market, extension etc). Slackening growth in rain fed areas has also resulted in widespread rural distress.

Indian agriculture is essentially small farm agriculture with the majority of farmers owning less than 1 ha of land. Small and marginal farmers now constitute over 80 percent of farming households in India. The average farm size has been declining. “The slow growth of opportunities in the non-farm employment sector has led to the proliferation of tiny and economically non-viable holdings” (National Commission on Farmers, 2006). The land and water resource base for an average farm holding has declined over the last few decades and this essentially means producing more food from less land and water resources. There are wide gaps in yield potential and national average yields of most commodities are low. “In addition to stressed natural resources and very inadequate rural infrastructure, there was clear evidence of technology fatigue, run-down delivery systems in credit, extension and marketing services and of insufficient agricultural planning at district and lower levels” (Planning Commission, 2011).

The last few years have also witnessed the diversification of agriculture towards high value commodities such as fruits, vegetables and livestock products at a fast pace. High value commodities account for a large share of the total value of agricultural

production in a number of districts in India. Urbanization has also resulted in the emergence and rapid expansion of super-markets for retailing agricultural goods. “However the rising demand for food items and relatively slower supply response in many commodities has resulted in frequent spikes in food inflation. The need for a second green revolution is being recognized more than ever before” (Government of India, 2011).

Increasing de-regulation of trade has added new challenges to Indian farmers, who are forced to compete on quality and prices on several products not only in the export market, but also in domestic markets. However, quite often only the large farmers are able to integrate their production to suit the demand cycles and quality standards and small and marginal farmers are left out of these arrangements. All these developments have led to the expansion of contract farming arrangements — most of them led by agri-business companies. Experience of these arrangements however has been generally mixed. “In order to make contract farming an effective development tool, strong mechanisms must be in place to monitor contracts and ensure that growers — the more vulnerable partners — are not exploited” (Singh, 2005). These are currently lacking in most cases.

Studies have shown that at least one third of the future growth in productivity should come through innovations in crop technologies. “Public sector technology generation often fails to take into account farmers’ needs, perceptions and location-specific conditions for each crop, leading to significant gaps between the varieties released by public sector institutions and the number of varieties actually used by the farmers. Private sector research and the seed industry often focus on those crops and varieties which have adequate scale (massive markets) and scope (repeated sales). As a result, some crops/crop groups get little research attention” (Planning Commission, 2011). Private sector participation in Agricultural Research and Development (R & D) has been on an increase. Recent estimates reveal that the business funding (largely private) for agricultural R & D constituted about 11 percent of the total R&D funding (Pal and Jha, 2007). The largest private investment occurred in chemicals (pesticides and fertilizers) and food processing, followed by seed and machinery. More recently, growth has been in plant breeding and biotechnology, animal health and poultry. While this has added to improved flow of new technologies, there are concerns on the higher costs of these technologies and, therefore, the restricted access and small farmers being by-passed.

In the dry lands and mountain ecosystems, livestock contribute anywhere between 50 to 75 percent of total household income of the rural population. Support to these massive and highly diverse livestock populations in these regions is lacking (Planning Commission, 2011). Though fisheries sector provides employment to millions of people and contributes to food security of the country, its potential hasn’t yet been fully exploited through scientific management, training and market development.

The country is also experiencing change in key climate variables, namely temperature, precipitation and humidity which has already started affecting its agriculture and it has to consider adaptive measure to cope with these changes (Government of India, 2008). Measures may include the introduction of the use of alternative crops, changes to cropping patterns, and promotion of water conservation and irrigation techniques.

EFFECTS IN THE AGRICULTURAL EXTENSION SYSTEM

Agricultural extension services can and should play an important role in addressing many of these challenges. Perhaps, there is no agency at the ground level, other than agricultural extension services that can provide knowledge support to farmers and other intermediaries who are supporting farmers and at the same time support programme implementation. Considering the changing nature of agriculture and the evolving challenges, producers currently need a wider range of support, including organizational, marketing, technological, financial and entrepreneurial. To be successful, farmers require a wide range of knowledge from different sources and support to integrate these different bits of knowledge in their production context.

Addressing many of these complex issues requires solutions which are beyond the decision making capacities of individual farmers. Collective decisions on resource use and marketing would necessitate forming new forms of collaboration and this is particularly important as this sector is dominated by small farms — often with weak bargaining powers and limited political voice. While a production led strategy was the sole focus of extension earlier, this needs to be expanded to include a market led strategy to deal with the new challenges. But to play this role effectively, extension should expand its mandate beyond disseminating information on technologies so that it can better respond to the evolving demands for support and services of farmers. This includes, organizing user/producer groups, linking farmers to markets, engaging in research planning and technology selection, enable changes in policies and linking producers to a range of other support and service networks (Sulaiman and Hall, 2004, Rivera and Sulaiman, 2009). The number and diversity of organizations involved in extension and advisory services have increased over the past few years and extension should also play an increasingly important intermediation and facilitation role to support application of new knowledge including technical knowledge. To do this, it should also reform its strategies and programme delivery architecture to better meet the needs of its large number of clients representing varied resource base and risk bearing capacity.

AGRICULTURAL AND ALLIED SECTORS EXTENSION SERVICES IN INDIA: THE GROUND REALITY

Extension in today's Indian context, includes all those agencies in the public, private, NGO and community based initiatives that provide a range of agricultural advisory

services and facilitate technology application, transfer and management. While public sector line departments, mainly the Department of Agriculture was the main agricultural extension agency in the 60's and 70s, the last two decades have witnessed the increasing involvement of private sector, NGOs, community based organizations and media. With the external support drying up with the end of the T&V (Training and Visit) system of extension in the early 1990s, states have been left to fund their extension machinery and this has led to considerable weakening of public sector extension.

The situation assessment survey of farmers conducted during the 59th. round of the National Sample Survey (NSSO, 2005) provided valuable insights into reach of extension services across India. The data collected from 51,770 households in 6638 villages showed that sixty percent of farmer households did not access any information on modern technology that year. For the farmers who accessed information, progressive farmers and the input dealers were the main source of information. Broadcast media was also used a great deal to obtain information, which included radio, television and newspapers. The public sector extension worker was a source of information for only 5.7 per cent of farmer households interviewed and the Krishi Vigyan Kendra (KVK) accounted as an extension source for only 0.7 per cent of the sample farmers. Private and NGO extension services were accessed by only 0.6 per cent.

In June 2010, the central government issued revised guidelines on ATMA implementation (DAC, 2010) mainly to address the constraints associated with the national implementation during the past five years. The revisions included hiring exclusive staff for ATMA at the district and block levels, inclusion of farmer advisory committees at the block, district and state levels and greater emphasis on ATMA's links to the KVKs. ATMA is now operational in 603 districts of India spread over 28 States and three Union Territories. Provision of separate staff for ATMA has brought improved attention to ATMA. The revised 2010 guidelines are yet to be fully implemented in all states, though this is expected shortly. With improved links to KVKs, better convergences among different schemes/departments/agencies, and greater focus on Commodity Interest Groups, ATMA is expected to strengthen Indian extension system during the XIIth. Plan (2012-2017).

The number of Krishi Vigyan Kendras (KVKs) funded by the ICAR has increased during the last few years. Presently 641 KVKs are established in the country. KVKs have the mandate of promoting technology application through on-farm trials, demonstrations and training. These activities are implemented by a multi-disciplinary team. Performance of KVKs varies widely. The effective reach of KVKs in most cases is marginal mainly due to its inadequate linkages with other development agencies. Staff shortage, limited operational funding and a narrow mandate has also led to sub-optimal utilization of KVKs. KVKs can do better if its technical expertise is linked to the facilitation support and reach of the DoA/ATMA.

Extension and advisory services alone won't have all these expertise and skills, but it should partner with others who have these to provide integrated technical support to farmers. Extension, especially the public sector, including the DoA, ATMA and the KVKs do not have adequate knowledge or personnel skilled in market development, value addition, value chain development, farmer organizational development etc. These kinds of support are neither sought by extension nor is it provided to extension by others. Extension is unable to broker relationships and working arrangements with others actors who can bring these kinds of complementary skills and expertise. Moreover, lack of an inventory of various extension providers in a district also constrains exploration of areas of collaboration. Extension still operates in the Research-Extension-Farmer paradigm that restricts its linkages to only research and farmers. Extension needs to embrace systems frameworks such as innovation systems framework, which accommodates more number of actors, their interactions, role of institutions and learning to reinvent its future. This is especially so in dealing with the poor. Quite often, communities continue to remain poor due to weak, nonexistent and exploitative relationships with actors who have access to new production inputs, services and knowledge. Farmers need a range of support that improves their capacity to access, adapt and use knowledge, inputs and services and extension should reinvent its role in the changing circumstances.

India has a Policy Framework on Agricultural Extension (DAC, 2000) which was developed by the Department of Agriculture and Co-operation (Ministry of Agriculture) a decade back. The nature of agriculture as well as extension evolved considerably during the last few years and perhaps this is the right time to revisit the previous policy framework. India needs a well articulated policy on extension and advisory service provision articulating the broadened mandate of extension and the role of partnership in achieving this broadened mandate. While a generic policy framework at the national level is desirable, having a policy framework and operational guidelines on implementing extension policy at the state level would be the best way forward in reforming extension.

THE STATUS OF TECHNICAL SUPPORT FOR EXTENSION SERVICES IN INDIA

Even after more than three decades of improving extension's links with research and education, extension doesn't receive the needed technical support from research and education. Though the country has 20825 agricultural scientists (Jha and Kumar, 2006) and a very large National Agricultural Research System (NARS) comprising of 52 numbers of National Agricultural Research Institute, 06 numbers of Bureau, 22 Project Directorates, 16 National Research Centres, 79 numbers of All India Coordinated Research Projects (AICRPs) or National Agricultural Innovation Projects (NAIPs) and a reasonably vast pan-Indian Agricultural Education Network comprising of 60 numbers of State Agricultural Universities (SAUs), 01 number of Central Agricultural University

(CAU) and 04 numbers of Central Universities having Agricultural Faculty along with 5 ICAR Institutes acting as Deemed Universities within its public sector, it hasn't been able to support extension to the desired extent (ICAR – 2014).

In 2002, the total numbers of Full Time Equivalent (FTE) Agricultural Researchers in India was 16,737 with a total spending of 1,355 million US \$ (Beintema and Stads – 2008). According to Paul *et al.* (2012), in 2009, only 11,216 FTE researchers were active in India, compared with 13,575 in 2000. The aforementioned decline in the number of FTE Agricultural Researchers occurred throughout the system, but it was most severe within the SAUs. Their research staff dropped from a peak of 7,780 FTEs in 2000 to 6,158 FTEs in 2009. Public investment in agricultural R&D increased from 13.6 billion Indian rupees or 0.9 billion PPP dollars in 1996 to 33.4 billion rupees or 2.3 billion PPP dollars in 2009 (both in 2005 constant prices). Private-sector participation in agricultural R&D is dominated by companies involved in breeding, biotechnology, animal health, plant protection, and farm machinery. Their role in Indian agricultural R&D began to expand as small national input companies gradually diversified into research. This trend was further stimulated by the participation of large national and multinational companies. Since the mid-1990s, agricultural R&D spending by the private sector has increased fivefold (Pray and Nagarjan 2012). In 2008–09, the private sector spent 7.8 billion rupees or 0.5 billion PPP dollars (both in 2005 constant prices), on agricultural R&D investment, accounting for 19 percent of India's total (public and private). This figure does not include research on agricultural machinery, food, and beverages. However, the government's interest in agricultural research has dimmed ever since with more than 4,500 seats for scientists across various Central and State government research institutes lying vacant in 2012 - 2013.

40 per cent of faculty positions in State Agricultural Universities (SAUs) have been vacant for years and a fifth of the positions for scientists in the countrywide network of the NARS too have not been filled.

In 2012 – 2013, 19 per cent posts of agricultural scientists in different Indian Council of Agricultural Research Institutes are vacant. The R&D programmes in these institutions are being managed through judicious re-deployment of available scientific manpower. A study carried out by the National Academy of Agricultural Research and Management also showed that 40 per cent of faculty positions in state agricultural universities have been vacant for years. More than 1,100 vacancies remained vacant in the central agricultural research institutes across the country with the Delhi office of Indian Agricultural Research Institute having the highest number of seats for scientists vacant at 149. In state universities, 3,627 seats for scientists in agriculture and allied areas remained vacant at the end of 2010. This included vacancies in the agricultural research areas such as field crops, horticultural crops, forestry, fisheries, veterinary and dairy sciences (Ministry of Agriculture, Govt. of India, 2012). These figures are

self-explanatory to suggest that all is not ok in the Indian agricultural research and education system.

Research extension linkages has often been perceived and implemented as organizing formal interface meetings of the district level officials. While such meetings are important, increasing the number of such meetings or workshops with research is not the solution to this problem what is important is the nature and quality of the relationship which has to be reflected in more joint activities.

While extension needs expertise and interactions of a problem solving nature, what research often provides is broad or generic technical recommendations. There is huge variation in the natural resource base, farming systems and socio-economic conditions of farmers in rain fed regions and broad technological recommendations make vary little sense in these kinds of situations. Adequate focus has to be given on effective technology selection, optimization, application and management. In 2003, more than one half of ICAR researchers were engaged in crop research and SAUs researchers spent a considerably higher portion of their research time on crops research (70 percent) [Beintema *et al.*, 2008]. Moreover less number of researchers was working on livestock (15.8 percent) and fisheries (2.5 percent) [Jha and Kumar, 2006].

While KVKs being district level organization with much better grasp of ground situation can better support extension with aspects related to technology backstopping, integration and management, KVKs are not formally mandated to do this and instead they concentrate more on organizing its own training programmes. Each KVK has a provision for 1 (one) Programme Co-ordinator, 6 (six) Subject Matter Specialists and 3 (three) Programme Assistants.

Currently more than 4500 scientifically qualified staff that can potentially provide scientific technical support to field extension is available with the KVKs. Though joint guidelines recently issued by the Director General, ICAR (Secretary, DARE) and the Secretary (Agriculture), emphasizes much stronger support by research to extension at different levels, its implementation is uneven.

Lack of interest to support extension arises mainly from the lack of recognition of this important task in the personal evaluation of scientists. KVKs are funded separately by ICAR and their contributions are evaluated based on the number of On Farm Trials (OFTs), Front Line Demonstrations (FLDs) and Trainings conducted by them. Many KVKs don't have the mandated number of staff, adequate training facilities and operational funds. Lack of adequate number of scientists in the Research Centers, especially in the Regional Stations and lack of adequate operational funds [with both research and extension] to support regular and need based field level experimentations and interactions further constrain provision of technical support for extension. It may be wise for the KVK functionaries to decide that they will not try to help farmers with all the decisions they have to make, but to concentrate on few decisions, which the staff of the

organization is really competent. The multi-disciplinary organization like KVK should try to make their Subject Matter Specialists competent enough to support farmers on decisions considered as important by the farmers of their mandated district.

THE EMERGING ROLE OF KVKs IN AGRICULTURE AND RURAL DEVELOPMENT

Agricultural and rural development encompasses the all round development of people in its effective dimensions of economic, social and agricultural scenario. World Bank defined “Rural Development as a strategy designed to improve the economic and social conditions of life of a specific group of people – the rural poor. It involves extending the benefits of development to the poorest among those who seek a livelihood in the rural areas”. Today, this definition still holds good. Hence, it is to be seen how these mandate of reaching the poor with benefits of development to be achieved? There is no second opinion that in India, rural development could be attained through improving agriculture, forestry, animal husbandry, dairying, sericulture, fisheries, rural engineering, and rural crafts. Empowering rural population to enable them to practice these occupations to earn more and live better will be a more specific criterion. Agriculture extension efforts by KVKs have an important contribution to make. It is a grass-root level organization that can help to fight poverty, to foster education of rural people, and to promote behaviour and technology that link high productivity with natural resources sustainability.

Agriculture, however, must be more than economically competitive. It must also be suitable, which entails conserving natural resources, such as soil, water and biological diversity, and taking into account agriculture’s social and cultural context. This complex challenge can also be overcome if traditional and new knowledge are effectively combined in new production systems that are compatible with the cultural and social values of rural societies. Contributing to the development of such systems will be one of the most important tasks of KVKs. In India, the extension efforts, particularly transfer of technology efforts, have largely been taken up by the state departments of agriculture and other disciplines as a state subject. The Indian Council of Agricultural Research (ICAR) as the apex body to provide new technologies in agriculture and allied aspects has its own transfer of technology activities too. The extension efforts of ICAR have evolved through National Demonstration Projects, Operation Research Projects, Lab to Land Programmes, and integrating of these approaches to Krishi Vigyan Kendras (KVKs) since 1974.

However, the pre-independence attempts on agricultural development were limited in scale and geographical coverage. These attempts did not have any follow-up action and lacks specificity in terms of programme planning and implementation. The above constraints in the agricultural development has been done away through the introduction

of planning in the post-independence period which emphasized by a systematic and intensive approach.

The post independent extension education and development programmes launched by Government of India can be generally grouped into five categories. They are:

1. Community development programmes
2. Programmes for technology development
3. Programmes for development with social justice
4. Frontline extension programmes of ICAR
5. Agricultural Research and development programmes by ICAR and Govt. of India.

Farming System Approach replaces the conventional single discipline based, commodity oriented approach. The Farming system approach considers the farm, the farm household and off farm activities in a holistic way to take care not only of farming but also all aspects of nutrition, food security, sustainability, risk minimization, income and employment generation which make up the multiple objectives of farm households. Farming system considers interdependencies of the components under the control of members of the households as well as how these components interact with the physical, biological and socio-economic factors not under the household's control. The Farming system approach emphasizes that research and extension agendas should be determined by explicitly defined farmers' needs through an understanding of the existing farming systems rather than the perception of research scientists or extension functionaries. With current reforms and policies, the public extension system would continue to play a prominent role in technology dissemination. The large scale of small and marginal farmers and landless labourers are benefited by the public extension system. The other players involved in extension/transfer of technologies such as NGOs, Farmer's organizations, Private sector (both corporate and informal), para-workers etc. would actively complement/supplement the effort of the public extension agency. Extension mechanism will have to be driven by farmer's needs, location specific and address diversified demands. There is room for both the public and private sectors in the development of a demand based and feedback driven system. Technologies required addressing total farming systems are knowledge intensive. Public extension system will need to be redefined with focus on knowledge based technologies to upgrade and improve the skills of the farmers.

Farmers' capacity building is often seen within the limited perspective of giving them the knowledge and skills required to practice crop and animal husbandry in a better way. Though, knowledge and skills are fundamental to efficiency in any enterprise, Indian farmers need more than that because of the limitations and complexities under which they operate. The KVKs which have been mandated to work with farmers, farm

workers and rural youth directly as well as through field extension functionaries have the greatest challenge to make their clients more efficient, specialized and to be economically active. The fact that the need for agricultural and rural information and advisory services is to intensify in the immediate future exerts more pressure on KVK performance.

DISSEMINATION OF INFORMATION AND KNOWLEDGE THROUGH KVK

Currently, the impact of KVK activities is measured by the number of participants attending each learning workshop, the percentage of participants that adopt the technology/skill after the workshop, and changes in the participants' income. Like most of the public extension system, the focus of the centers is assessment and refinement of technologies through learning programs, on-farm testing, and field demonstrations. Information on market access and consumer demands is rarely considered. KVKs have been criticized for reaching limited numbers of farmers, and largely those within close range of the center. There are calls to increase the number of KVKs within a district, and also the number of staff. This could help address coverage of farming communities. The KVKs have also been criticized for working in isolation from other actors in the extension system, namely the private sector—and with increasing technology emerging from this sector, partnerships with such organizations are necessary. As already described, the link between the KVK with the state DoA staff and ATMA is weak. Despite the structural guidelines for the two systems to work together, there is in some cases a serious lack of partnership.

CHANGED EXTENSION SERVICE NEEDS OF THE INDIAN FARMERS

As a result of rapidly changing agricultural scenario at the advent of WTO, farmers have to make different decisions than in the past. They now have to face decisions on:

1. Which technology to use?
2. How to manage this technology? Experience shows that the success of a technology on farms depends to a large extent on its management.
3. How to use his capital, land, labour in the most profitable way? The methodology taught in farm management courses to make these decisions becomes more and more important for financial success of a farmer.
4. How and when to change his farming system?
5. Whether or not to take a full time or part time job outside agriculture for himself or his children?

This decision is of great importance for the welfare of the farm families. Everywhere with increasing incomes, the proportion of the labour force working

in agriculture decreases. Also, in India not all farm families will be able to make a decent living based on income only from agriculture.

6. For which products is there a good demand in the market? With the rapidly changing markets, farm income depends a lot on the choice the farmer makes on which products to grow and whether he produces the quality the market requires.
7. How to increase the share he gets from what the consumer pays for his products? How and when to buy inputs and sell products? Can it help to start a co-operative?
8. How to make decisions collectively on resource use and in farmers' associations? It is doubtful whether Indian agriculture can develop successfully unless farmers strengthen their associations.
9. How to find and use the most relevant and reliable knowledge and information, which the farmer needs for making decisions? Farmer, who do not receive and use new knowledge rapidly, will have difficulties to compete with other farmers inside and outside India. But they have to check whether the information they receive is reliable and relevant for their situation.
10. How to get credit and production inputs on time, place and at suitable rate to derive support and profits by the farmers?

Some of the potential ways forward for strengthening extension and advisory provision in India and for addressing the changing needs of Indian farmers; could be summarized under the following four points.

Pluralistic and Partnership oriented Extension Services

Considering the poor reach of extension currently and the limited investments in extension, India needs more public, private and NGO extension and better co-ordination among them. Some of the public funding should be used to expand pluralistic extension arrangements by way of contracting and developing joint programmes. The public extension should take a lead in connecting these different extension providers and enabling effective communication that can foster partnerships. Identifying potential partners and developing working relationships among the different agencies should be the main task of extension managers at the district level. In the case of ATMA, this should be the role of the Project Director, ATMA and he/she should be made accountable to this task.

Development of extension policies and operational guidelines to promote pluralism and partnerships at the state level would go a long way in reforming extension and enable public-private partnerships (PPPs).

More financial backstopping, working convergence and Inter and Intra Organizational Co-ordination

Extension needs more resources from public (central as well as state) and private sector. It also needs funding support from NGOs and producers and producer groups. ATMA is emerging as a platform for bringing convergence among different programmes, co-ordination among different actors and funding support by different agencies. If at least 10% of the resources under different schemes are spent on extension through ATMA, this would go a long way in enhancing extension support and ensuring sustainability of ATMA in the long run. ATMA and the private sector should come together to design specific extension interventions in a project mode to provide integrated technical support to producers. There is a need to develop an overarching policy framework that defines the role of the private sector in the agricultural sector at the macro level.

Shifting Research Focus on Small Holder Farmers

Finding better ways of reaching the small and marginal farmers and tenant farmers especially those in the rain fed and difficult regions and providing them with integrated technical support would continue to remain as a major challenge for extension. Extension needs much stronger research support to develop and promote context specific, disaggregated technological solutions in these regions having huge variation in natural resource base, farming systems and socio-economic conditions (WGAE, 2011).

More number of meetings and interactions among research and extension personnel alone are not going to address this problem. Regional research stations (ICAR and SAUs) and the KVKs should take a lead in providing research support to extension by way of more decentralized adaptive research and trainings. Farmers' knowledge and practices also needs to be integrated while designing appropriate technological solutions. Reforms should also focus on addressing the issues that currently constrain provision of this research support.

Support to the Change as a Process of Management

To remain relevant and to deal with the contemporary changes in agriculture and the wider support needs of farmers (organizational, marketing, technological, financial and entrepreneurial) extension has to broaden its mandate and should have a much wider range of expertise. The debate should move beyond technology dissemination and research-extension linkages to ways of promoting innovation and enhancing capacity for innovation. Extension needs professional support, for embracing new frameworks and approaches such as innovation systems and innovation management. It needs professional assistance to experiment and evaluate new policies and extension delivery models appropriate to each state, district or block.

It should have to develop a Human Resource Management Plan at the state level to figure out capacity gaps, bringing new expertise and enhancing capacities of existing human resources. The potential of ICTs also needs to be exploited to enhance coverage and effectiveness. Extension needs new manuals and guidelines on operationalizing many of these new approaches. A new culture focusing on experimentation, learning and change needs to be inculcated in extension organizations so that it continues to modify, improve or fine tune its approaches and strategies based on continuous learning. Perhaps introducing this learning-derived institutional change is going to be the most difficult aspect of the change management process.

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