REVIEW PAPER

Delivery Mechanism of Agricultural Extension Services to Farmer in India: An Overview

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ABSTRACT

Indian agriculture is in practice with traditional knowledge blended with new scientific knowledge. There are several agricultural technology have been evolved to push the production and productivity but to transfer the technology to the farmers, there are few approaches are tested. After independence, organized approaches were thought of lick community development, progressive farmer, cluster or watershed. The economic development, technological development and social development of the society has forced to the extension scientists to exercise the different approach and strategies. The paper discuss diferent strategies and approach and required policy modifications.

Key words: *Indian agricultur; Traditional knowledge; Scientific knowledge; Transfer the technology;*

The failure of the various extension delivery approaches in our country to effectively engineer significant and sustainable agricultural growth has become a major concern to all stakeholders, including the funding agencies and donor community. The concerns have been fueled lately by the wave of pluralism, market liberalization and globalization sweeping across the world and giving rise to initiatives that will enhance efficiency and effectiveness of not only the sub-components of extension delivery but the entire system of technology generation, dissemination and use. With a rapidly expanding population, environmental degradation, political instability, economic failure and the declining budget, re-thinking the way agricultural technology is delivered to farmers has become necessary. This re-thinking has brought to the fore some issues that need consideration by development seekers as they change the ways agricultural technology is taken to farmers.

Agriculture and Economy: Agriculture contribution in the gross domestic product is declining in India, which in 2008-09 touched at 15.7% from about 30% in 1990-91. During the last two decades, the average annual growth of agriculture sector was less than half (around 3%) of the overall average growth of the economy (6-7%) (*NAAS, 2009*). Industrial and service sectors have outpaced performance of agriculture sector during the last two decades. But the proportion of workforce engaged in agriculture did not commensurate with the decline of its share in the gross domestic product. At present also, agriculture sector provides employment to about 52 per cent of the workforce that used to be about 61 per cent in 1990-91. These starkly different trends reveal that incomes in non-agriculture sector are growing faster than agriculture sector. And a sizable workforce from agriculture is needed to be shifted to non-agriculture sector for income and livelihood opportunities. Hence, in the country the research and development focus needs to be reoriented in a way to develop and promote those technologies that raise agricultural income and ensure employment opportunities in the agri-supply chain to a vast majority of the workforce.

Smallholders' Agriculture: Our agriculture is dominated by small farmers, having small landholdings for cultivation. The average size of the landholding declined to 1.32 ha in 2000-01 from 2.30 ha in 1970-71, and absolute number of operational holdings increased from about 70 million to 121 million. If this trend continues, the average size of holding in India would be

mere 0.68 ha in 2020, and would be further reduced to a low of 0.32 ha in 2030. This is a very complex and serious problem, when share of agriculture in gross domestic product is declining, average size of landholding is contracting (also fragmenting), and number of operational holdings are increasing. Declining size of landholdings without any alternative income-augmenting opportunity is resulting in fall in farm income, causing agrarian distress. A large number of smallholders have to move to post-harvest and non-farm activities to augment their income. The research focus should be to evolve technologies and management options to suit needs of smallholders' agriculture, and also to involve them in agri-supply chain through institutional innovations.

Deteriorating Production Environment : To add to smallholders' problem, the quality of production environment is worsening. The problem of land-and-water degradation is becoming a key constraint in augmenting agricultural production. Available estimates reveal that nearly 120.72 million ha of land in the country is degraded due to soil erosion and about 8.4 million ha has soil salinity and water-logging problems. Besides, huge quantities of nutrients are lost during crop-production cycle. Annually, India is losing nearly 0.8 million tones of nitrogen, 1.8 million tonnes of phosphorus and 26.3 million tonnes of potassium deteriorating quality and health of soil is something to be checked. Problems are further aggravated by imbalanced application of nutrients (especially nitrogen, phosphorus and potash), and excessive mining of micronutrients, leading to deficiency of macro- and micronutrients in the soils. Similarly, the water-table is lowering steeply in most of the irrigated areas, and water quality is also deteriorating, due to leaching of salts and other pollutants. The green-revolution belt is exhibiting second-generation problems owing to over-exploitation and mismanagement of soil-and-water resources. These all problems can be rectified by better management options and application of amendments. The research and development challenge is to stop further degradation and go in for rehabilitation of degraded lands and water resources in cost-effective manner.

Growing Food Demand : The demand for food and processed commodities is increasing due to growing population and rising per capita income. There are projections that demand for food grains would increase from 192 million tonnes in 2000 to 345 million tonnes in 2030. Hence in the next 20 years, production of food grains needs to be increased at the rate of 5.5 million tonnes annually. The demand for high-value commodities (such as horticulture, dairy, livestock and fish) is increasing faster than food grains-for most of the high-value food commodities demand is expected to increase by more than 100% from 2000 to 2030. These commodities are all perishable ones and require different infrastructure for handling, value-addition, processing and marketing. This is a challenge as well as an opportunity. The challenge is that it appears to be a difficult task for attaining mountainous targets. And the opportunities would be in augmenting farm incomes, generating employment and in involving a number of additional stakeholders in the food-supply chain. For research and development, the key challenges would be: (i) to develop promising technologies and management options to raise productivity to meet growing food demand in a situation of deteriorating production environment at the lowest cost; and (ii) to develop appropriate technologies, create required infrastructure and to evolve institutional arrangements for production, post-harvest and marketing of high-value and perishable commodities and their value-added products.

Climate Change and Agriculture : Inter-Governmental Panel on Climate Change has projected that by the end of this century, global earth temperature is likely to increase by 1.80 to 4.00C. This would lead to more frequent hot extremes, floods, droughts, cyclones, and recession of glaciers. Dynamics of pests and diseases would be significantly altered. The projected increase in these events will result in greater instability in food production and will threaten farmers' livelihood security. Producing enough food for increased demand against the background of changing climate scenario is a challenging task for agricultural research. This would require increased adaptation and mitigation research, capacity-building, changes in policies, and regional as well as global co-operation.

Technology Landscape :Developments in molecular biology, biotechnology, nanotechnology, information

technology and geo-spatial technology are expected to provide significant new opportunities for productivity enhancement. These developments are also posing new challenges of capacity-building and human resource development. There is a need to develop organizational policy and guidelines aimed at enhancing inventions and accelerating innovations in agriculture to harness opportunities by integrating modern and conventional research approaches.

Emergence of Agri-Business : Conventionally, agri-marketing in India has been unorganized and inefficient; showing 18 to 25% losses in the entire supply-chain. However, the landscape of agriculture is expanding now, which includes agri-business in the supply-chain operations and management. The corporate sector is entering and investing at different levels in the supply-chain, thus linking production eco-regions with consumers in the promising domestic and global markets. A different paradigm in the food system is emerging that witnesses deteriorating and fragmenting production environment and consolidation in marketing environment in the post-harvest, processing and marketing with the entry of the corporate sector. Globalization is opening enormous opportunities for food and processed commodities while at the same time throwing challenge of competing globally. The critical issue for the future of the Indian agriculture is to evolve mechanisms for linking front-end activities of agricultural supply-chain (wholesale, processing, logistics and retailing) with its back-end activities of farm production that would lead to enhanced efficiencies, ensured remunerative prices to producers, assured markets and reduced production and market risks (*Rao, 2010*). There are plenty of opportunities for strong public-private partnerships in the agricultural research and development as well as for fostering relevant agro-enterprises and technology incubators.

In light of the above, in the Eleventh Plan to increase public investment further, from 3% of agricultural GDP to about 4%. But it also needs to do much more to ensure that future growth is more efficient, sustainable, and inclusive. This can be achieved by focusing on the following:

- With availability of land and water fixed, growth in agriculture can be achieved only by increasing productivity per unit of these scarce natural resources through effective use of improved technology. The research system has so far focused mainly on breeding varieties that increase the yield potential of individual crops by enabling more intensive use of inputs. Although such research did increase potential yields substantially in the past, it put less emphasis on efficient and sustainable use of soil nutrients and water, or on identifying location-specific farming systems with proper mix of crops and livestock, especially for rain-fed areas. Besides, the potential yields of new varieties being released seem to have plateaued suggesting that the current system is no longer leading to adequate outcomes. This 'technology fatigue' has to be countered by changing research priorities suitably.
- At the same time, frontline trials of various research departments provide clear evidence of large gaps between what can be attained at the farmer's field with adoption of available technology as compared to what is obtained with existing practices. Exploiting this potential must be the main source of yield growth in the Eleventh Plan because overcoming technology fatigue will take time. Moreover, since yield gaps vary considerably from crop-to-crop and from region-to-region, the strategy must enable specific plans for each agro-climatic region. Constraints vary considerably even by very aggregate zones. This will also require much stronger links between research, extension, and farmers.
- Action on the environmental front cannot wait in face of a possibly looming adverse climate change due to global warming.
- For growth to be at all inclusive, the agricultural strategy must focus on the 85% of farmers who are small and marginal, increasingly female, and who find it difficult to access inputs, credit, and extension or to market their output. While some of these farmers may ultimately exit from farming, the overwhelming majority will continue to remain in the sector and the objective of inclusiveness requires that their needs are attended to. For example, credit has grown at un-precedented rates (30% per annum) to other sectors but not to small and marginal land

holders and women who lack collateral security. Besides issues such as rights to land (especially for women), it is now well recognized that the poor are best empowered if they function as a group rather than as individuals. Hence there is a need to encourage a 'group approach' for the poor and for women to reap economies of scale and be effective farmers. A group approach could also improve the bargaining power of small cultivators in contract farming. The few examples where small and marginal farmers have benefited from contract farming are those where they have entered into contracts collectively rather than individually. In Punjab, Mahindra Shubhlabh Services Ltd followed this approach for maize farming with a number of safeguards for risk protection, etc., built in. Again in South India, the United Planter's Association of South India signed contracts with women's self-help groups (SHGs) for tea cultivation. One way forward to encourage marginal farmers and women to form groups for purposes of farming would be to shift at least some of the cur-rent subsidies to be available only to groups of such farmers rather than to individuals.

1. Approaches

Innovative Farmer Approach : The development of agricultural extension in our country started with selection of progressive farmers who showed interest in adopting new technology called innovative farmers. They were treated as click agent. At that point of time 'Trickle down Theory' was adopted to transfer the technology. The theory played its role effectively but it had delivered only major technology to the resource rich. By this approach, the green revolution technology could not reach to every strata of the society. Resource rich farmers had utilized the government support but small and marginal farmers have left out.

Farmer-Group Approach : The age-old practice of extension-farmer contact on a one-to-one basis, though very effective, is expensive and unsustainable as the sole means of reaching farmers with agricultural technology. New methods emphasize the passing on of agricultural technology to farmers in organized groups (farmer groups). A farmer group is a collection of farmers interacting with one another towards achieving a common goal. Usually, the interaction between the members of the group is more than with those outside the group. Membership of a group varies, and it is advantageous to have a small number of people forming it. A group size of between 20 and 30 is ideal and manageable in order to provide a face-to-face interaction, better communication and the free flow of information.

The farmer-group approach plays valuable rôle in policy advocacy and in realizing economies of scale. One major benefit of the group is that farmers support each other to learn and adopt. Thus farmer-to-farmer extension is amplified. Rather than simply be agents for technologies imposed from outside, the extension agents are expected to become catalysts, mobilizing farmers to experiment on an identified need/ solution, recognizing local innovations and helping to assess and encourage them. Experienced farmers thus become the best discussion partners for other farmers. A farmers' network of communication operates in a sustainable basis since it is perpetuated continually for a number of human generations.

A condition of effective and sustainable functioning of farmer groups is that the perceived benefits to members substantially outweigh the perceived costs. Benefits are likely to be high where, the production of a high value commodity is involved and where linkages with other stakeholders (private or public sector) are valued by the group (*Stringfellow et. al., 1997*). There are various types of farmer groups, including formal co-operatives, informal farmer associations or groups, multi-purpose groups and national farmers' organizations. The benefits of farmer groups include:

- making agricultural extension services more client-driven and efficient;
- strengthening farmers' bargaining power with traders;
- reducing transaction costs for input supplies and output buyers;
- economies of scale (e.g. from bulking up in output marketing or storage) facilitating savings and access to credit; and
- reducing public-sector extension costs *(Conroy, 2003)*.

This strategy enhances the dissemination of agro-information either by public or private interventions to a wider spectrum of users, including women and youth, unlike the formal extension systems.

However, as veritable machinery, which is sustaining and relatively cost-effective, the farmer-group approach is dependent on sufficient mobilization at the grassroots and in social units in order to achieve the desired objectives of the approach.

Farmer Field School Approach : Farmer field schools are schools without walls where groups of farmers meet periodically with facilitators during the crop or animal cycle (*Davis and Place, 2003*). It is a participatory method of technology development and dissemination (*FAO, 2001*), based on adult learning principles and experimental learning. It reflects the four elements of experiential learning cycle, namely: concrete experience, observation and reflection, generalization and abstract conceptualization, and active experimentation. It has now been established in several states of the country, with millions of farmers participating.

The operation of the extension delivery approach is that developmental organizations partner with extension personnel to identify or form farmer groups based on particular topics. For instance, there are groups based on passion fruit, poultry, beekeeping, vegetable production etc. Farmer field schools hold field days for other FFS groups and neighboring farmers. This provides an opportunity for each participant to teach others what they have learned. At the end of the FFS cycle, certain farmers are chosen by the group to be farmer facilitators. They can then lead their own farmer field school the following season. The extension officer's role has evolved from that of a primary knowledge source to that of a facilitator of knowledge creation. The Extension Officer no longer has to have all the answers, and the messages of extension are not centrally contrived but, instead, related to locally relevant problems emerging from the FFS study field. The FFS methods have transformed farmers from recipients of information to generators and manipulators of local data.

One important issue in FFS is that of sustainability without outside funding. It is a participatory approach, which facilitates farmer demand for knowledge, and offers opportunity for the end users to choose, test and adapt technologies according to their needs. Through participation in FFS, farmers develop skills that allow them to continually analyze their own situation and adapt to changing circumstances.

2. Strategies

Provision of legal and policy framework : A major problem of organizing agricultural extension in developing countries is the absence of a legal and policy framework for providing the service. What exist now as extension in many states are programmes from central/state government, which have over the years been refurbished and tinkered with. They have no legal, policy or philosophical bases and are out of touch with cultural realities. Such a legal framework, preferably an act of parliament, should not only create extension as an important activity in pursuance of national development, but should also:

- state the structure for extension in the country;
- indicate the sources, levels and methods of funding;
- identify sources and types of programme;
- determine functions that constitute extension;
- provide the quality of manpower needed, and
- identify which agencies can participate and how.

Putting in place a legal and policy framework is one basic new and indispensable way of conducting extension in the developing countries. It will help streamline the confusion currently existing in the effort to transfer agricultural knowledge to farmers, particularly in the areas of service provision, programme development and funding.

Link to market opportunities : The old practice of asking farmers to produce without providing the means but to meet specific market demands have not worked. Extension is valuable when it is linked to specific market opportunities, when producers are being equipped to respond to particular market demands. The inefficiencies that bugged the traditional supply-driven, slow and expensive approaches to extension, are giving way to more efficient, demand-driven, flexible and responsive approaches.

Recognizing indigenous knowledge : There is a need to harness indigenous knowledge for the development of extension service. A country's knowledge base needs to be developed and fostered to both improve its

competitive position and to contribute to human and sustainable development goals. This is evident when local, scientific and technical information are properly managed and used. Special emphasis could be placed on developing and disseminating local content, improving the relevance of the information to local development, as well as capturing and auditing all relevant local resources.

Targeting and gender sensitivity : Targeting is the understanding of who the farmers are in terms of their capabilities (gender, resources, markets, culture, etc.) and ensuring that only technologies that are relevant to each farmer's capability is targeted at him or her. Targeting compels the extension service provider and, indeed, research to properly examine the audience and the technology, and identify farmers that have a greater likelihood of benefiting from the technology based on the characteristics (technical, social and market) of similar technology.

Networking and enhancing the capabilities of extension service providers : Agricultural extension by its nature is a service that relies on linkages and networks. An extension service that is not linked to research, farmers or other service providers cannot be effective. Unfortunately, the linkages between extension and research and extension and farmers in most states over the years have been very weak. The new thinking is that for extension to succeed, it must enhance its linkages and networks with research, farmers, and among extension providers (public and private). This way the capability of extension to transfer agricultural technology to farmers will be improved. National and regional associations of extension service providers have proved a good tool in this regard.

Increased use of information and communication technologies in extension : The promise of ICTs in agricultural extension is that they can energize the collection, processing and transmission of data, resulting in faster extension of quality information to more farmers in a bottom-up and interactive channel of communication. Thus ICTs may be the only way in which farmers can access a variety of information sources that are accessible, affordable, relevant and reliable. Also, increasing the use of ICTs in agricultural extension will narrow the gender disparities in terms of access to agricultural information. The internet could be used to enable farmers to become part of the information flow process and even to instigate the process of information flow rather than waiting for the information to be presented to them via radio, TV, newspapers, newsletters, bulletins or other ICTs.

Increased use of private extension service providers : Increased involvement of the private sector either in delivery, funding, or management of agricultural extension broadens the focus of extension personnel and makes extension services more responsive to client needs and changing economic and social conditions. It offers farmers value for their money. The result of increased private sector participation is higher in those aspects of extension service that are always profit-driven: for example, input procurement and distribution, cash crop extension, and veterinary extension. For services that are more of publicly oriented, for example, adaptive research, management and the administration of agricultural extension - including policy formulation, should continue to operate under the ambit of government.

CONCLUSION

If scientific research is to achieve a real impact on farm productivity and livelihoods, new methodologies for dissemination of information have to be developed or adapted. The main direction of reform in agricultural extension is towards a learning rather than teaching paradigm. This learning approach should incorporate new methodologies and approaches that are demand-driven and increase the real, interactive participation of local people at all levels of decision making in an extension delivery network. These methods require that the roles and responsibilities of researchers, extensionists, and local people be re-defined and shared. However, it is imperative that individual states make situational analyses of the social, political, technical, economic and natural conditions prevalent in their areas before adapting any method, approach, or strategy. An integrated approach (comprising of different strategies) is recommended in diverse socio-cultural, economic and

political situations in order to achieve the desired goals. Generally, a sound agricultural extension policy is indispensable to achieve success in transferring knowledge to farmers. What exists now in most states does not meet the criteria of an agricultural extension policy.

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