

Extension Perspective in Changing Agri-rural Environment

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Sectoral and spatial changes in agri-rural environment : Agriculture provides sustenance to two-third of India's population, which has crossed more than one billion and still growing. Agriculture and allied activities contribute 25 percent to its GDP. However, with decreasing share of agriculture to GDP is resulting into rural poverty and people are faced with the livelihood problem. The rural poverty and livelihood issue is aggravated by rising standards and cost of living at one end and on the other shrinking land holdings, steadily rising input costs, globalization and associated liberalization of markets and demand of competitiveness in unit cost of production, quality and ability to market produce and primary processed products without excessive post-harvest losses. Factors of demand and supply, poor PH-infrastructure, markets and the forces that intervene the agriculture markets usually create slump in the market price whenever there is a bumper harvest of any crop or commodity. Orchestrated distress sales, denying growers remunerative prices, compels the farmers to shift over to the crop and commodity, which in turn creates scarcity and soaring consumer prices. A vicious cycle that does not seem to be ever ending to the detriment of growers and consumers' interest. This paper makes an attempt to analyze sectoral and spatial changes taking place in agriculture.

Changes in agriculture : Food insecurity among the rural poor in India is a mirror image of poverty. It emphasizes that while adequate and sustained production and physical and timely access to food-two important components of food security, must be maintained and further consolidated for livelihood security of rural poor, the third component i.e. economic access to food is the critical component in Indian context. The growth process is the way to achieve lasting development. Growth, which is not accompanied by the improvement of the Social Fabric of society, will be only a hollow shell. Vastness of India and agro-climatic diversity enables it to produce wide range of crops and commodities. It has succeeded achieving quantum jumps in production and productivity of almost all crops and animal products.

Poverty in India is essentially a rural phenomenon particularly among the rural poor. Nearly 70 percent of the poor live in rural India and bulk of them are farmers and agriculture dependent. Despite the Green Revolution, Indian agriculture is not as productive, competitive, remunerative, and sustainable as desired and expected. The Green Revolution has fatigued and an imbalance exists among total production, national food security and household besides individual level food security. The impact of climate change on agriculture could result in problems with food security and may threaten the livelihood activities upon which much of the population

depends. Climate change can affect crop yields (both positively and negatively), as well as the types of crops that can be grown in certain areas, by impacting agricultural inputs such as water for irrigation, amounts of solar radiation that affect plant growth, as well as the prevalence of pests. Indian climate is dominated by the south-west monsoon, which brings most of the precipitation. It is critical for the availability of drinking water and irrigation for agriculture. Agricultural productivity is sensitive to two broad classes of climate-induced effects; (1) direct effects from changes in temperature, precipitation, or carbon dioxide concentrations, and (2) indirect effects through changes in soil moisture and the distribution and frequency of infestation by pests and diseases. Rice and wheat yields could decline considerably with climatic changes. However, the vulnerability of agricultural production to climate change depends not only on the physiological response of the affected plant, but also on the ability of the affected socio-economic systems of production to cope with changes in yield, as well as with changes in the frequency of droughts or floods. The adaptability of farmers in India is severely restricted by the heavy reliance on natural factors and the lack of complementary inputs and institutional support systems. Extensive and dramatic changes are occurring in the Indian economy as a result of the globalization of economic activity and

the implementation of structural adjustment reforms. Indian agriculture faces the dual challenge of feeding a billion people in a changing climatic and economic scenario. However, there is not much scope to increase the area under food grains. Switching to other crops is also difficult in regions like West Bengal, where three rice crops are grown in succession through the year. Agriculture is the predominant means of livelihood for a large number of peasant cultivators and agricultural labourers, for whom it is not easy to shift to other occupations. Due to their low financial and technological adaptability, such groups are potentially vulnerable to both climatic changes as well as economic change. Hence, it becomes important to examine the vulnerability to climate change not in isolation but in the context of ongoing economic changes. This translates into a dynamic interpretation of vulnerability and has important implications for developing adaptation strategies.

The agriculture will still continue to be the engine of the national growth and development. Rapid and balanced growth of agriculture is thus essential not only to achieve self-reliance at national level but also for household food security and to bring about equity in distribution of income and wealth resulting in rapid reduction in poverty among the rural poor. The Green Revolution process based on the synergy of advanced technology, effective policies and desired political will ushered in the mid 1960's, followed by white, yellow and blue revolutions, almost tripled the agricultural production, halved the real price of major food grains and other food items, increased the per capita food consumption by 30 percent, more than doubled per capita GDP, and also halved the percentages of undernourished and rural poor. India is one of the world leaders in the production of milk, rice, wheat, fruits, vegetables, cotton, sugarcane, poultry and fish. It is poised to achieve an all-time high of 220 million tons of food grain production.

India has the largest cattle and buffalo population, second largest population of goats and the third largest of sheep in the world. Total livestock population is around 495 million. We are also the largest milk producers (91 mt) in the world today. Yet, we have not been able to compete globally in the export of milk products, meat and even live animals- as being done by Australia, New Zealand, Holland etc. Today, we also produce 41 billion eggs and have 490 million poultry birds. We need to link farmers to markets – the way it is done in Gujrat – through exemplary cooperative movement. Such efforts need to be replicated fast in other states as well. Supply of fodder and feed, use of silvi- pastoral approach in rainfed areas (especially Rajasthan, Madhya Pradesh, Maharashtra,

Andhra Pradesh etc.), establishment of A.I Centers, Livestock, Clinics, Supply of good quality, vaccines, insurance of livestock (at least of valuable productive ones), establishment of modern abattoirs, processing, packaging, storage, and marketing (including export) facilities would all lead to much faster growth in livestock sector- for which India has great comparative advantage but so far not fully exploited. For example, we should be major producer of Mozzarella Cheese, being the largest buffalo milk producer, yet our share in global market is almost negligible.

Overtime changes in extension methodologies and approaches : Agricultural extension has undergone considerable change over decades. New policies are resulting in a large proportion of extension now being undertaken by the private sector rather than traditional public sector providers. These changes are continuing and have presented the agricultural community with certain challenges and problems. Traditionally, the major aim of agricultural extension was to advance the transfer of new techniques, new knowledge and new technology from the research sector to the farmers. The linear and mainly technology-driven model reflects the modernistic development perspective of the 1960s and is based on the positivist science paradigm. An example of the Transfer of Technology is the green revolution of the 1970s. The green revolution packages were suitable mainly to areas of high natural potential having uniform and controllable growing conditions. This model, aiming at a widespread adoption of technologies, is likely to be successful in relatively homogenous, low-risk, natural and social environments, where farmers live under similar conditions, perceive the same kinds of challenges and share a common set of beliefs and values. In Farming Systems led more emphasis is laid on (contractual and consultative) farmers' participation for better understand their complex situation and the inter-dependencies among elements of farming systems in order to develop adapted technologies (Biggs, 1989; Farrington and Martin, 1987; Rhoades and Booth, 1982).

The first step is to identify the main issues in the changing landscape of agricultural innovation and development that we need to tackle. What are the main changes that affect agricultural R&D, extension, education and agricultural development in general? Once we have identified these changes, can we ask further questions about how each component and actor in the system has to change? These questions may have to do with the nature and extent of change, possible period or sequencing of change, or partners in change, new norms or rules (such as prioritization, accountability, incentive

and reward structure, natural resource accounting and poverty impacts).

The agricultural extension system in our country was devised to support the multifaceted approach for achieving the goals of self-reliance in the sector. The agencies, directly or indirectly associated with the task, include national institutes/directorates, SAU's network, input companies, NGOs, agro-processor, private consultants, farmers associations and other organizations. The transfer of technology, human resource development and information and communication system formed the key components of extension strategies. A re-evaluation of the role of extension and restating the strategic approaches to agricultural extension was necessitated due to the challenges offered by sustainability considerations, complex problems arising from the Agreement on Agriculture under WTO, the changing nature of agricultural technology, rapid developments in Information and Communication Technology (ICT) and the changing development agenda. Public expenditure on agricultural extension and its control have been justified on the ground that support for agriculture leads to reduced food prices and increased food security, poverty alleviation, employment generation, environmental conservation, etc. which benefit the whole population specially the poorest of the poor in the society. Important and pertinent questions are raised in this connection as to who should fund and deliver extension particularly agricultural extension which has to play various roles ranging from provider to coordinator, facilitator, arbitrator, regulator, guarantor, etc.

Farmers need to be supported with information, knowledge and the skills to adopt improved technologies that would enhance productivity, employment opportunities and sustainability. Therefore, the ambit of agricultural extension has remarkably widened and the onus of managing the complex affairs rests with agricultural scientists and extension specialists working with public and private sectors as well as NGO's of the country so as to help the farmers to produce according to the requirements of the markets.

The supply pool for agricultural commodities is no more confined to domestic production alone. The countries having competitive edge in cost of production are looking for opportunities to dump their output anywhere in the world. Despite our complex and diversified agriculture, it is yet to pass the test for comparative advantage in terms of cost effectiveness for many important commodities. Unless, we succeed in inducing cost effectiveness having locational advantage, it may not be possible for us to harness the benefits of WTO through export of

agricultural commodities. Besides, we have to face a number of emerging threats including unrealized opportunities in agricultural marketing; unwarranted imports by other countries; under exploited export opportunities for Indian products and distortion in domestic markets.

Farmer- agro- industry- consumer linkages : There is a need to have strong linkage between agricultural marketing and agricultural production system as 'what to produce', 'how much to produce', 'how to produce' and 'for whom to produce'.

Shift in physical output value realization : Ensuing shift in the approach from increased physical output to increased value realization by the producers in the need of the time.

Agro- processing and value addition of agricultural produce : India has great potential for expanding its export of processed products in view of the increasing production of fruits and vegetables, dairy products, meat and marine products, etc. The practice of contract farming is coming up around such processing centers. More and more processing facilities for such commodities need to be augmented.

Grading and packaging : In view of tremendous potential for export of fruits and vegetables, it is necessary to give greater attention to grading and packaging of these commodities by creating required infrastructural support.

Diversification of agriculture : India has enormous inherent potentials for diversification and scope to introduce new areas in agricultural production such as hi-tech horticulture, precision farming, organic farming, etc.

Augmented infrastructural facilities : A strong infrastructural support has to be developed in terms of cold storage chains, transport, credit support, market information and insurance to fully exploit opportunities for export.

Cost effectiveness : The country's agriculture has to become more cost effective to meet the growing challenges and opportunities arising out of WTO agreements and the consequent globalization impacts. For this, future growth of agriculture has not only be yield based but should be tilted towards ensured demand in the national and international market.

Export promotion : There is a great need to orient our agricultural production system for enhanced export promotion.

Global market research and information center : An apex center at the national level for market research, international price analysis, global demand, availability and

also to pass on this information to the concerning authorities is very much required.

Upgrading of human resource through trainings : There is a need to train the farmers in the areas like product planning, marketing information, preparation of produce for marketing, improved marketing practices, rules and regulations, input marketing, etc.

Involvement of private sector : Efforts should be made to involve private sector in creating necessary marketing infrastructures.

Marketing information network : Easy access to timely and relevant information to farmers, traders, policy planners and other marketing agencies so as to enable them to have proper marketing decisions is very much needed. Application of IT in this area is still a miss-link.

Marketing of agro-inputs : For the marketing agro-inputs like seeds, it is necessary to streamline and simplify seed certification procedures, modify the Seed Act and enforce it strictly. Greater participation of private sector, coo-operatives and NGOs in the production and distribution of seeds is required.

Declared EXIM policy (2002-07) by Government of India : The knowledge on freely exportable and importable commodities, restricted as well as non-exportable/ importable at various levels as it has implications on the marketing of agricultural products.

Effect of rural migration and urbanization on agriculture: Rural population has migrated to cities due to lack of employment in agriculture sector as livelihood security of rural poor is uncertain in this sector, hence there is need to empower rural women to secure their livelihood through other alternatives. Livelihood of rural poor can be secured by way of adopting agro based highly remunerative and income generating enterprise like Mushroom production, IPM, Processing and preservation, Vermi composting, Nutritional garden, Dairying, Poultry, Strawberry cultivation and value addition etc. The intervention like crop enterprise technology, approach and service diversification can contribute significantly in sustaining livelihood.

Rural India accounts for nearly 60 percent of the country's house hold consumption, and thereby, represents the largest potential market demanding immediate attention in our efforts to project the country as a global force in terms of agriculture and economy. Sustainable development can be realized only when economic growth benefits the poor and underprivileged section of the population, which live in rural areas. Food processing industry has enormous significance towards ushering speedy transformation of the rural economy, in

particular, and the national economy, in general, besides reduction in rural migration.

Food processing helps in promoting a synergy between the two major components of the economy, namely, the agriculture and industrial sectors. Strengthening the agri-industrial base of the country will also be beneficial in preventing population shift from rural areas to urban areas, improving economic condition of the rural people, promoting entrepreneurship and in generating employment in rural areas. Having become aware of the vast potential of promoting agri-business in rural India. Some of the corporate houses have taken a lead by establishing processing units and strengthening marketing activities in rural areas and the initial response seems to be a quite encouraging.

Growers have no share in value-addition to their produce and by-products. Large part of year of their family labour is un or under employed. Landless often migrate in search of wage earning dislocating education of children. It has brought post-harvest technology and agro-processing at the centre stage. Scientists, policy makers and development agencies are looking towards rural food and agro-processing as a tool for additional income and employment to the rural people in rural areas having potential scope for enabling them to meet their needs at the least cost, retain and use waste and by-products usually to feed, fuel and industrial raw material value in the production catchments and market surpluses after value addition. Leading luminaries of Indian agriculture consider PHT and Value Addition as half the agriculture story.

There is overwhelming evidence that internal migration can lead to positive change in both sending and receiving areas (*Deshingkar and Grimm, 2004*). Migration can help to reduce poverty or to halt the slide into poverty. For example, the income earned by women migrating from West Bengal to Delhi to work as housemaids meant that they had been able to move out of poverty (*Mukherjee 2004*). It can increase income, savings and assets. For example, a study of 955 migrant households in Tamil Nadu found that 57 percent of lower income migrants had seen their income increase and 53 percent had increased their asset holdings (*Sundari, 2005*) and migrants from Mahbubnagar District, Andhra Pradesh to the paddy fields of Karnataka have been found to save an average Rs 2000-3000 per season (*Khandelwal, 2002*). It can lead to the sending of remittances to marginalised sending localities, which can be used to invest in human capital or in productive assets in sending localities and can play an important role in

reducing vulnerability, improving food security, stimulating land markets in sending areas, increasing local wages and the demand for local goods and services and generally improving the economy (Deshingkar, 2006). It also helps tighten rural labour markets (Wiggins and Deshingkar, 2007). Poverty in India is essentially a rural phenomenon although lately urban poverty has also been increasing, but a good proportion of it comprises the rural migrants. Nearly 70 percent of the poor live in rural India and bulks of them are farmers and agriculture dependent. Despite the Green Revolution, Indian agriculture is not as productive, competitive, remunerative, and sustainable as desired and expected. The Green Revolution has fatigued and an imbalance exists among total production, national food security and household and individual level food security.

There are some negative impacts to acknowledge, however, migration can lead to an acute shortage of labour and high dependency ratios in sending areas. Mass male migration can lead to worsening poverty, but these risks are off-set where wage rates are sufficiently high to allow regular remittances. People who are away for a long time may lose access to natural resources and lose their voice in community decision-making. Migration can also have a negative effect on collective action and natural resource management, where significant labour inputs are required (Deshingkar, 2003).

Emerging innovative methodologies /models /cases of extension education: Today, the transfer of technology model is often viewed as the antithesis of participatory research. However, this is often not the case. In fact, much of the present participatory practices can still be classified as an expansion of the transfer of technology model because information is obtained from farmers and incorporated into scientific research. Participatory methods are used to better meet farmers' needs and to adapt technologies to site-specific circumstances at a relatively late stage of the research process. By the mid-1980s, people were re-thinking the transfer of technology model and emphasis was on the farmer. There are different types of approaches summarized under 'Farmers First'. Farmers became part of the process of generating, testing and evaluating technologies that promoted sustainable agricultural production. The main outcome expected from these approaches is the generation and adoption of new, appropriate technologies by small, resource-poor farmers to aid in solving production constraints in order to increase farm productivity and income (Selener, 1997). Most of the current NRM research initiatives focus on the generation and provision of technologies, assume a

functioning linear research-development continuum, use mostly consultative forms of participation, and consider participatory research as a tool for applied and adaptive research. Therefore, they principally fall into the categories of 'transfer of technology' and 'farmers first' approaches. Longer-term participatory learning and action research approaches are only beginning to be chosen by international agricultural research centres (IARCs) as they require a different kind of professionalism and challenge the mandate, i.e., they are considered to fall under the sphere of development rather than research.

The present departmental mode of organization and management of public systems in agricultural research and extension need to be moulded in an innovation system framework. This implies demolishing dichotomies like research /extension, plan/non-plan, centre/state, public/private, agricultural/rural, and so on. More effective mechanisms must be identified and developed to internalize stakeholder involvement in decision-making and improve partnerships across the board. There is need to shift from an hierarchical and linear technology generation-diffusion model to a non-linear and holistic learning mode.

This will necessitate creating and nurturing a broad-base 'think-tank' at the ICAR and SAU levels. The model of the Technical Advisory Committee (TAC) of the CGIAR with its own secretariat and loop in the funding process may be adopted with suitable modifications. At the level of institutes also, there is need to expand and back up bodies like the Research Advisory Committee (RAC), governing Councils etc. to play this role effectively.

Bureaucratic and financial norms of functioning and accountability processes have proven inadequate for meeting scientific goals. These need to be replaced by more autonomous, flexible and performance-centered processes and management climate.

Relevance and excellence must underpin the functioning of our universities. None other than Nobel Laureate Professor Amartya Sen had stated on November 14, 1999 that "University education in India is in a state of crisis. It is not a crisis of lack of resources, it is deterioration of quality quite a lot of our success depend on not what we inherit but on what we acquire and how we apply it". What is needed today is extra-ordinary teachers and scientists who will be able to face challenges of future agriculture and produce the product which will be competitive in the international market. For this, universities must nurture and nourish extra-ordinary teachers and scientists devoted to the cause of science and at the same time are dedicated to their profession of teaching, research and extension.

In order to make way for teaching in real life subject and expanding room for practice and innovativeness through hands-on training it will also be necessary to build competence and capability of teaching faculty in emerging areas of science and technology and skills in vocational courses. The periodic refresher programmes for knowledge upgradation of teaching faculty must be ensured through centre of excellence in various professional areas. In fact, investment to develop faculty is a key strategy to facilitate change through introduction of new subject of learning, optimally utilize the institutional infrastructure for practical training and forge linkages with other sector of economy for skill development during internship.

Strategies for developing sustainable approaches and models : The three vital strategic components based on which the Indian agriculture was meticulously transformed during the planned era included technology packages, institutional support and policy interventions. The radical metamorphosis of agriculture could be made possible through technically qualified manpower developed within the country. The institutional network for agricultural education developed after independence has assumed the status of "National Education System", which is one of the largest in the world. The task of agricultural education in the country is mainly taken care of by 261 colleges. The 42 SAUs and three Deemed-to-be Universities are also meant to impart education in Veterinary, Fishery, Dairying and Animal Sciences.

Promoting the use of eco-friendly inputs, practice of precision agriculture and participatory technology development for sustainable increase in productivity and production of exportable surplus by brining down the cost of production and improving the competitiveness of Indian Agriculture. For exploitation of the agro-ecological diversity of the country, programmes should be evolved for production/ export of agricultural produce from different regions during the off seasons in importing countries. The APEDA and SAD's can work on this and the State Departments of Agriculture, Horticulture, Agricultural Marketing and State Agricultural Marketing Boards can implement this.

Adoption of suitable national strategies on augmenting animal productivity, production, consumption and marketing of animal products will generate capital formation per unit of animal resources. Creation of realistic database on meat, milk and egg production, handling transportation, pre and post harvest loss, marketing etc for better economic return. Cutting edge technologies on processing, preservation and value addition on animal products by integrating newer bio-technological tools with

the ITK need to be developed. To improve the export oriented meat production, buffalo male calves management with high input ration be made for increased growth rate for marketing.

Technology specific extension models based on agro-ecosystem need to be developed. Demand driven approach is to be emphasised instead of supply driven approach. Quality extension services like ISO certification, HACCP, EUREPGAP for both public and private service providers are to be encouraged. Role delineation and linking ATMAs and KVKs for effective implementation of extension programmes at district level is another critical measure to be taken up for proper coordination and integration of extension approaches of Department of Agriculture and Cooperation (DAC), Government of India and Indian Council of Agricultural Research (ICAR). Feedback should be strengthened and its effective use for improving the quality of extension services at the grass root level must be ensured. Participation of front line extension scientist/subject matter specialist in technology generation, assessment, refinement and transfer can play a greater role. Cost economics of technologies are to focussed, accountability of the extension service providers are to be ensured through proper monitoring and involvement of farmers and other stakeholders. Village knowledge centres and Agri-clinics may be linked and integrated with public extension system (SAU, ICAR, line departments) for providing farm advisory services and quality inputs as well. The effectiveness of front line extension of SAUs and ICAR and extension services of state line departments has gone down due to lack of adequate qualified manpower. Vacant posts in SAUs, ICAR and the line departments at all levels should be filled up regularly with priorities.

Dealers of different agencies, who are also engaged in advising farmers while selling their products, are required to be considered as extension agents and trained them accordingly. Contract farming needs to be grounded in a organised way and the state governments are required to bring out effective legislation and enforce law for contract farming. Strong Farmers' Organizations capable of providing extension and advisory services to the farmers, which may be an alternative in pursuing an extension mechanism sustainable on its own. Agricultural credit has to be made available to the farmers adapting simple procedure and cases of suicides need to be seen very specifically. Community radio stations, farm broadcast on low frequency FM band and TV channels are to be used by extension agencies operating at zonal or district level. There is a need for assessing requirement

