Modern Extension Approaches for Livelihood Improvement for Resource Poor Farmers

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Introduction

India's agricultural extension system is at a pivotal point in its evolution. Since independence, the extension system has focused on four major strategies, reflecting the dominant agricultural and rural development goals during each period. In looking back, the evidence suggests that investments in agricultural research and extension have served the country well, particularly in achieving food self-sufficiency. Extension has been traditionally funded, managed and delivered by the public sector all over the world. Agricultural extension in India has grown over last six decades. It is supported and funded by the national government—through its Ministry of Agriculture (MoA) and other allied ministries. The share of agriculture in Gross Domestic Product (GDP) has declined from over half at the time of independence to less than one-fifth this year. Indian agriculture sector has an impressive long-term record of taking the country out of serious food shortages despite rapid population increase, given its heavy reliance on the work of its pluralistic extension system. There are five major agricultural extension systems devoted to extension work in India:

1. Ministry of Agriculture at central level, including the Indian Council of Agricultural Research (ICAR) and the Directorate of Extension (DoE);

2. State Departments of Agriculture (DoA), as well as the State Agricultural Universities (SAUs);

3. Departments of Agriculture (DoA), Animal Husbandry (DAH), Horticulture (DoH) and Fisheries (DoF), as well as the Krishi Vigyan Kendra (KVKs) and, more recently,
4. Agricultural Technology Management Agency (ATMA) at the District level;

5. A wide variety of producers groups, including cooperatives and federations of milk, fruits, cotton, oilseeds, coconut, spices etc.; as well as civil society organizations, such as the Non-governmental Organization (NGOs).

But so far today gap between technology developed/released and the technology disseminated/adopted is wide. According to Nation-wide survey of farmers' access to extension is the 2003 National Sample Survey Organization (NSSO) 59th round, 33rd schedule on 'Situation Assessment Survey of Farmers' sixty per cent of the farmer-households in India did not access any information on modern technologies that year. That such a large proportion of the farming population does not use any extension service indicates the poor organizational performance of the public extension in 2003. Even today hardly one third of the technology developed by the research system has reached the farming community and the technology adoption/application at field level is even less than what ever technology has made reach to the farmers. The frontier extension programmes such as KVK and ATMA still struggling with quality HRD and resources to cater the need of farming community. Efforts require a shift from

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technology dissemination to technology application mode and for this extension efforts has to be intensified. The biggest challenge with extension policy makers is

- Mismatch between technical know - how & extension professional skills
- Low level and number of extension professional
- Low resources with rapidly-changing rural context
- Diversified cliental with multifold challenges
- Production & climate change challenges

Historical Perspective

The agricultural sector in India is currently passing through a difficult phase. India is moving towards an agricultural emergency due to lack of attention, insufficient land reforms, defective land management, non-providing of fair prices to farmers for their crops, inadequate investment in irrigational and agricultural infrastructure in India, etc. India's food production and productivity is declining while its food consumption is increasing.

Since independence, the extension system in India has focused on four major strategies, reflecting the dominant agricultural and rural development goals during each period. The evidence suggests that investments in agricultural research and extension have served the country well, particularly in achieving food self-sufficiency.

In mid-1990s, the Govt. of India and the World Bank began exploring new approaches to extension that would address these system problems and constraints resulting in new, decentralized extension approach, which would focus more on diversification and increasing farm income and rural employment. The central institutional innovation that emerged to address these system problems was the Agricultural Technology Management Agency or "ATMA" model that was introduced at the district level to:

1. Integrate extension programs across the line departments (i.e., more of a farming systems approach),
2. Link research and extension activities within each district, and
3. Decentralize decision-making through "bottom-up" planning procedures that would directly involve farmers and the private sector in planning and implementing extension programs at the block and district-levels.

Encouraged by the success of Pilot Testing of the ATMA Model in 28 districts, the Planning Commission, Govt. of India constituted a working group on Agricultural Extension for formulation XIth FYP approach (2007-11) with Sri J.N.L. Srivastava as its Chairman; the working group critically reviewed the existing approaches, strategies and on-going schemes and submitted their recommendations on the agricultural extension approaches for XIth FYP (GOI, 2007). The centrally sponsored scheme, "Support to State Extension Programme for Extension Reforms" based on ATMA model is an important initiative for revitalization of extension system in the states. The scheme aimed at promoting decentralized, market driven and farmer-led extension system through an innovative institutional arrangement for technology dissemination through ATMA. This institution is an apex body for coordination and management of agricultural extension system at the district level. At the block level, the Block Technology Team (BTT) — a team of line department representatives

posted in the block and Block Farmer Advisory Committees (BFAC)—a group exclusively of farmers in the block that are jointly responsible for operationalisation of schemes' activities. Extension activities under the schemes are also promoted in Public-Private Partnership (PPP) mode with involvement of both the governmental and non-governmental agencies, including NGOs, Panchayati Raj Institutions (PRIs), Farmers Organizations (FOs), Para Extension workers, agripreneurs, cooperatives, input suppliers and corporate sectors (Singh and Swanson, 2006; Singh et al. 2011; DAC, India, 2011-12; Singh et. al. 2012).

Singh et al. (2009) assessed the impact of ATMA model in Bihar's context and found that scientists have become more responsive to the needs of farmers and focused need based research to meet location-specific requirement of different farmers. Need-based training and exposure visits to farmers and farmer-led extension have played a very effective role for technology dissemination. There has been considerable improvement in adoption of new technologies and farm practices by all categories of farmers. Singh et al. (2011) found that decentralizing a large, complex national extension system is not easy, but Government of India appears to be moving toward this long-term goal.

Technology Transfer (persuasive + paternalistic), Advisory work (persuasive + participatory), Human resource development (educational + paternalistic) and Facilitation for empowerment (educational + participatory) are the four paradigm of extension education. In light of the context and facts our strategy must be requires as targeting the area based all development agencies/ agents for similar message/ technologies, Strategies must be supplemented by input and ensuring utilization of locally available inputs or resources & efforts starts from low cost or no cost technologies for confidence building of clients.

About 90% of our farming community is small and marginal with less resources and weak assess of information about improved technology enhances the relevance of ICTs for Agricultural Development in general and for Agricultural Extension in particular is extremely high for a country like India. The application of Information and Communication Technology (ICT) in agriculture is increasingly important. E-Agriculture is an emerging field focusing on the enhancement of agricultural and rural development through improved information and communication processes. More specifically, e-Agriculture involves the conceptualization, design, development, evaluation and application of innovative ways to use information and communication technologies (ICT) in the rural domain, with a primary focus on agriculture. All stakeholders of agriculture production system need information and knowledge about these phases to manage them efficiently. ICTs are most natural allies to facilitate the outreach of Agricultural Extension system in the country.

Despite large, well-educated, well-trained and well-organized Agricultural extension manpower, around 70% of farmers in the country still remain un-reached, not served by any extension agency or functionary. Of the 30%, who have some access to Agricultural Information, the major sources of this information are Radio and Television. The Mobile has just started to make its presence felt on this scenario. Internet supporting Information-Kiosks are also serving the farming community, in many parts of the country. Hence ICTs are highly relevant for Agricultural Extension scientists, researchers, functionaries and organizations. The various applications of ICTs have been discussed in sections below, which have relevance in reaching the resource poor farming community.

Challenges with Extension:

Agricultural extension faces great challenges as agriculture sector needs to nearly double biological yields on existing farm land to meet gross food needs that will also double in the next quarter century. To help meet this challenge, the role of extension is clear - there is a great need for information, ideas, and organization. About 80 percent of the world's extension is publicly funded and delivered by civil servants, providing a diverse range of services to the general population, commercial producers, and disadvantaged target groups through a variety of approaches. Budgetary constraints and concerns about performance are pressuring these services to show the payoff to investment in extension and explore alternatives to public provision.

The key challenges facing policymakers who must decide what role governments should play in implementing or facilitating extension services, and to what extent. Our focus is on international, primarily developing country, experience. The core of the generic challenges inherent in the nature of extension that make its organization difficult - the magnitude of the task, dependence on wider policy and other agency functions, problems in tracing cause and effect, and consequently, difficulties in obtaining political support for funding, accountability, liability to public service functions beyond agricultural knowledge and information transfer, fiscal sustainability, and interaction with knowledge generation. Subsequently, we identify a range of innovations that have emerged in order to overcome the generic difficulties. These include improving extension management, decentralization, single commodity focus, fee for-service public provision, institutional pluralism, empowerment and participatory approaches, privatization, and interconnecting rural people and the use of appropriate media.

The biggest challenge with extension is how to transform and strengthen pluralistic agricultural extension and advisory systems in moving toward the broader goal of increasing farm income and improving rural livelihoods. The focus is primarily on the technical knowledge, management skills, and information services that small-scale farm households will need to improve their livelihoods in the rapidly changing global economy. Also included is information on how extension should help all types of farmers in dealing with escalating natural resource problems, including climate change.

Some innovative initiatives to enhance information access:

National goals for agriculture and natural resources management include food security, improving rural livelihoods to reduce poverty and food insecurity, and sustainable use of natural resources. To reach these goals, extension staff should regularly consult farmers, researchers and industry representatives to develop strategic plans that identify specific market opportunities for products with potential for local economic and ecological success. Agricultural extension and advisory systems worldwide have undergone major changes in the past two or more decades, mainly due to:

1) Green Revolution that increased the world's food supply;
2) Growth of the commercial farm sector;
3) Trade liberalization leading to rapidly developing global food system;
4) The expanding role of trans-national life science companies in developing proprietary agricultural technologies; and

5) Expansion of bio-energy industry in many leading to increasing staple food costs.

Due to increasing use and demand for natural resources, there is an urgent need to educate all types of land users about sustainable ways to use natural resources, especially those considered public goods. Agricultural extension and advisory services are concerned with (1) transferring technologies associated with production systems; (2) enhancing the skills and knowledge (i.e. human capital) among all farmers so they can select the most appropriate mix of enterprises; and (3) use the most efficient agricultural practices and sustainable natural resources management. This is achievable if farmers organize into groups (i.e. social capital) to increase market access and more effectively articulate their goals and needs to policy makers, researchers and extension providers.

In India ICT applications such as Warana, Dristee, E-Chaupal, E-Seva, Lokmitra, E-Post, Gramdoot, Dyandoot, Tarahaat, Dhan, Akshaya, Honeybee, Praja are quite successful in achieving their objectives.

Some of these have been dealt in detail below:

e-Extension (e- Soil Health card Programme): The Deptt. of Agriculture, Gujarat State is one of the ambitious programmes which aims to analyse the soil of all the villages of the state & proposes to provide online guidance to farmers on their soil health condition, fertilizer usage and alternative cropping pattern. The website is www.agri.gujarat.gov.in/ www.shc.gujarat.gov.in/ .

AGRISNET- uses state-of-the-art broadband satellite technology to establish the network within the country. The website is http://www.apgrinet.gov.in for Andhra Pradesh and http://agriculture.up.nic.in for UP.

AGMARKNET is a comprehensive database which links together all the important agricultural produce markets in the country (http://www.stockholmchallenge.se/data/agmarknet/).

Agri-Clinics and Agri-Business Centres: It provides a web based solution to the small and medium farmers as well as owners of large landholdings. It brings on a single platform all the stakeholders in agribusiness like farmers and farmer groups, institutions and autonomous bodies, agro machinery and farm equipment makers, cold chain tech., commodity brokers, cooperatives, food processors, pre and post harvest management experts, packaging technology providers, insurance companies, warehousing and logistics agencies, surveyors and certification agencies.

e-KRISHI VIPANAN: This initiative professionalizes and reorganizes the agriculture trading business of Mandi Board by installing cost effective digital infrastructure using latest advancement in ICT by collecting and delivering real time information online. It makes the operations more effective, totally transparent, benefiting all stake holders (farmers, traders & the government), empowering them through accurate and timely information for effective decision making.

Query Redress Services: Empowering the farmer community through effective, need-based interventions. It enhances livelihood promotion of farmer community through information dissemination and extension services, using ICT as tool. The project helps the farming community by making available a 10000 plus network of experts to them. Any queries from farmers are forwarded to the ISAP central office from where it is routed to the relevant experts. The service caters to information and knowledge needs

of the farmers, professional members of ISAP, individuals and other stakeholders involved in the wider agricultural and allied sectors.

Kisan Call Centres: Kisan call centres have been established across the country with a view to leverage the extensive telecom infrastructure in the country to deliver extension services to the farming community. The sole objective is to make agriculture knowledge available at free of cost to the farmers as and when desired. Queries related to agriculture and allied sectors are being addressed through the Kisan Call Centres, instantly, in the local language by the experts of State departments, SAUs, ICAR institutions etc. There are call centres for every state which are expected to handle traffic from any part of the country. SMS using telephone and computer interact with farmers to understand the problem and answer the queries at a call centre. The infrastructure is placed at three locations namely- a professionally managed call centre (level-I), a response centre in each organization, where services of SMS are made available (level-II) and the Nodal Cell (level-III).

Tata Kisan Kendra: The concept of precision farming being implemented by the TKKs has the potential to catapult rural India from the bullock-cart age into the new era of satellites and IT. TCL's extension services, brought to farmers through the TKKs, use remote-sensing technology to analyze soil, inform about crop health, pest attacks and coverage of various crops predicting the final output. This helps farmers adapt quickly to changing conditions. The result: healthier crops, higher yields and enhanced incomes for farmers.

e-Choupal ITC's Agri-Business Division launched "*e-Choupal* " in June 2000 in which village internet kiosks managed by farmers - called *sanchalaks* - themselves, enable the agricultural community access ready information in their local language on the weather & market prices, disseminate knowledge on scientific farm practices & risk management, facilitate the sale of farm inputs (now with embedded knowledge) and purchase farm produce from the farmers' doorsteps (decision making is now information-based).

e-Sagu, an ICT based personalized agro-advisory system is being developed since 2004.The The word 'Sagu' means 'cultivation' in Telugu language. It aims to improve farm productivity by delivering high quality personalized (farm-specific) agro-expert advice in a timely manner to each farm at the farmer's door-steps without farmer asking a question. The advice is provided on a regular basis (typically once a week) from sowing to harvesting which reduces the cost of cultivation and increases the farm productivity as well as quality of agri-commodities.

AKASGANGA (Meaning "milky way" in Hindi) was established in 1996 under the banner of Shree Kamdhenu Electronics Private Ltd. (SKEPL) by a group of young entrepreneurs. It was established at a time when information technology was almost unknown in the villages of India. AKASHGANGA's success demonstrates the potential of information technology to impact livelihoods in poor, rural communities. AKASHGANGA's experience indicates that even illiterate or semi-literate people can adopt IT-based systems when they see substantial benefits and when the systems are deployed in purposeful, easy-to-use ways.

National Knowledge Network (NKN): Expanding the ICT Network

The project NKN is funded by DIT and is currently being managed in multiple phases by National Informatics Centre (NIC). The idea of setting up of a NKN was deliberated by Government of India and the National Knowledge Commission.

Collaborative engagements were held with key stakeholders including experts, potential users, telecom service providers and educational and research institutions. These discussions have yielded a consensus on the optimal approach to be adopted for setting up such a network, to provide a unified high speed network backbone for all the sectors. National Knowledge Network (NKN) is an initiative which has enabled India to leapfrog to Knowledge Society. It aims at establishing connectivity for Knowledge & Information Sharing by

- Enabling Collaborative Research

- Facilitating personalized life-long leaving education.

- Providing an ultra high speed e-governance backbone

- Creation of unified network which can act as a carrier of all kinds of networks in the field of research, education and governance.

Pre requisite for farmers welfare is organize farmers into viable units, capacity building of farmers/ farmers leaders about govt. programmes / schemes, Awareness creation about various rights / acts such as Seed act/ pesticide bill/ IPR etc, suitable amendments on various act and rules for protecting the rights of farmers, ensure quality input timely adequately, planning from grass root with involvement & participation of farmers beneficiaries and the approach must be (a) Contact/ Contract/ Cooperative/ Cluster(SHG/FIG) Farming (b)Contingent plan/ Common Utility Activities(CUA) Viz. Community Nursery, Seed Bank, etc. /Conservation Technologies viz. zero tillage, DSR and (c) Enforcement policy/Assured Price& Market/ Technological backstopping .

The Amul Model:

Under the model, the entire value chain –from procurement, to processing and marketing – is controlled by the farmer's cooperative, which is directly linked to the final customer. There are no middlemen; the cooperative collects the milk directly at the producers' doorsteps. The model envisages that democratic elections are held every three years, to elect the members of the management committees who, in turn, elect the chairman. This ensures an active participation of farmers in decision-making, as well as transparency and democratic management. Membership is open to anyone who owns at least one cow and is able to provide at least 700 litres of milk per year. The final price of Amul products are decided by GCMMF, which conducts market surveys on aspects including the costs of milk, labour, processing, packaging, advertising, transportation and taxes. The success of AMUL model gives us a way to replicate this model with many agriculture commodities such as vegetable, fruits and commercial crops etc.

Livestock feeding systems and market access

As part of the East African Dairy Development project, the World Agro-forestry Centre is working to improve feeding systems of smallholder dairy farmers through introducing improved fodder shrubs, herbaceous legumes and grasses, and promoting feed conservation. Marketing is a key feature of these interventions, and the Centre facilitates the development of seed and nursery enterprises. It also helps farmers link to business development services along the value chain such as feed suppliers and seed companies. The use of volunteer farmer trainers as a dissemination pathway is being tested and the trainers are assisted to develop enterprises for marketing inputs (e.g. seed), products (e.g. fodder) and services (e.g. making silage) which they are

demonstrating. The process by which farmer trainers become business service providers is being researched and their effectiveness in disseminating innovations assessed.

Scaling-up of good practices:

Agriculture and rural development programs may reach fewer people, have minimal impact on poverty, and are not sustainable if people abandon promising approaches introduced by projects, owing to the inaccessibility of spare parts, lack of capacity to maintain and repair, and insufficient resources for purchase and maintenance. Prior to scaling-up, actors must identify Sustainable Agriculture and Rural Development (SARD) good practices that can be replicated within similar or different contexts. Good practices are often those that multiple stakeholders with different perspectives agree on their cost-benefit ratio, ecological, economic and social sustainability, and poverty reduction impact. A SARD good practice is one that is beneficial to the environment, profitable for farmers and communities, socially and culturally appropriate, and productive over the long term. It must be effective, efficient, easily replicated under similar constraints, responsive to real local needs and adaptable to other local conditions. Scaling-up efforts are more likely to succeed when multiple stakeholders are already engaged in effective partnerships or networks, informal groups are present and active, or rural people are involved in local and national decision-making processes. Supportive policies clear and secure land tenure systems and high literacy rates are also important. Scaling-up can take place through horizontal expansion of small-scale success, or through a vertical uptake of micro-level good practices into macro-policies and institutions.

Modernizing national agricultural extension systems:

Agricultural Extension can be defined as providing need- and demand-based knowledge and skills to farm households (men, women and youth) in a non-formal, participatory manner, aimed at improving quality of life. Extension is essential for research and development, but agricultural research agendas may remain largely academic unless extension workers provide input about farmers' identified and unsolved problems. To effectively serve the farming communities, applied research institutions need extension services that work in a field problems-oriented mode, and in turn extension services need the backstopping of strong applied agricultural research institutions. Some researchers believe that good technology will automatically be adopted by farmers; therefore there is no need for extension. However many 'good technologies' sit on shelves for years, demonstrating that good technologies must first travel between relevant research institutes and the farmers' fields to increase their chances for adoption. The growing trend of various departments involved in agricultural and rural development creating their own extension services, puts a large number of extension workers in the field and creates more demand for farmers' time and confusion due to duplication or conflicts of technical advice. More pluralistic agricultural extension creates the need for effective coordination among various agencies, a responsibility that governments should take up. Extension should evolve towards empowering farmers through active participation in decision-making, working through farmers' groups, preparing and delivering client-oriented messages, gender sensitivity, and research-extension-farmers linkages. Advanced information technology is also a key ingredient in agricultural development. The main goal is to harness relevant information technology without compromising the unique local factors like indigenous communication patterns or ecological

conditions. However, information technology should not be considered a replacement of the need for the human element of extension agents.

A new extension vision for food security challenge:

There is requirement of a vision comprising policy directions recommendations for transformation of agricultural extension services as they prepare to provide meaningful support to food security initiatives, as viable partner to fit in a pluralistic, multi-disciplinary and integrated effort involving many sectors, both public and private. It must be focuses on extension reform that will spearhead community development and Food Security Challenge".

Agricultural extension for institutional reforms:

Institutional reforms (extension and non-market) that emphasize stakeholder participation and have the potential to improve efficiency and effectiveness of extension efforts. It emphasizes how Agricultural extension cannot operate in isolation but as parts of a broader knowledge system, the Agricultural Knowledge System (AKS), which comprises of three pillars: – research, extension and agricultural higher education. The three pillars involve complementary investments that should be planned and sequenced as a system rather than separate entities. Success is only possible with strong cross-institutional linkages between AKS systems and their clientele. Agricultural extension needs to expand its focus to non-farm micro-enterprise development initiatives as a way of improving livelihoods because most rural people depend upon multiple sources of income. Agricultural extension services should go beyond providing technical support, and provide market extension and advice on importance of farmer organizing into farmers' associations. Approaches to extension should change in response to the changes in the global environments in the recent years which includes globalization, involvement of non-governmental agencies in extension and rural-urban dynamics brought about by technological advances.

Participatory Action Research (PAR)

Participatory Learning and Action (PLA) is an umbrella term for a wide range of approaches and methodologies, including Participatory Rural Appraisal (PRA), Rapid Rural Appraisal (RRA), Participatory Learning Methods (PALM), Participatory Action Research (PAR), Farming Systems Research (FSR), etc. The common theme is the full participation of people in the processes of learning about their needs and opportunities, and in the action required to address them. This issue is divided into three sections: the first section includes reflections on participatory processes and practice in community-based adaptation to climate change; the second section focuses on participatory tool-based case studies and the third section, participatory tools.

Action research simultaneously contributes both to existing practical concerns/problems of people and furthers the goals of social science. Therefore, there is a dual commitment to study a system and concurrently to collaborate with members of the system in changing it in what is together regarded as a desirable direction. What differentiates action research from other types of research is its focus on turning the people involved into researchers; the research takes place in real-world situations, and aims to solve real problems and the initiating researcher, has to make no attempt to remain objective, but openly acknowledges their bias to the other participants. Models of the action research process are cyclical in nature with four, sometime five stages:

plan, act, observe and reflect or diagnosis, action planning, taking action, evaluation and specifying learning.

Action research approach emphasizes collaboration, which enables mutual understanding and consensus, democratic decision making and common action. Within this broad definition there are four basic themes: 1) collaboration through participation; 2) acquisition of knowledge; 3) social change; and 4) empowerment of participants. Action researchers are responsible for developing a learning environment which challenges the status quo and generating better alternatives to improve their future. The CRASP definition of action research has been used as: **Critical** collaborative enquiry by **Reflective** practitioners, who are **Accountable** in making the results of their enquiry public, **Self-evaluative** of their practice, and engaged in **Participative** problem solving and continuing professional development.

Strengthening farmer organizations and agency:

Rice production increased in the Philippines through improved varieties, fertilizer application, increases area under irrigation mainly driven by national investment in irrigation systems and later on spearheaded by partnerships between farmers and the government institutions. The transformation continued with the government launching farmer-run Irrigation Associations that were capable of managing the operation and maintenance (O & M) of irrigation systems. This participatory approach reduced O & M costs because farmers partially or fully managed the irrigation systems; improved equitable distribution of water and reduced internal conflict. The comprehensive research aimed at improving production included the analysis of system performance (e.g. production and water distribution); organizational variables (member characteristics and their value systems); environmental variables (social, economic and political environment) and system related variables (e.g. management of cropping calendar). Through collaboration they streamlined the organizational structure and defined and implemented the action plans. The participatory approach resulted in improved rice production, uptake of new technology and more sustainable irrigation system.

Learning in sustainable natural resource management:

The importance of learning in natural resource management (NRM) is being recognized by an increasing number of scholars and practitioners. A learning approach to NRM applies principles and theories of adult, organizational and social learning, and is underpinned by three core elements: systems thinking, negotiation, and reflection. By combining learning theories with concepts from adaptive management, co-management, and participatory resource management, this article explores how the explicit inclusion of learning principles and processes can strengthen community-based natural resource management. Case studies from the South Pacific are used to draw out lessons for the wider application of learning approaches to NRM.

Conclusions:

Extension as we know is a systematic process of exchanging ideas, knowledge and techniques leading to mutual changes in attitudes, practices, knowledge, values and behaviour aimed at improved production and productivity. Extension should respond to both external and internal forces including: 1) international agenda focusing on sustainability, biological diversity, inter-sectoral linkages and participation; 2) political landscape evolving towards decentralization; and 3) demographic changes such as population growth and displacement and rural-urban migration that redefines

the client base. Shifting from traditional, top-down approach towards a more participatory approach is, therefore, need of the hour.

The challenges are technology and its transfer and the process of problem-solving capacity building i.e. the function of technology transfer should complement human development. The Extension workers must transform themselves from messengers to facilitators, for success in the changed scenario. The world-wide experience shows that the farmers temporarily adopted the technologies while they were offered incentives, but stop practicing them when incentives are withdrawn. Activities based on active farmer participation in research and extension has showed potential for increasing adoption rates and, thus, improving natural resource management and food security.

The concept of participatory innovation development and extension is based on dialogue, farmer experimentation and strengthening of the organizational capacities of rural communities. The key step is adopting right kind of tools like participatory rapid appraisal (PRA) tools to obtain better results. Introducing training programmes based on raising awareness through participatory, dialogue-based education, aimed at empowering local people for self-reliant development can help a great deal. Newer extension methods including the ICTs have helped in providing access to information through various communication technologies which include the internet, wireless networks, and cell phones etc through which people communicate with others across the world. The implementation of rural ICTs involves organizational and social change. Besides, an important barrier to realizing the economic benefits of ICTs is the often substantial high level of investment in new infrastructure – both hardware and software. In developed countries, large potential customer bases and efficient capital markets help overcome this barrier, hardware and software designed for developed countries can easily be adapted to serve higher income consumers in developing countries, but this leaves out the majority of the population in developing countries. Thus there is an urgent need for a comparative analysis of different extension strategies, organizational models, institutional innovations, and resource constraints and how an extension system might be transformed and strengthened through specific policy and organizational changes as well as needed investments.

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