

Reinventing Agricultural Extension System in India

The Road Ahead

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Agricultural extension is critical to improve farm productivity and to translate the same into increased income. However, the agricultural extension system in India is facing a multitude of challenges. The support, in terms of policies and promotion, received by the agricultural sector even before the green revolution is gradually weakening. Private extension has been unable to match the requirements of a diverse and smallholder-dominated Indian agricultural sector. Restructuring of the Indian agricultural extension system is vital in developing the sector into a major source of growth in the Indian economy.

The authors thankfully acknowledge the comments received during the presentation of the draft of this paper in the seminar on “Indian Agriculture: Policy Shifts and Emerging Challenges” organised by the National Bank for Agriculture and Rural Development Chair Professor unit at the Tata Institute of Social Sciences, Mumbai during 20–21 June 2019, which helped to improve the manuscript. The authors particularly thank R Ramakumar of TISS for his comments and useful suggestions. They also thank the anonymous referee whose comments and suggestions have helped improve the paper.

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Agricultural research and extension play an important role in attaining food security and lifting the rural poor out of poverty. Studies have revealed the effectiveness of expenditure and investment on agricultural research and development (R&D), including extension services, in reducing poverty as compared to several other avenues of investment (*Businessline* 2017; Bathla et al 2019).

A strong agricultural extension system is vital in transferring the knowledge and technology generated by the research system to the diverse categories of stakeholders that may lead to its adoption, and further, to translate production gains into increased value generation. To facilitate this, many institutions were created, mainly in the public sector. As a result, new technologies developed by the research systems were disseminated widely. This has resulted in the growth of total factor productivity (TFP) in agricultural sector at the rate of 1.5%–2.0% per year over a period of time (Pal 2017). Several studies have indicated favourable economic returns for increased extension expenditure (Evenson 2001; Benin et al 2011; Birthal et al 2015). Compared with the heyday of agricultural extension in India coinciding with the green revolution, the technologies and institutions operating in Indian agriculture have undergone a sea change. This warrants a reoriented approach in agricultural extension development in India. This paper is an attempt in that direction.

Contextualising Agricultural Extension System

In the context of fast-changing global agriculture, the extension system needs to transcend from a production-centric approach to a value chain-centric one. For this, it has to develop expertise in order to address the concerns of all stakeholders—producers, market functionaries, retailers, and consumers.

However, at the policy level, extension expenditure has stagnated for a long period (Sajesh and Suresh 2016). The reasons involve undermining the role and efficacy of the extension system in improving farm productivity and anticipation of the large-scale substitution of public extension system with private extension system, in addition to the termination of external aids to the extension system. Fast developments in information and communication technologies (ICTs) have strengthened this attitude.

Meanwhile, the agrarian economy in India continued to grapple with several challenges. The General Agreement on Tariffs and Trade (GATT) and the consequent coming into force of the World Trade Organization (WTO) had brought

new opportunities but posed several challenges as well. India's bilateral and multilateral trade agreements—including the Association of Southeast Asian Nations (ASEAN) agreement—have also posed additional challenges (Francis 2011; Saraswath et al 2019). Several environmental issues affected Indian agriculture, such as soil and water degradation, climate change and chemical contamination, to mention a few. Even though the TFP of Indian agriculture grew, it was with large variations among crops and regions. Further, widespread distress was reported from the hinterland.

Notwithstanding these hindrances, the agricultural production continued to grow at a rate higher than the population growth rate. During the 1981–2017 period, foodgrain production in India grew at a rate of 2.11% per year, higher than the population growth at 1.82% per year. It is projected that by 2032–33, the domestic demand, including indirect use, would be to the tune of 334–349 million tonnes of foodgrains, 245 million tonnes of vegetables, 175 million tonnes of fruits, 221 million tonnes of milk and milk products, 165 million eggs, and 25 million tonnes of fish and meat together, respectively (NITI Aayog [2018] [based on actual consumption in 2011 the National Sample Survey Family Budget]). This indicates a demand increase to the tune of 21% for foodgrains, 42% for milk, 70% for meat, 33% for vegetables and 54% for fruits, compared to that of 2011–12. The supply to meet this increased demand has to come from a reduced cultivable area, emerging water constraints, without adding to the environmental pollution. The role of agricultural extension will be of paramount importance in this context. Farmers who use information are found to realise higher net returns. Birthal et al (2015) peg this figure at over 12% net returns per hectare.

Evolution of Public Sector Extension System

During the post-independence period, several extension programmes were launched with the immediate target of achieving food self-sufficiency. These include the grow more food (GMF) Campaign in 1947, Community Development Programme (CDP) in 1952 and National Extension Service (NES) in 1953. Later, various location-specific extension activities were initiated under several major programmes during the pre-green revolution period. These were the Intensive Agricultural District Programme (IADP), Intensive Agricultural Area Programme (IAAP), and High Yielding Varieties Programme (HYVP), as well as Farmer Training Centre (FTC) during 1961–67. Towards imparting functional competency, a training and visit (T&V) programme was initiated on a pilot scale in Rajasthan in 1974, modelled on the basis of the experience from the World Bank (Amateur 1994). This was scaled up at the national level in 1977. The National Agricultural Extension Programme (NAEP), during 1984–95 and the National Agricultural Technology Project (NATP) introduced in 1998 had components of innovations in technology dissemination.

The Agricultural Technology Management Agency (ATMA), an autonomous extension agency created at the district level in 2005, was considered as a key intervention for reforming the extension system. Concomitantly, the National Agricultural

Research and Extension System (NARES), led by the Indian Council of Agricultural Research (ICAR) also developed several programmes for effective extension. Krishi Vigyan Kendras (KVKs), the major extension arm of ICAR, were established in 1992. Currently, KVKs act as the major technology-backstopping agency for agricultural extension systems at the district level.

The current public agricultural extension system in India follows a three-tier structure, namely the state level, central level, and the NARES). State departments (agriculture, horticulture, animal husbandry, fisheries, etc) play a key role in terms of the number of personnel engaged and beneficiaries covered in their respective states. Technological backstopping to respective state departments is provided mainly by the state agricultural universities. The ATMA functions as a coordinating system of all the agencies involved in a delivery of extension services in the district (DAC 2014; Birner and Anderson 2007).

The Union Ministry of Agriculture and Farmers Welfare formulates and implements national-level extension programmes in agriculture and allied sectors. The Directorate of Extension is the nodal extension organ of the Department of Agriculture and Farmers Welfare: <https://agricoop.nic.in/en>. Under its scheme “Support to State Extension Programmes for Extension Reforms” (SSEPER) initiated in 2005, it releases grants-in-aid to state governments. The scheme is operationalised through the ATMA that encourages the organisation of farmer groups and farm schools for promoting farm technologies.

Other than this, several commodity boards like the spices board, tea board, coffee board, rubber board, Coconut Development Board, National Dairy Development Board, and National Fisheries Development Board under different ministries, also provide commodity-specific extension services such as technical advice inputs and subsidies, accreditation of input providers, training, product quality assurance and analytical testing, market promotion, etc. Other central government agencies like the seeds corporations and input manufacturing companies are also involved in the provision of extension services. Some of these schemes, such as technology missions on different crops (horticultural crops, maize, oilseeds and pulses), watershed development programmes and the National Food Security Mission have their own extension mechanism. Of late, the Rashtriya Krishi Vikas Yojana (RKVY), funded by the central government, is being implemented through the state governments.

Further, in order to strengthen the extension system with innovative methodologies and capacity building, the National Institute of Agricultural Extension Management (MANAGE) was established in Hyderabad in 1987 with a mandate to devise suitable extension strategies and train senior extension functionaries. This was in addition to four extension education institutes (EEI) already in operation at Nilokheri, Haryana (1959); Anand, Gujarat (1962); Hyderabad, Andhra Pradesh (1962); and Jorhat, Assam (1987).

The NARES—comprising the ICAR and state agricultural universities (SAUs)—contributes to Indian agriculture in terms of developing location-specific cutting-edge technologies to support the national agri-food system. ICAR reaches out to farmers mainly through KVKs, which are mandated to conduct

on-farm trials (OFTs), front-line demonstrations (FLDs) and capacity development programmes (CDPs). ICAR, with a vast network of 716 KVVKs all over the country, provides vocational training to primary producers and extension personnel. The activities are monitored zonally by the Agricultural Technology Application Research Institute (ATARI), and there are currently 11 ATARIS. The ICAR has also started Agricultural Technology Information Centres (ATIC) since 2000 in selected ICAR institutes and SAUs to function as a single window system, showcasing or selling technologies and products developed in the institute or university. The SAUs and ICAR institutes also carry out extension activities directly, but in a limited manner, mainly confined to the areas in their vicinity. In recent times, the public sector extension agencies have increasingly utilised developments in ICTs. For example, MKISAN is a mobile-based application that enables central and state agencies to provide information to definite stakeholders in vernacular languages through SMS. Further, the concept of establishing agribusiness incubation (ABI) centres at the institute level gave a major thrust to public extension services for the commercialisation of agriculture through start-ups.

Private Sector Agriculture Extension System

The private sector extension is gaining momentum as it encourages an efficient input delivery system and need-based farm advisory services. The private sector has the potential to provide context-specific services. As a result, the embedded services, public-private partnerships (PPPs) and contact farming arrangements are considered important for agricultural extension (Ferroni and Zhou 2011). There are about 0.3 million agro-input dealers—dealing with seeds, fertilisers, pesticides and agro-machinery—across the country. Compared to this, there are only approximately 0.15 million sanctioned posts of extension workers in the country, of which more than 30% remain vacant (DAC 2014). However, one challenge in this context is the quality of information supplied. A profile of the private extension system in India is outlined in Table 1.

Apart from input provision, a number of firms have launched outreach activities in their own capacity or in association with other actors in the public or civil society sector. The initiatives

Table 1: Profile of Major Stakeholders in Private Extension Service in India

Major Stakeholders	Subgroups	Participation Configuration	Example
Private corporate firms	Input firms	Information support	Indo-American hybrids, ASPEE, Sandoz
		Sponsorship cost	
		Sharing training	
Consultancy firms	Project consultancy	Technical consultancy	Agro Tech, Good Earth, Green Valley Plantation
		Managerial consultancy	
		Contracting firms	
Farmers' associations	Producers	Sub contracting	KAICO
		Self-help groups	VFPCCK
		Cooperatives	IFFCO
Non-governmental organisations	Individual charitable	Self-help groups	MitraniKETAN
		Neighbourhood groups	BAIF
		Professional	Organised services
ICTs	Traditional	Print media, television, radio	Agrowon, Kissan Krishideepam
		Modern	Internet-based

Source: Prasad (2001).

launched by ITC, like e-Choupal, Chaupal Sagar, and Chaupal Pradarsan Khet (CPK), provide farmers with access to information about weather and innovative farming practices, collection and storage facilities, and technology demonstrations, respectively. Further, many companies provide funding through their corporate social responsibility (CSR) policy.

NGO/Civil Society Extension System

In India, there are more than 3 million registered non-governmental organisations (NGOs), of which 15,000–20,000 are actively involved in the development of rural areas and oriented towards land-based livelihoods (Gulati et al 2018). Some prominent ones are Professional Assistance for Development Action (PRADAN), Bharatiya Agro-Industries Federation (BAIF), Syngenta Foundation, Action for Food Production (AFFRO), and Self Employed Women's Association (SEWA), among many others.

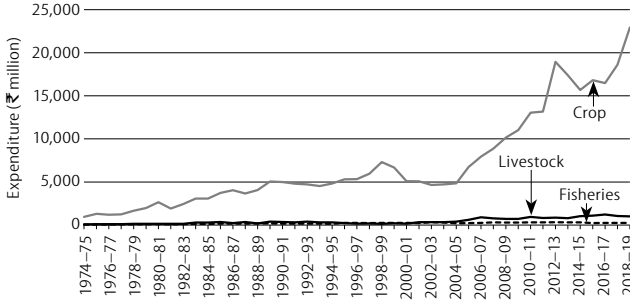
Over the years, commodity-based farmers' organisations, farmers' interest groups (FIGs), self-help groups (SHGs), and cooperatives utilising social capital have emerged as a major force to reckon with to generate income and reduce poverty (Swanson and Samy 2006). The examples include the Maharashtra State Grape Growers' Association, Young Farmers Association Punjab, Organic Farming Association of India (OFAI), and many more. Out of the 5.8 lakh functional cooperatives spread across India, about 3.75 lakh are agricultural cooperatives, with 280 million member farmers. There exist many successful cooperatives in different sectors. AMUL in Gujarat, Mother Dairy in North India, OMFED in Odisha, and MILMA in Kerala—all in the milk sector—as well as Indian Farmers Fertiliser Cooperative Limited in the fertiliser sector, National Agricultural Cooperative Marketing Federation of India in the marketing sector, etc, have proved their significant presence.

Issues and Challenges

The extension system has to respond to several issues and challenges that the agricultural sector faces. Some of the emerging challenges in the sector are the dominance of ever-increasing smallholders along with the fragmentation of holdings; diversification of the agricultural sector to high-value crops and enterprises; reorientation of the aim of agricultural R&D from productivity improvement to income improvement; evolving institutions that can exploit economies of scale in agricultural operations; unsustainability in agricultural sector with respect to soil, water and biodiversity; inclusiveness issues; increased demand for value added products; emergence of farm collectives; imparting resilience against climate change; and effective usage of ICTs. In addition to these generic challenges in Indian agriculture, the Indian extension system is confronted with some specific challenges.

Presence of multiple agencies targeting same clients: The draft report on Doubling Farmers' Income (DFI) shows 107 categories of public and private extension service providers (GoI 2017). These agencies

Figure 1: Trend in Extension Expenditure in India, 1974–75 to 2018–19 (real price) (2004–05 base)



Source: Chand et al (2011) and CAG (various years).

span across Ministries of Agriculture and Farmers' Welfare, Commerce and Industries, Food Processing, Textiles, Water Resources and Ganga Rejuvenation, Finance, Science and Technology, Rural Development, and Information and Broadcasting. Besides, state governments and intergovernmental institutions also undertake extension services. In addition, private players like agripreneurs, farmer collectives, ICs, input dealers, agribusiness companies, etc, are also involved in service provision. While the diversity of actors helps to address varying extension priorities of farming communities and supplement each other's efforts, it also raises the possibility of redundancy in activities, competition among agencies, and provision of contradicting information. There is a need to integrate or converge them in order to provide a one-stop solution to farmers' problems at the village level by leveraging the resources, efforts and innovations more effectively and meaningfully.

Pattern of funding for agricultural extension: Agricultural extension is funded majorly by state and central governments together. An analysis revealed that over the years, the expenditure on agricultural extension has increased, but with high degree of variability (Figure 1) (constant prices based on wholesale price index of 2004–05, triennial ending average; Chand et al 2011). This expenditure suffered a dip during the latter half of the 1990s. The initiation of the ATMA and NMAET helped to reverse the trend subsequently.

When expenditure in extension activities was analysed in a disaggregate manner, it was revealed that real extension expenditure over the years has not increased much in absolute terms (Table 2). In fact, during the immediate post-liberalisation period (between 1995–96 and 2004–05), a negative growth in total expenditure is observed. The positive growth in

Table 2: Trend Growth in Extension Expenditure in India across Sectors (1974–75 to 2018–19)

Period	Crop	Livestock	Fisheries	Total
Expenditure (₹) (real, 2004–05 prices)				
1974–75	950.0	82.6	49.6	1,082.1
1994–95	4,826.2	320.6	156.2	5,303.0
2004–05	4,851.2	394.1	201.0	5,446.3
2018–19	22,931.9	1,013.1	261.2	24,206.2
Growth rate (% per year)				
1974–75 to 1994–95	8.7	7.8	6.0	8.5
1995–96 to 2004–05	-2.6	9.7	-0.1	-1.9
2005–06 to 2018–19	8.6	3.7	-0.1	8.1
1974–75 to 2018–19	6.0	5.3	3.4	5.9

Source: Computed by the authors from data in Chand et al (2011) and CAG (various years).

livestock and fisheries sectors could be due to low base values (Sajesh and Suresh 2016).

Pal (2017) noted that as on the triennium ending 2011, the funding from state governments constituted almost three-fourths of the total funding. A relatively new data set shows that the share of state governments has increased substantially, when calculated only for crop-based extension system. This figure could be for the direct extension system, but may not reflect the funding for various extension activities implemented through a multitude of programmes and institutions. The share of agricultural extension as a share of agricultural gross domestic product (GDP) at the national level has shown an improvement since 1970, mainly on account of the T&V programme, but this slowed down till 2004–05. Only 0.54% of agricultural gross domestic product (GDPA) was spent for research and extension during 2014–15 (Gulati et al 2018).

The funding is skewed towards crop husbandry, ignoring the allied sectors like livestock and fisheries, despite their significant contributions towards national GDPA and farmers' livelihood security. This contrasts sharply with the need of the sector, where livestock is emerging as a major component of farm income, and fisheries being considered as a sunrise sector.

Rather than the absolute figures of expenditure, its movement relative to GDPA, operational holding and number of farmers would provide greater analytical insights. The extension expenditure as a share of GDPA stood at 0.18% in 2011–13 (average), showing wide variation across states (Pal 2017). This is in concordance with priorities for agricultural sector, in the form of newer schemes and programmes in state and central governments. Following a dip during the post-liberalisation period, the intensity ratio has shown an upward trend from 2004–05 onwards. However, in recent years, there is a dithering in this trend.

Regional disparity in extension expenditure: Regional variation in extension expenditure is an issue of concern. Pal (2017) showed that dry regions, accounting for about 60% of the total agricultural land, received only 23% of the total funding as of 2013. On the other hand, the irrigated regions accounted for about 24% of the agricultural land, and were allotted 35% of the extension budget. Further, a comparison with the number of farming households instead of the operational holdings revealed a different picture. As a policy guideline, expenditure allocation should consider both the number of holdings and cultivators. While it is worthwhile to mention that there is inadequacy of funding for dry land regions, the higher size of operational holding in dry lands also needs to be acknowledged. A comparison of the states in terms of extension expenditure for crops, for the past decade for which data is available, is provided in Table 3 (p 41).

Human resource availability for public extension: The total workforce, at various levels in public extension system in India under the Ministry of Agriculture and Farmers' Welfare, is estimated to be around 0.14 million for a net cropped area of 141 million hectares, spread across 158 million operational

holdings, and leaves almost 0.09 million posts vacant (Gulati et al 2018). On an average, the available extension services of the department reach only 6.8% of farmers (GFRAS 2012). One extension officer has to serve 1,162 operational holdings at the national level, as against the recommended 750 (GoI 2017). The ideal ratio of extension workers to the operational holdings in different areas is 1:400 in hilly areas, 1:750 in irrigated areas, and 1:1,000 in rainfed areas (Gulati et al 2018). The number of operational holdings per extension personnel is as high as 3,162 in Andhra Pradesh, 2,428 in Karnataka, and exhibits wide variation across states (Sajesh and Suresh 2016). In terms of net crop area per extension personnel, it was as high as 3,194 in Rajasthan, 3,154 in Karnataka and 2,982 in Punjab. In most cases, farmers require a one-on-one interaction with the extension person, and therefore, it would be prudent to examine the intensity of problems considering the number of cultivators as well. The increase in paperwork and documentation squeezes the time available for extension work. However, recruitment is not commensurate with the increased activities and responsibilities, or with the vacancies arising in the system.

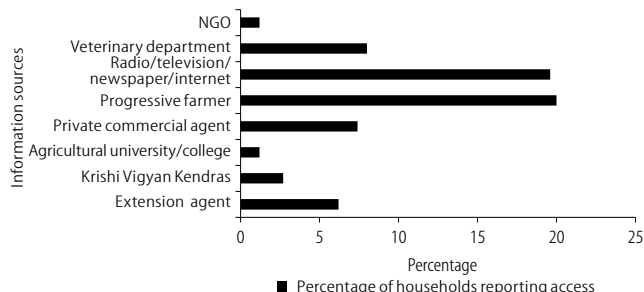
Access to information sources: The National Sample Survey Organisation (NSSO 2005) throws light on access to information

Table 3: Level, Share, and Growth of Extension Expenditure for Crop Sector across States, 2015–16 to 2017–18, Nominal Values

State/Union Territory	Level of Expenditure (₹ million)	Share of Expenditure (%)	Trend Growth Rate (for 10 Years Ending 2017–18) %/Year
Andhra Pradesh (undivided)	467	1.4	0.5
Arunachal	89	0.3	12.6
Assam	463	1.4	-4.1
Bihar	5,967	18.2	31.6
Chhattisgarh	307	0.9	39.6
NCT Delhi	29	0.1	11.5
Goa	48	0.1	17.4
Gujarat	1,197	3.6	11.3
Haryana	3,126	9.5	7.8
Himachal Pradesh	372	1.1	15.6
Jammu and Kashmir	550	1.7	5.9
Jharkhand	798	2.4	15.8
Karnataka	872	2.7	29.7
Kerala	2,539	7.7	59.4
Madhya Pradesh	1,249	3.8	20.2
Maharashtra	1,242	3.8	16.3
Manipur	46	0.1	7.7
Meghalaya	157	0.5	18.8
Mizoram	82	0.2	22.6
Nagaland	143	0.4	40.2
Odisha	106	0.3	1.0
Puducherry	113	0.3	6.1
Punjab	2,194	6.7	95.6
Rajasthan	553	1.7	18.8
Sikkim	63	0.2	23.7
Tamil Nadu	2,814	8.6	10.2
Tripura	330	1.0	10.5
Uttar Pradesh	5,044	15.4	14.5
Uttarakhand	234	0.7	-
West Bengal	1,619	4.9	5.0
Total	32,813	100	5.6

Source: Computed by the authors from CAG (various years) data.

Figure 2: Proportion of Households Accessing Different Sources of Information



Source: NSSO (2014).

by different stakeholders. The percentage of farmers who accessed information from any source, for large, medium, and smallholders, is 54%, 51% and 38%, respectively. It is also noted that the small farmers and socially backward farmers have access to fewer information sources compared to their counterparts (Birthal et al 2015). Smallholder farmers rely mainly on local sources of information such as progressive farmers (16%) and input dealers (12.6%), along with radio (12.4%). Only 4.8% of smallholders considered extension workers as a primary source of information, compared to 9.8% in the case of medium farmers and 12.4% in the case of large farmers (Adhiguru et al 2009). The NSSO (2014) also provides information on access of farmers to different source of information (Figure 2). The low share of extension personnel could be partly due to their insufficient number, and due to them being overloaded with paperwork required for official record-keeping.

The National Statistical Office (NSO 2021) reports that the share of agricultural households accessing technical advice is only about 48.7% during July 2019–December 2019 and 42.2%

Table 4: Percentage of Agricultural Households Accessing Technical Advice from Different Sources (%)

Source of Technical Advice	July–December 2018		January–June 2019	
	Agricultural Households Accessing Technical Advice	Agricultural Households That Adopted the Accessed Technical Advice	Agricultural Households Accessing Technical Advice	Agricultural Households Adopted the Advice among Those Who Accessed Technical Advice
Progressive farmers	22.8	92.1	20.3	91.0
Input dealers	19.9	93.3	19.1	92.4
Government extension agent/ATMA	3.1	83.4	1.5	86.2
Krishi Vigyan Kendra	1.3	80.4	0.5	72.0
Agricultural university/college	0.3	79.9	0.2	73.8
Private commercial agents	1.2	74.6	0.9	85.7
Veterinary department	6.6	89.5	6.8	90.6
Cooperatives/dairy cooperatives	2.7	89.5	1.8	90.1
Farmer producer organisations	0.5	79.0	0.3	87.6
Private processors	2.1	86.5	2.3	90.2
Agri clinics and agribusiness centres	0.5	70.9	0.3	90.5
NGOs	0.6	70.3	0.2	68.5
Kisan call centres	1.5	69.5	0.7	72.0
Print media	5.3	67.6	4.1	65.4
Radio/television/other electronic media	13.2	65.4	8.2	61.7
Smartphone app-based information	1.2	75.5	0.8	62.8
Any agent	48.7	89.8	42.2	89.5

Source: NSO (2021).

during January 2020–June 2020. About 90% of those who accessed technical advice adopted the advice. Progressive farmers and input dealers were the major sources of information (Table 4, p 41).

Apart from landholding size, issues of inclusiveness also arise with respect to disadvantaged regions, crops and marginalised sections of society. This is particularly so in the cases of non-timber forest produce in tribal areas, small ruminants in case of livestock (sheep and goat) and dry land crops. In remote and disadvantaged areas, contact with extension agents and farmers is less. Holistic livelihood development interventions are needed for such areas.

Extension for allied sectors of agriculture: The livestock and fisheries sectors play a significant role in augmenting farm income, imparting resilience to rural income flow and meeting the food and nutritional security. However, Indian extension expenditure largely concentrated on crop sector (Figure 1). Only 5.1% of the households were able to access information on animal husbandry as against 40.4% households accessing information on modern technology for crop farming (NSSO 2005). Similarly, the fisheries sector, with two distinct subsectors—capture (marine and inland) and culture (marine cage and inland)—faces different issues and challenges. Fisheries extension is yet to receive adequate policy support in relation to its extent of contribution to economic growth. The challenges faced by marine and inland sectors are quite different and therefore demands different extension strategies, especially in the context of the envisaged blue economic growth.

Reforming agriculture extension—the way forward in improving convergence in extension system: The convergence of multiple actors in the research, extension and community domains helps in mobilisation of farmers; validation of context-specific information; increase in efficiency of service delivery systems; and development of the capacities of various agencies on the principle of leveraging the activities, investments and resources from different agencies, resulting in higher productivity and sustainable food security. A suitable platform may be initiated for effective convergence among various agencies.

Anecdotal evidences point out that farmers' organisations like producer organisations, cooperatives, SHGs, etc. can be more effective as a platform for convergence of various schemes, programmes and agencies. A well-discussed case is of Mahagrapes—an association of 16 grape growers' cooperative societies in Maharashtra—which facilitates all the activities in different nodes of the value chain, from input provision to logistics and certification (Birthal et al 2007).

Farmer-led extension: More than 80% of Indian farmers are small and marginal holders. Small farmers face high unit transaction costs in almost all non-labour transactions, including non-labour input markets, credit services and output markets. High transaction costs constrain the smallholder farmers from reaping the benefits of distant urban markets (Birthal and Joshi 2007; Pingali et al 2019). The idea of farmer producer

organisations (FPOs) is gaining ground in this context. The FPOs can organise smallholders for backward and forward linkages for inputs, production, processing and marketing (Mondal 2010).

Strengthening public extension: Public extension, being the arm of the government, has to lead in the development of communication content and its validation (as well as prevention of contradictory information provision). Further, it can play a major role for involvement of all stakeholders in the process to converge their activities across the value chain. Further, the issues faced by the agricultural sector warrant collective adoption of management measures, such as in cases of pest and disease management in crop, livestock and fisheries (for example, foot and mouth disease of livestock); water quality issues; adaptive mechanisms against climate variability; market forces (price and market intelligence), agronomic requirements, etc. The management would be more effective upon wider adoption. Therefore, attributes like rivalry and exclusion—the major characteristics of private resources—are not facilitative in this context, and warrant presence of a public extension system.

The staffing pattern for public agricultural extension appears to revolve around minimising the size of the organisation, for a long time, applied to the bureaucratic system in general with inadequate appreciation of the context and case-to-case needs. The belief that Indian public administration is over-staffed falls flat in light of empirical evidences. Swami (2012) noted that India has only a fifth as many public servants as the United States (US), relative to its population: 1,623 public servants per 1,00,000 residents in India compared to 7,681 for the US. In India, the total number of public agricultural extension workers, as of 2012, is 0.12 million for 119 million cultivators (that is, 101 per 1,00,000 cultivators) and 263 million agricultural workers—cultivators plus agricultural labourers—(that is, 46 per 1,00,000 total workers) (Sajesh and Suresh 2016; DAC&FW 2015). This is much less than the value of 1,623 reported for general bureaucracy relative to total residents.

Private sector involvement in building partnership: The input and service providers in the private sector needs to be made part of effective extension mechanism. One of the emerging instruments of private sector involvement is through CSR. However, the CSR funding to agriculture and rural development sector does not depict an encouraging trend (Table 5). While private extension services found a place particularly for

Table 5: Trends in CSR Expenditure on Agriculture and Rural Development-oriented Programmes

	2014–15	2015–16	2016–17	2017–18	Total
Agro-forestry	18.1	57.9	43.5	12.2	131.6
Animal welfare	17.3	66.7	78.6	57.8	220.3
Conservation of natural resource	44.6	49.9	119.1	211.8	425.4
Rural development	1,059.4	1,375.8	1,552.1	1,456.0	5,442.8
Total R&D and agriculture	1,139.4	1,550.2	1,793.2	1,737.8	6,220.1
Total	10,066.0	14,503.0	14,312.0	13,327.0	52,208.0
%	11.3	10.7	12.5	13.0	11.9

Source: Compiled from Report of the High-level Committee on Corporate Social Responsibility Govt (2019b).

high-value commercial crops, livestock and fisheries, it did not replace the demand for public extension services.

Research–Extension–Farmer Linkage

Strengthening the linkage between research, extension and farmers require transparency, accountability and coordination among different agencies involved in the extension system. ICAR research institutes and SAUs are considered as “concept nurseries and think tanks,” in addition to their normal role in extension. Researchable issues recognised by the ATMA through deliberation with farmer and state extension functionaries must feed these research institutes and SAUs, to bring about technological development on the basis of different field-level problems. The pan-India presence of KVVKs may be leveraged for technology assessment through OFTs followed by validation through FLDS, prior to technology transfer to farmers through state extension functionaries.

Innovative Extension Approaches

The reforms in the Indian extension system have to factor in the existing structural problem in delivery of research and extension services, due to (i) a hierarchical, classical top-down, one-way communication system, and (ii) a one-size-fits-all research and extension approach, applied irrespective of technologies, institutions, agroclimatic variations, and socio-economic conditions of stakeholders. Glendenning et al (2010), through an analytical framework, suggest an innovative extension approach with a focus on governance structure, capacity building and management, nature of local communities, and consequent performance and impact. Some such approaches are: asset based community development (ABCD), rural advisory services (RAS), model village system of extension (MVSE), and commodity based village development (CBVD) (Mohanty et al 2020).

Entrepreneurship development: Extension needs to identify the potential for entrepreneurship development across the value chain and help forge forward and backward linkages. Assessing the entrepreneurial intention of farmers and capacity building for entrepreneurship development need to be undertaken.

Potential of information technology: The unprecedented growth of information technologies present many opportunities for agriculture, in general, and agricultural extension, in particular. Innovations like block chain technology, artificial intelligence, cloud computing, and geographical information systems needs to be manoeuvred for improving production, productivity and returns in a sustainable manner. It is important to develop the capacity of extension personnel in the aforesaid aspects. Harnessing the potential of social media for extension and ICT-based knowledge management are the areas that must be emphasised.

Capacity development of extension personnel: The capacity development of agricultural extension professionals on

technical and collaboration aspects is one of the important issues of the ongoing extension reforms to serve the farming community efficiently and effectively. Mastery over relevant technologies, policies and regulations in agriculture (including allied sectors) and natural resource management is a *sine qua non* for new extensionists (Sulaiman and Davis 2012). This also includes awareness regarding the markets, finance and insurance, emerging technologies, policies, standards, input delivery and natural resource management (Sulaiman and Davis 2012).

Extension for high-value agriculture: Birthal et al (2007) have observed that the growing demand for high-value food commodities offers opportunities, but also poses several challenges, particularly for smallholders. Customised extension strategies are needed to promote such initiatives, and enhance the income of producers. Institutional innovations like growers’ associations, cooperatives, and contract farming are considered to address some issues of marketing, risks management and transaction costs (Eaton and Shepherd 2001). Gulati et al (2018) have pointed out that agricultural extension services for HVA sectors remain weak and disorganised, and suggested setting up of community farm schools with useful demonstrations, to impart knowledge on diversification towards other high-value crops.

Increased priority for livestock and fishery extension: As per the 2019 livestock census, India has about 536 million livestock and 852 million poultry including 193 million cattle, 103 million buffaloes, 74 million sheep and 149 million goats (GOI 2019a). Increasing farm income and imparting resilience to it requires further promotion of livestock and adopting improved management strategies. Veterinary extension faces several challenges, including low personpower. The Planning Commission (2012) noted that the livestock sector accounts for



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only about 12% of total public expenditure on agriculture and allied sectors. The major arms of veterinary extension are the state veterinary departments and veterinary universities. However, the number of veterinary clinics and dispensaries are only about 37,647 and must cater to such a large population of livestock (GoI 2019a).

The fisheries sector has also registered high growth in recent periods and has emerged as a sunrise sector. The government, in the 2020 Union Budget, has proposed increasing fish production to 20 million tonnes by 2023–24 from 13.8 million tonnes (in 2020) and to increase the exports to ₹1 lakh crore by 2025–26 (from ₹47,000 crore in 2020). However, the extension facilities for fisheries is quite underdeveloped with a low level of funding, and requires overall revamping (Sajesh et al 2018).

Augmenting the environmental orientation: Augmenting the environmental orientation in agricultural extension, especially in the context of sustainability issues, climate change-related risks and natural disasters, is important. A declining resource base leads to increase in the cost of production and reduction in the profitability. It has been widely acknowledged that only eco-sensitive practices will be sustainable in the future. Similarly, it is imperative to raise the resilience capacity of farmers in the context of climate change-related issues like drought, flood and other disasters. Extension is crucial in achieving overall environmental quality and energy efficiency through better practices.

Engendering extension services: Worldwide, extension services remain dominated by men, and the needs of women farmers, as well as households headed by women, are excluded systematically from accessing many extension services (Beevi et al 2018). The *Economic Survey 2017–18* revealed that the feminisation of agriculture and women's role as cultivators, entrepreneurs and labourers is increasing day by day. Also, it is important to sensitise the extension agents on gender aspects and the need for reaching out to farmers irrespective of their gender.

Conclusions and Implications

Agricultural extension plays a critical role in achieving food and nutritional security of the country as well improving farmers' incomes. Towards this, the entire sector has seen several initiatives in India, beginning in the pre-independence period. The extension programmes got a further fillip with the ushering in of the green revolution, mainly with public funding. The role of the extension initiatives is more pronounced in recent times, due to the shift in focus to improve farmers' incomes rather than farm productivity; emerging value chain concept, emergence of various challenges on the farm front and need for entrepreneurship development. Consequently, the extension system has to continuously innovate to cater to the evolving situation.

At the policy level, several issues are to be addressed. The major one is fulfilling the requirement of inclusive growth and

last-mile connectivity with the farmers. While the increasing role of the private sector in extension is to be acknowledged, it is to be noted that the private sector cannot match the demand of India's diverse agricultural sector in terms of geographical coverage and scale. Thus, public agricultural extension needs to receive adequate policy support in terms of funds, human resource and avenues for skill upgradation, particularly in the context of the public resource nature of agricultural information, and the need to widely adopt agricultural technologies and scientific practices.

Bringing convergence of the extension system to cater to the localised information for farmers is another requirement. All stakeholders, including the public and private sector (as well as NGOs) should be part of the broad platform. The ATMA, SAMAEITI, KVK systems and the line departments of the state governments have to evolve an institutional mechanism to fulfil the extension requirements. The diversity of the information requirements for a farming system, including farm prices, is to be recognised. The extension system must address the needs of the predominantly smallholders, marginalised areas, and marginalised section of the society. This highlights the importance of decentralised extension system. An institutional set-up that can collect real-time information on farming issues, pool them centrally and disseminate them locally needs to be devised. In such a system, ICTs at the village level can play a major role. Integrating input dealers into the emerging extension landscape through their capacity building and quality assurance is the need of the hour.

Reorienting the extension system to address the current needs and focus of the nation in terms of income improvement is a challenging task. Diversification, commercialisation, productivity improvement and value addition are significant steps towards this end. Addressing the needs of the allied sectors like livestock and fisheries is critical to improve farm income and nutritional requirement (protein, in particular) of the nation. Skill improvement is an essential step in this regard. The PPP model can be promoted, through which public funds can be provided to private parties, including NGOs, to train farmers. With a vibrant monitoring and evaluation system, this strategy could yield rich dividends.

Effective usage of ICTs and real-time governance (RTG) can address the numerous issues in agriculture extension and governance, especially with regard to agronomic practices, crop protection activities—including management of pest and diseases—dissemination of information on prices and management practices for animal husbandry and fisheries. Social media can be a useful tool for extension, although its usage to promote the same has not been widespread in India. Artificial intelligence and machine learning are newer technology options to address many challenges of crop, livestock and fisheries management. Such technology platforms, combined with RTG, can be an effective mechanism to disseminate information. Policy needs to evolve mechanisms to train extension personnel in emerging ICT-based applications, including e-NAM, futures trade, online transactions as well as modern ICT usage. However, the notion that modern ICTs can substitute the human

intermediation in extension is rather far-fetched. Rather, these technologies function as an extension aid (Sulaiman et al 2012). The extension policy needs to see a paradigm shift in terms of strategies and focus. Effective utilisation of farmers' collectives is an important strategy to leverage economies of scale and to reduce transaction costs. Successful examples of farmers' collectives including FPOs are emerging from the

hinterland. Natural resource management and income generation needs greater focus.

Thus, the extension system needs to be futuristic and evolve strategies to suit emerging technology platforms. In this context, both the public and private sectors need to be promoted through different institutional mechanisms, so as to achieve inclusiveness and geographical coverage.

REFERENCES

- Adhiguru, P, P S BIRTHAL and Ganesh P Kumar (2009): "Strengthening Pluralistic Agricultural Information Delivery Systems in India," *Agricultural Economics Research Review*, Vol 22, No 1, pp 71–9.
- Benin, S, E Nkonya, G Okecho, J Randriamamonjy, E Kato, G Lubade and M Kyotalimye (2011): "Returns to Spending on Agricultural Extension: The Case of the National Agricultural Advisory Services (NAADS) Programme of Uganda," *Agricultural Economics*, Vol 42, No 2, pp 249–67.
- Beevi, Anshida C N, M Wason, R N Padaria and P Singh (2018): "Gender Sensitivity in Agricultural Extension," *Current Science*, Vol 115, No 6, pp 1035–36.
- Birner, R and J R Anderson (2007): "How to Make Agricultural Extension Demand-driven? The Case of India's Agricultural Extension," IFPRI Discussion Paper 729, International Food Policy Research Institute.
- Bathla, S, P K Joshi and A Kumar (2019): "Targeting Agricultural Investments and Input Subsidies in Low-Income Lagging Regions of India," *European Journal of Developmental Research*, Vol 31, No 1, pp 1197–26.
- BIRTHAL, P S and P K Joshi (2007): "Smallholder Farmers' Access to Markets for High Value Agricultural Commodities in India," *Food Policy for Developing Countries: The Role of Government in the Global Food System*, Case Study No 6–4, http://faculty.apec.umn.edu/kolson/documents/4103_cases/case_6-4.pdf.
- BIRTHAL, P S, S Kumar, D S Negi and D Roy (2015): "The Impacts of Information on Returns From Farming: Evidence from a Nationally Representative Farm Survey in India," *Agricultural Economics*, Vol 46, No 4, pp 549–61.
- Businessline (2017): "Spending on Sgri R&D Alleviates Poverty Substantially: Study," 13 December, <https://www.thehindubusinessline.com/economy/agri-business/spending-on-agri-rampd-alleviates-poverty-substantially-study/article-9992439.ece>.
- Chand, Ramesh, P Kumar and S Kumar (2011): "Total Factor Productivity and Contribution of Research Investment to Agricultural Growth in India," *Policy Paper*, Vol 25, National Centre for Agricultural Economics and Policy Research, New Delhi.
- CAG (Various Years): "Combined Finance and Revenue Accounts—Union and States," Comptroller and Auditor General of India, New Delhi.
- DAC (2014): "Guidelines for the Centrally Sponsored Scheme 'National Mission on Agricultural Extension and Technology (NMAET)' to be Implemented during the XII Plan," Department of Agriculture and Cooperation, Ministry of Agriculture, Government of India, New Delhi.
- DAC&FW (2015): "All India Report on Agriculture Census 2010–11," Agriculture Census Division, Department of Agriculture, Cooperation and Farmers' Welfare, Ministry of Agriculture and Farmers' Welfare, New Delhi.
- Eaton, C, and A W Shepherd (2001): "Contract Farming: Partnerships for Growth," FAO Agricultural Services Bulletin 145, Food and Agriculture Organization, Rome, Italy.
- Evenson, R (2001): "Economic Impacts of Agricultural Research and Extension," *Handbook of Agricultural Economics*, Vol 1A, B Gardner and G Rausser (eds), Amsterdam: Elsevier Science, pp 573–628.
- Ferroni, M and Y Zhou (2011): "Review of Agricultural Extension in India," Syngenta Foundation for Sustainable Agriculture.
- Francis, Smitha (2011): "A Sectoral Impact Analysis of the ASEAN-India Free Trade Agreement," *Economic & Political Weekly*, Vol 46, No 2, pp 46–55.
- Glendinning, J C, Suresh Babu and K Asenso-Okyere (2010): "Review of Agricultural Extension in India: Are Farmers Information Needs Being Met?" Discussion Paper 01048, International Food Policy Research Institute (IFPRI), Washington, DC.
- GFRAS (2012): "Fact Sheet on Extension Services, Position Paper, Global Forum for Rural Advisory Services.
- GoI (2017): "Empowering the Farmers through Extension and Knowledge Dissemination," Report of the Committee on Doubling Farmers' Income, Vol 11, Ministry of Agriculture and Farmers Welfare, Government of India.
- (2019a): "Basic Animal Husbandry Statistics 2019," Department of Animal Husbandry and Dairying, Government of India.
- (2019b): "Report of the High-level Committee on Corporate Social Responsibility," Ministry of Corporate Affairs, Government of India.
- Gulati, A, P Sharma, A Samantara and P Terway (2018): *Agriculture Extension System in India: Review of Current Status, Trends and the Way Forward*, New Delhi: Indian Council for Research On International Economic Relations.
- Mohanty, A K, M V Sanjeev and Sajev V K (2020): "Innovative Extension Approaches for Sustainable Technology Dissemination in Fisheries," *Pluralistic Extension for Upscaling Secondary Fisheries*, 17–24 January, ICAR-Central Institute of Fisheries Technology.
- Mohanty, A K, A Suresh and V K Sajesh (2020): "Novel Extension Approaches for Technology Dissemination in Fisheries," Training Manual on ICAR Winter School, Responsible Fishing: Recent Advances in Resource and Energy Conservation, 21 November 2019–11 December 2019.
- Mondal, A (2010): "Farmer's Producer Company (FPC): Concept, Practice and Learning—A Case from Action For Social Advancement," *Financing Agriculture*, Vol 42, No 7, pp 29–33.
- NSSO (2005): "Situation Assessment Survey of Farmers: Access to Modern Technology for Farming," 59th Round, January–December 2003, Report No 499(59/33/2), National Sample Survey Organisation, Ministry of Statistics and Programme Implementation, New Delhi.
- (2014): "Key Indicators of Situation of Agricultural Households in India," 70th Round January–December 2013, National Sample Survey Organisation, Ministry of Statistics and Programme Implementation, New Delhi.
- NSO (2021): "Situation Assessment of Agricultural Households and Land and Holdings of Households in Rural India, 2019," National Statistical Office, Ministry of Statistics and Programme Implementation, New Delhi.
- NITI Aayog (2018): "Demand and Supply Projections Towards 2033: Crops, Livestock, Fisheries and Inputs," Working Group Report, Government of India, New Delhi.
- Pal, Suresh (2017): "Strengthening Delivery of Agricultural Extension Services in India: Experiences and Contemporary Issues," *Agricultural R&D Policy in India: The Funding, Institutions and Impact*, New Delhi: National Institute of Agricultural Economics and Policy Research.
- Pingali, P, A Aiyar, M Abraham and A Rahman (2019): "Linking Farms to Markets: Reducing Transaction Costs and Enhancing Bargaining Power," *Transforming Food Systems for a Rising India*, Cham: Palgrave Macmillan, pp 193–214.
- Planning Commission (2012): "Report of the Working Group on Animal Husbandry and Dairying," Twelfth Five Year Plan (2012–17), Planning Commission, Government of India.
- Prasad, R M (2001): "Private Extension System: Options and Issues," *Private Extension in India: Myths, Realities, Apprehensions and Approaches*, Chandrasekhara P (ed), Hyderabad: National Institute of Agricultural Extension Management.
- Sajesh, V K and A Suresh (2016): "Public-sector Agricultural Extension in India: A Note," *Review of Agrarian Studies*, Vol 6, No 1, pp 116–31.
- Sajesh, V K, A Suresh, A K Mohanty, M V Sajeev, S Ashaletha, K Rejula and C N Ravishankar (2018): "Trend and Pattern of Expenditure on Fisheries Extension in India: Implications for Policy," *Indian Journal of Extension Education*, Vol 54, No 2, pp 32–40.
- Saraswath V K, P Priya and A Ghosh (2019): "A Note on Free Trade Agreements and Their Costs," NITI Aayog, Government of India, https://niti.gov.in/writereaddata/files/document_publication/FTA-NITI-FINAL.pdf.
- Sulaiman, R V and K Davis (2012): "The 'New Extensionist' Roles, Strategies, and Capacities to Strengthen Extension and Advisory Services," Global Forum for Rural Advisory Services, Lindau.
- Sulaiman, R V, Andy Hall, N J Kalavani, Kumuda Dorai and T S Vamsidhar Reddy (2012): "Necessary, But Not Sufficient: Critiquing the Role of Information and Communication Technology in Putting Knowledge into Use," *Journal of Agricultural Education and Extension*, Vol 18, No 4, pp 331–46.
- Swami, Praveen (2012): "Figures Bust Myth India's Bureaucracy Is 'Bloated'," *Hindu*, 30 January, New Delhi, <https://www.thehindu.com/news-national/Figures-bust-myth-Indias-bureaucracy-is-%E2%80%99Bloated%E2%80%9D/article13386342.ece>.
- Swanson, Burton and Mohamed Samy (2006): "Extension Strategies for Poverty Alleviation: Lessons from China, India and Egypt," *Journal of Agricultural Education and Extension*, Vol 12, No 2.