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Agriculture Extension System in India: A Meta-analysis

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ABSTRACT

Agriculture extension system bridges the gap between research labs to a farmer's field. Agricultural research, education and extension are said to be the most critical for promoting farm productivity and enhancing farmer's income. The public sector is major extension service provider and the reach of the public extension is limited in India and in addition it is burdened with non-extension responsibilities such as the distribution of subsidies and inputs, with little time left to attend to core extension activities. The objective of the article is to review the agricultural extension system in India to suggest pathways for better extension system in India. The public extension services are highly skewed towards crop husbandry ignoring allied sectors in India. Over the years the understaffed extension departments are burdened with non-extension works. The growth in the High-Value Agriculture sector has been twice or sometimes even thrice that of the crop production. However, Agriculture extension services for such sectors almost nil or unorganized. Further, extension personal are less than the recommended ratio of 1:750 at a national level. Hiring and training sufficient number of extension professionals in the sector can significantly contribute to the farmer's income. India spent just 0.7 per cent of Agriculture GDP on agriculture research and education which includes extension and training, which is par below the recommended 2 per cent by the World Bank. The Government vision of achieving doubling of farmer's income by 2022 without the successful delivery of agricultural extension to rural smallholder farmers is a daunting task if the issues not addressed timely.

Key words: Agriculture extension, Extension approaches, Meta analysis, India

India predominantly an agrarian rural economy, with around 69 per cent of its population living in rural areas (Aayog 2017) and around 47 per cent of the workforce engaged in agriculture (Labour Bureau 2015-16). There are 138 million agricultural holdings in India, of which around 85 per cent are small and marginal farmers[1] (Census 2010-11). The majority of them are poor (Mahendra Dev 2014). In a predominantly rural economy with high dependency on agriculture for rural household livelihoods, growth in agriculture is vital in order to ensure fairness in food and nutritional security in the rural area. There is a strong relationship between agricultural growth and reduction in poverty and malnutrition and creating equitable society as compared to growth in any other sector. In the context of the Indian government's push to double farm income by 2022, the thrust placed on smallholder farmer is fair and visionary.

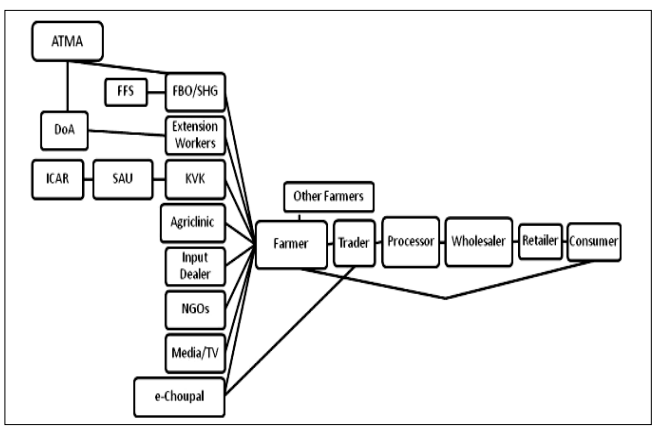
Agricultural research, education and extension are said to be the most critical for promoting farm productivity and enhance income amongst various types of government spending for agriculture. Agriculture extension system bridges the gap between research labs to a farmer's field. However, the reach of the public extension is limited in the country and in addition it is burdened with non-extension

[1]Average size of operational holdings in India is 1.4 hectares (Thapa 2009)

responsibilities such as the distribution of subsidies and inputs, with little time left to attend to core extension activities like advising farmers to enhance adoption of new practices and techniques (Reddy 2018). The Government vision of achieving doubling of farmer's income by 2022 without the successful delivery of agricultural extension to rural small holder farmers is a daunting task.

Why agriculture extension?

Agriculture growth depends on various factors such as rainfall, creating irrigation infrastructure, agriculture research and development and prices stabilization, etc. Besides these, the other critical factor is agriculture extension as it translates innovations in the labs to lands of farmer's. The right information at the right time and place through proper channels is crucial for the farming community to take informed decisions. The extension has been playing an important role in agriculture development for a long time especially during the early period of India's first Green Revolution (Babu *et al*. 2013). It has primarily played a role in disseminating agricultural technologies and management practices and thus greatly accelerating agricultural growth and rural development. With changing in government policies, demand and supply characteristics of technology, and marketing reforms, agriculture extension system is facing more opportunities together with challenges.



Notes: Information flow is the line between the boxes, though strength and feedback in each line are not described here.
ATMA: Agricultural Technology Management Agency, DoA: Department of Agriculture, ICAR: Indian Council for Agricultural Research, FFS: Farmers Field School, FBO/SHG: Farmer-based organization / Self help group, SAU: State Agricultural University, KVK: Krishi Vigyan Kendra (Farm Science center), NGO: Non-government organization
Source: International Food Policy Research Institute, 2010

Agricultural extension approaches in India

For a long time since independence, extension services were being provided mainly by the public sector. At present also the public sector is major extension service providers through a two-tier system. At the central level, Indian Council of Agriculture Research (ICAR) is the nodal institute for agriculture research and extension; while at the state level, the State Agricultural Universities (SAU) via the Krishi Vigyan Kendra (KVKs) and Agriculture Technology Management Agency (ATMA) at the district level facilitate agriculture extension. However, the public extension is highly skewed towards crop husbandry ignoring allied sectors. Besides the existing public extension service system, there are several private players, civil-society organizations including farmer-based organizations and NGOs that play a major role in providing extension services (Birner and Anderson 2007).

Agriculture extension system by non-public players

Input dealers: At present, there are 2.82 lakhs input dealers in the country who are marketing seeds, pesticides, fertilizers, farm machinery. A study estimates that 13% of farmers get their information from input dealers in the country (Singh *et al*. 2016). However, a major complaint against input dealers is that they involve in product promotion instead of technical advice to the farmers. To address this issue, the government of India recognizing the importance of this category of extension support to farmers has started offering a course by MANAGE and other recognized institutes on input use efficiently this will help Input Dealers to brush up on the latest technical knowledge in various sub-sectors of agriculture and to certify them as qualified Input Dealers.

Agribusiness companies: Private sector agribusiness and input manufacturing companies (ITC, Nuziveedu Seeds, IFFCO, KRIBCO, Pepsico, Heritage etc.) also undertake direct extension activities, these extension activities are in support of their product brand and seek to help the farmers to realize higher production (and thus returns) through necessary pre-sowing preparation, optimum seed rate, correct agronomic practices, application of nutrients and harvesting techniques.

NGOs: In India, there are 3 million registered NGOs of which many are actively involved in the development of rural areas and naturally oriented themselves towards land-based livelihoods. Hence, they accommodate an essential component of extension in their intervention (Ashok Gulati *et al*. 2018). To name a few of the NGOs which are PRADAN, BAIF, Syngenta Foundation, India etc. are some of the leading NGOs working in agriculture.

Organized user groups: Farmer Producer Groups, Commodity Interest Groups, Farmers Clubs, Farmer's Cooperatives etc. roles in extension in niche regions and areas. Some of the most successful farmer organization in Maharashtra is MAHAGRAPE, and United Planters Association of Southern India (UPASI) which is the apex body of tea, coffee, rubber and cardamom growers is involved in leadership, research and extension services for the plantation industry. Generally, farmers groups play an important role in reducing the cost of cultivation, increased profitability, information access and reduce the transaction cost there by facilitating farmers to achieve higher price realization. The consumers also get benefitted as they get good quality products at lesser cost. Therefore, many states

and government of India promoting Farmers Producers' Organizations (FPOs) as they also play important role in strengthening extension activities. However, upscaling and replication of these models is unheard off. There is a need for enabling policy environment in the country to promote such organizations. To give an example from china, farmer's cooperatives are playing an important role in the application and dissemination of new technologies. Cooperatives collaborate with research institutes and extension organizations, and provide services to their members. Now a days, over 95% of cooperatives provide effective technology services and help to solve the last mile problems. Majority of the farmers' cooperative organizations in china provides its members with seeds, pesticides, fertilizers and farm machineries through group buying and direct purchase and this will reduce the price by 10% and increases the profit margin by 25-30 per cent (Zhong 2014).

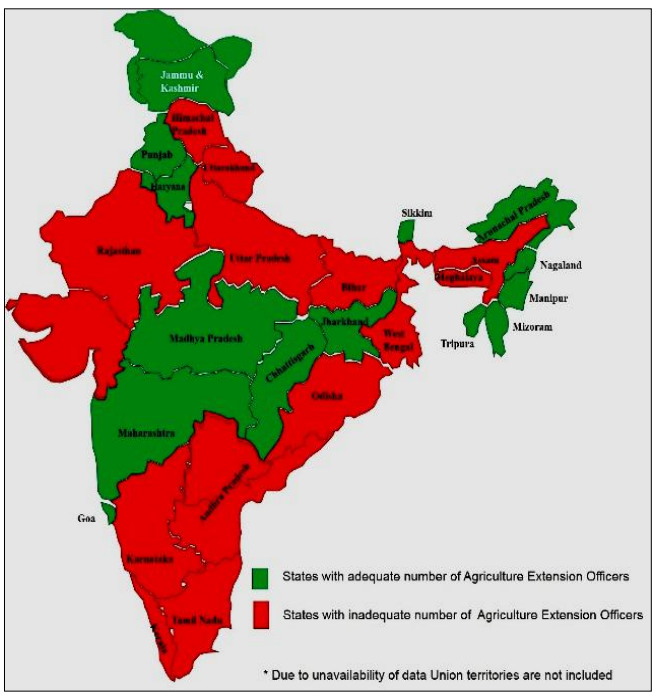
Extension through media and ICT: ICT is an imperative tool to link value chains in agriculture. Due to the increasing number of ICTs tools such as mobile phones, internet, TV etc. has shown tremendous potential to disseminate information to farmers. However, a scalable intervention leveraging ICT has yet to emerge. Kissan Call centres have proved to be important and reliable arm disseminating information and addressing farmer's queries. Every week more than 1.9 crore crop advisories reach out to farmers. Mobile Apps, TV channels and periodic journals have benefitted e-friendly farmers in a massive way (Gulati *et al*. 2018).

Present status of agriculture extension in India

Agricultural extension in India is skewed towards crop production neglecting allied sectors, though the allied sectors such as dairy and fishery significantly contribute towards farmer's household income. However, extension support is weak in the case of animal husbandry and fisheries in India. The public sector extension is currently offering a one-size-fits-all to all category farmers and all kind of products. Considering heterogeneity among farmers, crops they produce, agro-climatic zones, soil types farm resources endowments, enabling policy environment, etc., there is a need for continues capacity building of extension professionals as they lack recent advancements in agriculture technologies and development. In the case of NGO led extension models are relatively efficient and exhibit sensitivity to local priorities, however, they lack capacity and scale to make to create impact at large. It is evident that non-public extension players offering extension services in a localized region without any coordination among the players and even with the public extension. As a result, there is a restriction of good practices developed among individual players and an opportunity to scale applications at large. To mention, the majority of the players operate without any quality standards, as a result players are unaccountable leaving farmers alone towards legal issues under the circumstances of harmful advice (it happen mainly with seed business) (Hans India News 2018). The right type of information makes a huge difference to farmers, inappropriate and untimely information has serious consequences on his farm decisions and profitability. The negative impact of imperfect knowledge has proven to be a major problem especially in the private sector. Spurious markets for pesticides and fertilizers exist in different parts of the country.

Manpower in public extension system

There is a major scarcity of extension officers at various levels in India, of the 143,863 positions in the Department of Agriculture, only 91,288 posts are filled (Gulati *et al*. 2018). This huge unfilled position or gap in extension workers means that on average extension services only reach 6.8% of farmers (FAO 2012). Further, one extension officer served 1162 operation holding, i.e. the ratio of extension workers to operational holding is low at 1:1162 at the national level as against recommended 1:750. As per the Doubling Farmers Income Committee Report, the minimum ratio of extension workers to the operational holding in different areas as; a) Hilly Area – 1:400, b) Irrigated areas – 1:750 and c) Rainfed areas – 1:1000. Central government sanctioned 27,937 positions, against which, only 13,672 positions were filled, and 14,265 positions were vacant (Gulati *et al*. 2018). With the filling of vacant positions, the ratio would improve from 1162 farmers per officer to 1037 farmers per officer.



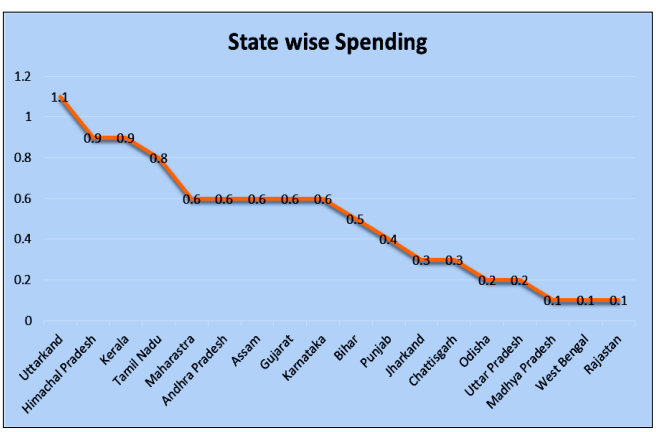
Investment in agriculture extension

The extension system in India is divided into extension education and extension training. 'Agriculture Research and Education' (R&E) include extension education, while 'Extension and Training' include frontline and field extension. Public funding for agriculture research & extension is contributed by both centre and state with around 55 per cent of the total allocation contributed by the centre

and 45 per cent by states. The total R&E expenditure for agriculture and allied activities has increased from ₹31,073 million in 2000-01 to ₹61,552 million 2014-15, recording a compound annual growth rate of 5 per cent for the period 2000-01 and 2014-15 (Gulati *et al*. 2018).

For extension, around 82 per cent of total budget allocation is funded by the state government, and around 18 per cent is allocated by the centre. In 2014-15, India allocated around for ₹ 17956 million for agriculture extension and training exclusively, which has grown from ₹ 6,407 million in 2000-01, therefore, recording a CAGR of 7.6 per cent for the given period. An important component of agriculture R&E is provisioning of funds for extension services to ensure diffusion of new innovations in the field. Historically, India spent a very small proportion of agriculture gross domestic product (GDPA) on research and development, it was at 0.32 per cent for 1971, and two decades later it rose marginally to 0.45 per cent (1991). Between 1999-00 and 2014-15, agriculture R&E expenditure as a share of GDPA increased from 0.50 per cent to 0.54 per cent.

It is observed that agriculture R&E expenditure as a percentage of GDPA remained steady since 2000-01 at 0.5 per cent till 2007-08, post which it rose significantly reaching 0.7 per cent of GDPA in 2010-11 and finally settling down at 0.54 per cent in 2014-15. At the national level India spent about 0.54 per cent of its GDPA on agriculture R&E, there are considerable variations across states. Most of the eastern states spend less than 0.5 per cent of its GDPA on agriculture R&E.



Eastern states, which are also among few of the poorest states in the country with a high dependency on agriculture, are also the states with the lowest spending on agriculture R&E. In order to improve agriculture productivity in this region, increasing of agriculture R&E and extension funding will be critical. It is observed that around 70 per cent of the total agriculture R&E budget is allocated to crop-husbandry itself, while only 10 per cent is allocated to animal husbandry and dairy development. Similarly, decomposition of extension expenditure across sectors shows that only crop husbandry receive around 92 per cent of total extension expenditure allocation and only 0.9 per cent was allocated to animal husbandry and dairy segment. However, animal husbandry and dairy segment have grown in importance and it is in contrast to the gradual transformation of the agriculture sector in India.

To provide food and nutrition security in the country, the R&E has given high on crop husbandry. But considering the growing importance and demand for livestock products, India may need to rethink about the allocation of agriculture R&E and increased allocation towards livestock sector. Extension support is weak or non-existent in the case of animal husbandry and fisheries in India. However, the contribution of dairy farming to farmer's source of income has increased from 4.3 per cent in 2002-3 to 11.9 per cent in 2012-13. It clearly demonstrates the role of the allied sector such as dairy contribution for farmer's household income.

In addition, Indian urban population consumption pattern evidenced shift in consumption pattern from cereal pulses based to high vaue agriculral produce due to sustained income growth. Therefore, the agriculture production systems must change to address the growing food demand and changing consumer preferences for diversified and safe food (Birthal *et al*. 2015). Therefore, to augment the change required in the agri-food production system, India needs to increase financial resources for agriculture R&E and extension in horticulture crops and animal husbandry and dairy.

Challenges in agricultural extension

According to Stefanie Kaegi (2015), some of the major challenges faced by Public Extension in India are it is burdened with non-extension duties, lack of qualified public extension professionals, extension professional's unwillingness to work in remote areas, depending on State priorities, public agricultural extension delivery is neglected. In addition, the private extension sector in India also faces many concerns and challenges. According to Sajesh and Suresh (2016), "while there are a variety of institutions in the field of extension, the ability of private extension to reach disadvantaged and marginalized areas, enterprises and sections of society is not yet established".

Category	Challenges
Human Resource Development (HRD)	Inadequate resources – human, physical and financial
	Skill deficit including ICT skills
	Inadequate competency and skills of extension functionaries
	Poor performance incentives for public extension officer
Linkages	Poor linkages – Research, Extension, Farmer, Market
	Lack of convergence – Poor linkages between Public - Public, Private-Private and Public-Private
Finance	Credit deficit

	The release of funds – Procedural delays and lack of transparency
Policy and Governance	Low political priority and support for the extension
	Inadequate operational flexibilities
	Weak accountability towards user systems (farmers)
	Weak Public-Private Partnership
	The absence of current day adjusted Extension Policy
Market Linkages	Lack of Market and Profit Orientation
	Lack of focus on Value Addition
Infrastructure	Poor Infrastructure – mobility, connectivity, ICT
Management	Top-down approach in programming and decision making
	Lack of farmers' participation in Extension planning and implementation
	Generic Extension
	Over-involvement of Extension functionaries in Non-Extension works
	Administrative procedural delays
Advisory System	Production Oriented Extension Incomplete Extension (not fulfilling the complete package of the production system and the post-production chain of activities)
	Service delivery skewed in favour of dominant power structure
Empowerment of Farmers	Inadequate focus on Women in Agriculture
Private extension - challenges	Accountability towards Clientele
	After-Sale service and maintenance
	Over emphasis on profit and market share
	Exploitation tendency towards farmers
	Quality concerns and regulation
	Limited coverage in terms of geography as well as beneficiaries
	Driven by incentives for investments in Agriculture and Allied Sectors
	Constraints in scalability and replicability of successful private extension initiatives
	Limited policy support or convergence with Government programmes
	Limited access to technologies developed by Public Institutions
	Limited collaboration between other private extension programmes

Source: Doubling Farmer Income Report (2017)

Important milestones in Indian Agricultural Extension System during post-Independent India

Year	Milestones
1950s	India has witnessed a long history of planned agriculture extension service (AES) intervention. Government's Community Development Program (1952) and National Extension Service (1953) were the first planned attempts to educate farmers about improved methods of farming.
1960	The other important area-based special programs were Intensive Agricultural District Program.
1964	Intensive Agriculture Area Program launched.
1966	High Yielding Varieties Program launched.
1967	Farmers Training Centers were created to educate farmers about high yielding varieties and train them in improved methods of farming to augment the above programs.
1970s	The Indian public agriculture extension system witnessed a slow decline. By this time, the system was predominantly involved in the distribution of agricultural inputs through the state agriculture depots, and in the handling of subsidies that were provided through various agricultural development programs. Consequently, the system was criticized for having become a monolith organization without any specific goals.
1974	World Bank's Training & Visiting (T&V) program was introduced as a pilot program in Rajasthan.
1977	World Bank's Training & Visiting (T&V) program was scaled up to several states.
	T&V, agriculture extension was expected to act as a 'transmission belt' between agricultural research centres and farmers by recruiting, training and deploying a large and dedicated cadre of technical workers with formal training in agriculture technology. The T&V based agriculture extension system (AES) played a key role in ensuring the success of the Green Revolution in several regions of the country. While the focus of the early AES was on the demonstration of high yielding varieties of seeds and agronomic practices and training farmers in adopting the same, it also played a major role in ensuring timely availability of inputs such as seeds, fertilizers and agricultural chemicals.
1998	Indian Government, with the support of the World Bank, introduced the Agriculture Technology Management Agency (ATMA) under the Innovation in Technology Dissemination (ITD) component of

	the National Agricultural Technology Project (NATP). It was first introduced in 28 districts in seven states from 1998 to 2003 under the guidance of MANAGE (National Institute of Agricultural Extension Management). The main goal of ATMA was to bring together different agencies involved in extension activities on one platform.
2014-15	The National Mission on Agriculture Extension and Technology (NMAET) was launched by the Department of Agriculture and Farmers' Welfare (DACFW) in 2014-15 and take a holistic view of extension by embedding components for technical support and training in four major sub-schemes. It aims to make the system farmer-driven and accountable by restructuring and strengthening existing agriculture extension program to enable the delivery of technology and to improve the current agronomic practices of farmers. NMAET consists of 4 Sub Missions: ➢ Sub Mission on Agricultural Extension (SMAE) ➢ Sub-Mission on Seed and Planting Material (SMSP) ➢ Sub Mission on Agricultural Mechanization (SMAM) ➢ Sub Mission on Plant Protection and Plant Quarantine (SMPP)

Source: Gulati *et al*. (2018)

CONCLUSION

1. Over the years the understaffed extension departments are burdened with non-extension works such as the distribution of subsidies and inputs, by ignoring core extension activities. Therefore, considering the limited number of extension personnel's, the government need to provide enabling environment to private and civil society extension service providers to promote multiple channels as public extension alone cannot meet the growing service needs of the farmers.

2. Currently the extension personal are less than the recommended ratio of 1:750 at a national level. Hiring and training sufficient number of extension professionals in the sector can significantly contribute to the farmer's income, and sufficient female extension professionals must be hired on subsector wise where female farmers participation is very high, for example, dairy sector. A large number of vacant positions in the States' Agriculture Departments is a matter of grave concern. Majority of the States have their extension staff up to Block level. Only 6 States have their staff up to village level, and 11 states have extension manpower up to Panchayat level. Vacancy position is particularly alarming in tribal and distant areas which are mostly in need of extension services. India is having around 1.2 lakhs extension professionals, where as in China there were 7.134 million local agriculture extension personals of which 2.87 million are at country level, 35, 100 are at the district level, 3.913 million are at village and town level. Among that 49.7 per cent of the personnel has a junior college diploma or above and 67.9 per cent professional titles.

3. A large body of literature has shown that public expenditures on agricultural research and development generate very high returns not only in boosting agriculture productivity but also in contributing to broader welfare outcomes, such as the reduction of poverty and improving nutrition security. India spent just 0.7 per cent of Agriculture GDP during 2014-15 on agriculture research and education which includes extension and training, which is par below the recommended 2 per cent by the World Bank. In 0.7 per cent aggregated allocation, 0.54 per cent was on agriculture research & education and 0.16 per cent on agriculture extension.

4. Agriculture extension services in India are mainly focusing on crop production mainly focusing on Transfer of Technology (ToT). Around 70 per cent of the Agriculture Research and Education (R& E) budget was allocated for crop production, while 92 per cent of the budget on agriculture extension was allocated to crop production.

5. In recent years, consumers' consumption pattern is shifting from cereals based to high-value agricultural products such as Fruits, Vegetables, dairy products etc. The growth in the High-Value Agriculture sector has been twice or sometimes even thrice that of the crop production. Between 2001-02 and 2013-14, livestock contributed 26.3 per cent, 15.4 per cent by food-grains and 14 per cent by fruits and vegetables to the gross value of output from agriculture and allied activities. However, Agriculture extension services for such sectors almost nil or unorganized.

6. Presently, extension service providers such as Public, Private, civil societies are working independently without functional coordination among themselves at field level. As a result, best practices generated by each of the actors not accessible to the wider application.

7. Majority of the extension service providers in agriculture lack specific standards or quality certification this leads to un accountable in case of any wrong advice to the farmers leading to a loss to the farmers. Thus, extension personnel need to be supported with standardized, certified extension manual that depicts the wide range of strategies, tools and functions that are relevant for their work in different settings. There is no formal mechanism to evaluate extension performance and to understand its impact. Suitable methodologies have to be developed, and senior managers have to be trained in collecting and analyzing the needed data for doing evaluation and impact assessment. "If it can't measure, it can't be improved".

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Note:

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