



सत्यमेव जयते
Ministry of Agriculture &
Farmers Welfare

Report of the Committee on Doubling Farmers' Income

Volume XI

**“Empowering the Farmers through Extension
and Knowledge Dissemination”**

**Agricultural Extension & Knowledge Diffusion, Skill
and ICT: Empower every Farmer in every Corner**

Document prepared by the Committee on Doubling Farmers' Income,
Department of Agriculture, Cooperation and Farmers' Welfare,
Ministry of Agriculture & Farmers' Welfare.

November 2017

Foreword

The country has witnessed a series of concerted discussions dealing with the subject of agriculture. In 1926, the Royal Commission of Agriculture was set up to examine and report the status of India's agricultural and rural economy. The Commission made comprehensive recommendations, in its report submitted in 1928, for the improvement of agrarian economy as the basis for the welfare and prosperity of India's rural population. The urban population was about 11 per cent of the whole, and demand from towns was small in comparison. The Commission notes, that communication and physical connectivity were sparse and most villages functioned as self-contained units. The Commission encompassed review of agriculture in areas which are now part of Pakistan, Bangladesh and Myanmar. The net sown area in erstwhile British India was reported as 91.85 million hectares and cattle including buffaloes numbered 151 million. Almost 75 per cent of the cultivated area was under cereals and pulses, with rice and wheat occupying 46 per cent of the net sown area. The area under fruits and vegetables was about 2.5 per cent and that under oilseeds and non-food crops was about 20 per cent. In the ensuing years, as well known, the country underwent vast changes in its political, economic and social spheres.

Almost 40 years later, free India appointed the National Commission on Agriculture in 1970, to review the progress of agriculture in the country and make recommendations for its improvement and modernisation. This Commission released its final report in 1976. It refers to agriculture as a comprehensive term, which includes crop production together with land and water management, animal husbandry, fishery and forestry. Agriculture, in 1970 provided employment to nearly 70 per cent of the working population. The role of agriculture in the country's economic development and the principle of growth with social justice, were core to the discussions. The country was then facing a high population growth rate. After impressive increase in agricultural production in the first two Five Year Plans, a period of stagnancy set in and the country suffered a food crisis in the mid-1960s. The report in fifteen parts, suggested ample focus on increased application of science and technology to enhance production.

Thirty years hence, the National Commission for Farmers was constituted in 2004 to suggest methods for faster and more inclusive growth for farmers. The Commission made comprehensive recommendations covering land reforms, soil testing, augmenting water availability, agriculture productivity, credit and insurance, food security and farmers competitiveness. In its final report of October 2006, the Commission noted upon ten major goals which included a minimum net income to farmers, mainstreaming the human and gender dimension, attention to sustainable livelihoods, fostering youth participation in farming and post-harvest activities, and brought focus on livelihood security of farmers. The need for a single market in India to promote farmer-friendly home markets was also emphasised.

The now constituted DFI (Doubling Farmers' Income) Committee besides all these broad sectoral aspects, invites farmers' income into the core of its deliberations and incorporates it as the fulcrum of its strategy. Agriculture in India today is described by a net sown area of 141 million hectares, with field crops continuing to dominate, as exemplified by 55 per cent of the area under cereals. However, agriculture has been diversifying over the decades. Horticulture now accounts for 16 per cent of net sown area. The nation's livestock population counts at more than 512 million. However, economic indicators do not show equitable and egalitarian growth in income of the farmers. The human factor behind agriculture, the farmers, remain in

frequent distress, despite higher productivity and production. The demand for income growth from farming activity, has also translated into demand for government to procure and provide suitable returns. In a reorientation of the approach, this Committee suggests self-sustainable models empowered with improved market linkage as the basis for income growth of farmers.

India today is not only self-sufficient in respect of demand for food, but is also a net exporter of agri-products occupying seventh position globally. It is one of the top producers of cereals (wheat & rice), pulses, fruits, vegetables, milk, meat and marine fish. However, there remain some chinks in the production armoury, when evaluated against nutritional security that is so important from the perspective of harvesting the demographic dividend of the country. The country faces deficit of pulses & oilseeds. The availability of fruits & vegetables and milk & meat & fish has increased, thanks to production gains over the decades, but affordability to a vast majority, including large number of farmers too, remains a question mark.

The impressive agricultural growth and gains since 1947 stand as a tribute to the farmers' resilience to multiple challenges and to their grit & determination to serve and secure the nation's demand for food and raw material for its agro-industries.

It is an irony, that the very same farmer is now caught in the vortex of more serious challenges. The average income of an agricultural household during July 2012 to June 2013 was as low as Rs.6,426, as against its average monthly consumption expenditure of Rs.6,223. As many as 22.50 per cent of the farmers live below official poverty line. Large tracts of arable land have turned problem soils, becoming acidic, alkaline & saline physico-chemically. Another primary factor of production, namely, water is also under stress. Climate change is beginning to challenge the farmer's ability to adopt coping and adaptation measures that are warranted. Technology fatigue is manifesting in the form of yield plateaus. India's yield averages for most crops at global level do not compare favourably. The costs of cultivation are rising. The magnitude of food loss and food waste is alarming. The markets do not assure the farmer of remunerative returns on his produce. In short, sustainability of agricultural growth faces serious doubt, and agrarian challenge even in the midst of surpluses has emerged as a core concern.

Farmers own land. Land is a powerful asset. And, that such an asset owning class of citizens has remained poor is a paradox. They face the twin vulnerabilities of risks & uncertainties of production environment and unpredictability of market forces. Low and fluctuating incomes are a natural corollary of a farmer under such debilitating circumstances. While cultivation is boundarised by the land, market need not have such bounds.

Agriculture is the largest enterprise in the country. An enterprise can survive only if it can grow consistently. And, growth is incumbent upon savings & investment, both of which are a function of positive net returns from the enterprise. The net returns determine the level of income of an entrepreneur, farmer in this case.

This explains the rationale behind adopting income enhancement approach to farmers' welfare. It is hoped, that the answer to agrarian challenges and realization of the aim of farmers' welfare lies in higher and steady incomes. It is in this context, that the Hon'ble Prime Minister shared the vision of doubling farmers' income with the nation at his Bareilly address on 28th February, 2016. Further, recognizing the urgent need for a quick and time-bound transformation of the

vision into reality, a time frame of six years (2016-17 to 2022-23) was delineated as the period for implementation of a new strategy.

At the basic level, agriculture when defined as an enterprise comprises two segments – production and post-production. The success of production as of now amounts to half success, and is therefore not sustainable. Recent agitations of farmers (June-July 2017) in certain parts of the country demanding higher prices on their produce following record output or scenes of farmers dumping tractor loads of tomatoes & onions onto the roads or emptying canisters of milk into drains exemplify neglect of other half segment of agriculture.

No nation can afford to compromise with its farming and farmers. And much less India, wherein the absolute number of households engaged in agriculture in 2011 (119 million) outpaced those in 1951 (70 million). Then, there are the landless agricultural labour who numbered 144.30 million in 2011 as against 27.30 million in 1951. The welfare of this elephantine size of India's population is predicated upon a robust agricultural growth strategy, that is guided by an income enhancement approach.

This Committee on Doubling Farmers' Income (DFI) draws its official members from various Ministries / Departments of Government of India, representing the panoply of the complexities that impact the agricultural system. Members drawn from the civil society with interest in agriculture and concern for the farmers were appointed by the Government as non-official members. The DFI Committee has co-opted more than 100 resource persons from across the country to help it in drafting the Report. These members hail from the world of research, academics, non-government organisations, farmers' organisations, professional associations, trade, industry, commerce, consultancy bodies, policy makers at central & state levels and many more of various domain strengths. Such a vast canvas as expected has brought in a kaleidoscope of knowledge, information, wisdom, experience, analysis and unconventionality to the treatment of the subject. The Committee over the last more than a year since its constitution vide Government O.M. No. 15-3/2016-FW dated 13th April, 2016 has held countless number of internal meetings, multiple stakeholder meetings, several conferences & workshops across the country and benefitted from many such deliberations organized by others, as also field visits. The call of the Hon'ble Prime Minister to double farmers' income has generated so much of positive buzz around the subject, that no day goes without someone calling on to make a presentation and share views on income doubling strategy. The Committee has been, therefore, lucky to be fed pro-bono service and advice. To help collate, analyse and interpret such a cornucopia of inputs, the Committee has adopted three institutes, namely, NIAP, NCAER and NCCD. The Committee recognizes the services of all these individuals, institutions & organisations and places on record their service.

Following the declaration of his vision, the Hon'ble Prime Minister also shaped it by articulating 'Seven Point Agenda', and these have offered the much needed hand holding to the DFI Committee.

The Committee has adopted a basic equation of Economics to draw up its strategy, which says that net return is a function of gross return minus the cost of production. This throws up three (3) variables, namely, productivity gains, reduction in cost of cultivation and remunerative price, on which the Committee has worked its strategy. In doing so, it has drawn lessons from the past and been influenced by the challenges of the present & the future.

In consequence, the strategy platform is built by the following four (4) concerns:

- Sustainability of production
- Monetisation of farmers' produce
- Re-strengthening of extension services
- Recognizing agriculture as an enterprise and enabling it to operate as such, by addressing various structural weaknesses.

Notwithstanding the many faces of challenges, India's agriculture has demonstrated remarkable progress. It has been principally a contribution of the biological scientists, supplemented by an incentivizing policy framework. This Committee recognizes their valuable service in the cause of the farmers. It is now time, and brooks no further delay, for the new breed of researchers & policy makers with expertise in post-production technology, organisation and management to take over the baton from the biological scientists, and let the pressure off them. This will free the resources, as also time for the biological scientists to focus on new science and technology, that will shift production onto a higher trajectory - one that is defined by benchmark productivities & sustainability. However, henceforth both production & marketing shall march together hand in hand, unlike in the past when their role was thought to be sequential.

This Report is structured through 14 volumes and the layout, as the readers will appreciate, is a break from the past. It prioritizes post-production interventions inclusive of agri-logistics (Vol. III) and agricultural marketing (Vol-IV), as also sustainability issues (Vol-V & VI) over production strategy (Vol. VIII). The readers will, for sure value the layout format as they study the Report with keenness and diligence. And all other volumes including the one on Extension and ICT (Vol. XI), that connect the source and sink of technology and knowledge have been positioned along a particular logic.

The Committee benefited immensely from the DFI Strategy Report of NITI Aayog. Prof. Ramesh Chand identified seven sources of growth and estimated the desired rates of growth to achieve the target by 2022-23. The DFI Committee has relied upon these recommendations in its Report.

There is so much to explain, that not even the license of prose can capture adequately, all that needs to be said about the complexity & challenges of agriculture and the nuances of an appropriate strategy for realizing the vision of doubling farmers' income by the year of India's 75th Independence Day celebrations.

The Committee remains grateful to the Government for trusting it with such an onerous responsibility. The Committee has been working as per the sound advice and counsel of the Hon'ble Minister for Agriculture and Farmers' Welfare, Shri Radha Mohan Singh and Dr. S.K. Pattanayak, IAS, Secretary of the Department of Agriculture, Cooperation and Farmers' Welfare. It also hopes, that the Report will serve the purpose for which it was constituted.

12th August, 2017

Ashok Dalwai
Chairman, Committee on
Doubling Farmers' Income

About Volume XI

The eleventh volume of the Report of the Committee on Doubling Farmers' Income (DFI) examines the status and reforms needed in the agricultural extension system. The key roles played by extension are the transfer of technology to farmers, capacity building to manage the technology, and assisting farmers in their decision making on inputs, cultivation and for managing their output. This includes sharing information on markets and policy environment that relate to individual farmers. However, the extension services system has so far been, largely coordinated for input marketing and associated services, besides cultivation practices.

The Committee reviewed the extension services network and systems, which were earlier designed to address the drive for intensive farming, which originated in a period when the country faced deficit production. In today's situation, where the majority of farmers generate increasing amount of marketable surplus, particularly in case of certain commodities, there is strong demand for knowledge and assistance in the post-production phase. At the same time, climate change led vagaries require renewed attention to the associated shifts in risks, which include changes in seasonality patterns, nature of pests & diseases, crop planning and input requirements. The Committee concluded that in the existing backdrop, the extension system must have added emphasis to guide market linkage in an ever dynamic environment, including suitably communicating the advantage of various agricultural reforms that aim to empower the farmers. The efficiency and effectiveness of the extension system are a function of its ability to delineate and differentiate the subjects that are extended, depending on the localised need of each farming region, besides what it costs to render the targeted services.

In considering the limitations in the current extension system, the Committee makes suggestions to improve its interface with farmers, through all possible modes of interaction. It also revisits the resources and capacities needed in extension, in the light of modern day technology, including ICT, physical connectivity and the increased presence of private sector in providing extension services to farmers. This volume accordingly discusses a suitable architecture for the extension system that will meet the changing demands of a market led and income-centric agricultural economy. Greater emphasis is laid, on the farmer who manages agriculture and not just the commodities produced. The term extension has been redefined in this context.

This volume also suggests the needed efforts to create a common platform at different levels for different extension service providers – public, private, NGOs, etc. to coordinate their approach and delivery. It also stresses on the optimal blend needed between manpower and technology based extension. The aspects of scientific research and development that also feeds the extension system, will be discussed in Volume-XII that follows.

Ashok Dalwai

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Doubling Farmers' Income

Volume XI

“Empowering the Farmers through Extension : Knowledge and Science & Technology”

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Chapter 1

Agricultural Extension – Role, Importance and Status

Farmers are enterprise owners in agriculture, and it is the responsibility of the Agricultural Extension System (AES) to transform the knowledge, skill and attitude of the farmers with the aim to enhance their farm productivity, production and profitability. An effective extension service makes for efficient farming.

1.1. Agricultural Extension- Empowering Farmers to Help Themselves

India is bestowed with large number of agricultural research institutions spread across the country covering agriculture and allied sectors. As many as 113 Research Centres/Institutes of Indian Council of Agricultural Research (ICAR), 77 State Agricultural Universities (SAUs) – Central Agricultural Universities (CAUs), Water and Land Management Institutes (WALMI), in various states and research institutions of various Commodity Boards, as also their related Ministries/Departments are involved in the generation of transferable technologies encompassing multiple aspects of the agricultural sector along its long chain of pre-production, production and post-production stages including marketing. This research system is supplemented with 700 Krishi Vigyan Kendras (KVKs) located in all the districts of the country for validating & acclimatising the technologies for local conditions.

More than 50,000 dedicated agricultural scientists are working to address field level problems and to evolve technological solutions. However, all the technologies developed by these scientists have not always reached all the farmers. In addition, there are many technologies and practices developed by individuals and corporate bodies in the private sector. Agricultural Extension is, responsible to transfer various technologies and farm management practices developed at research institutions under National Agricultural Research System (NARS) to the fields of the farmers, along their specific value chain, to improve their productivity, production and profitability, besides making this happen on sustainable basis and also negotiating several risks that the agricultural sector is vulnerable to. The research & development outputs become barren, if they do not reach the intended user, namely, the cultivator, the dairy farmer, the fishery farmer, the plantation grower and others engaged in various agricultural and allied activities. Besides playing an important role in transfer of technologies from research institutions to the doorstep of the farmers, agricultural extension also communicates the benefits of developmental programmes of government to the farmers; disseminates information on inputs, credit & insurance facilities, infrastructure, processing, post-harvest technologies and marketing. Such information and education, bring about desirable behavioural changes.

Agricultural Extension also plays crucial role in providing real time information on weather and market situation, which impacts the profitability of the farmers. It alerts the farmer on infestation of pests and diseases, cyclones, floods, hailstorms, and other natural calamities, which can damage entire agriculture. As the crops, seasons and problems change from time to time, continuous extension support becomes crucial for all the farmers all the time. Extension is basically an informal and continuous education provided to farmers at their farm-gate beyond the boundary walls of schools and colleges, and other formal institutions. This continuous

support and hand holding are an important factor in enhancing farm viability and farmers' income, and promoting agriculture as an enterprise.

The needed information and support are offered through the Extension Service Provider (ESP), whose role can be comprehended as that of a friend, philosopher and guide of the farmer. He/she provides continuous information, knowledge, skills and hand-holding support to the farmer and helps him/her to help himself/herself.

1.2. Concept behind Agricultural Extension

The term “extension” was first used in the United States of America (USA) and United Kingdom (UK) in the first decade of the 1900s to imply the extension of knowledge from land grant colleges to the farmers, through the process of informal education. In India, extension work was primarily started by F.L. Brayne (1920) in the State of Punjab. The term community development and extension education became more popular with the launching of community development projects in post-independent India in 1952, and with the establishment of the National Extension Service in 1953. Since then, community development has been regarded as a programme for all-round development of the rural people and extension education as the means to achieve this objective. Agriculture, the dominant rural activity has been the core of the Extension Projects.

The concept of Extension has evolved over a period of time, which can be traced through following definitions of agricultural extension by various researchers.

- Extension education is an applied science consisting of contents derived from researches, accumulated field experiences and relevant principles drawn from the behavioural sciences synthesized with useful technology, in a body of philosophy, principles, contents, and methods focused on the problems of out-of school education for adults and youths. (Leagans. J.P.)
- Extension education is an applied behavioural science, the knowledge of which is to be applied for desirable changes in the behavioural complex of the people.
- Extension is education and its purpose is to change the attitude and practices of the people with whom the work is done.
- Extension education is a science which deals with various strategies of change in the behavioural patterns of human beings through technological and scientific innovation for the improvement of their standard of living.
- Extension is to teach a person how to think, not what to think, and to teach people, to determine accurately their own needs to find solution to their own problems and to help them acquire knowledge and develop convictions in that direction.
- Extension is an out-of school system of education in which adults and young people learn by doing. It is a partnership between government, the land grant colleges and the people, which provide services and education designed to meet the needs of the people.

- Extension education is an integral behavioural science which contributes towards the understanding and formulation of methods and procedures for bringing planned change in human behaviour.
- Extension education is education for the betterment of people and for changing their behaviour i.e. knowledge, skill and attitude.
- Extension education is the dissemination of useful research findings and ideas among rural people to bring out desirable changes in their social and cultural behaviour.
- Extension education deals with practical items of information which is useful for rural people which solve daily problems, specially, those related to agricultural production.

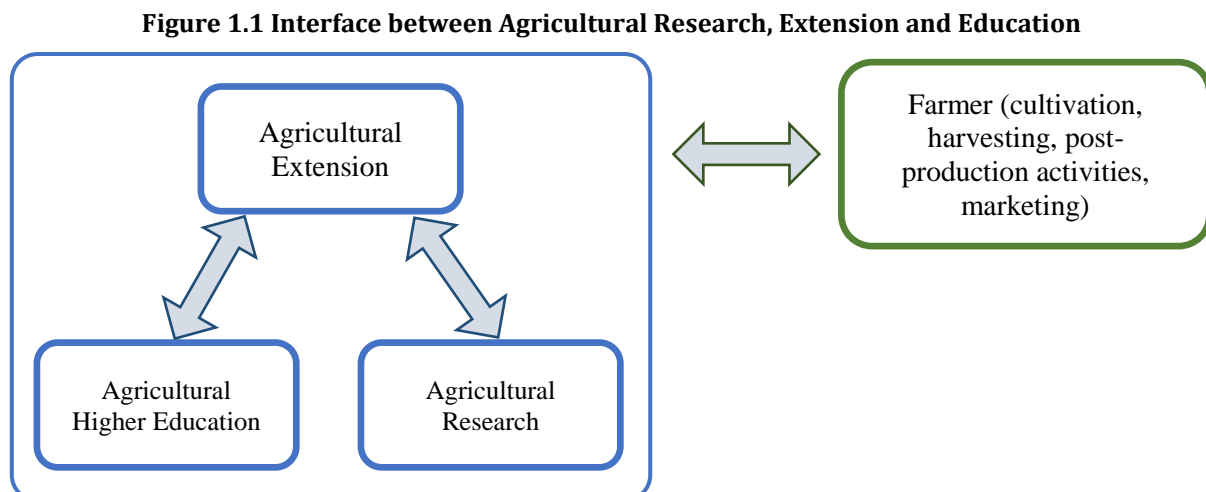
Agricultural Extension tries to enhance agricultural production by providing the knowledge necessary to make improvements in agricultural practices, and by removing constraints which may hamper the process of increasing farm production (Rivera W.M. 2001).

In its role of providing knowledge related inputs for enhancing agricultural production, agricultural extension can be loosely defined as ‘a service to “extend” research based knowledge to the rural sector to improve the lives of farmers’ (Kapoor, 2010).

As per Anderson, 2008, Extension could aim at bridging technology gap or management gap or both, in the knowledge base of the farmers.

- Technology gap bridged by providing better inputs like improved seeds, fertilizers, machinery etc.
- Management gap bridged by providing better farm management practices such as quantity & timing of applying inputs, ways of preparing land for cultivation etc.
- Agricultural Knowledge and Information Systems for Rural Development (developed by FAO and World Bank).

Agricultural extension is a part of a larger agricultural knowledge tripartite:



The multi-directional interaction among extension, research and education, reinforces the point as to how the three feed into one another; and in turn aid and abet the farmers. Hence the need to converge the activities of the three components is evident. One of the ways in which, the link is broken is when research does not translate into the research output being shared with farmer or when extension does not provide feedback to research being done. From the current perspective of farmers' income, the need is evident that these energies should also focus on value propositions that are more market linked.

1.3. Redefining Agricultural Extension for Doubling Farmers' Income (DFI)

The various definitions brought out in the previous section, as also the prevalent emphasis in India, have largely been production-centric in nature. The approach towards Extension and its focus as well are required to evolve as per the evolving needs of the farmers. Agricultural Extension has, through the decades since Independence, demonstrated its ability to be dynamic and is therefore amenable to its reorientation to meet the current mandate of 'doubling farmers' income'. It is in the light of this contemporary need, that the DFI Committee offers the following definition:

“Agricultural Extension is an empowering system of sharing information, knowledge, technology, skills, risk & farm management practices, across agricultural sub-sectors and along all aspects of the agricultural supply chain, so as to enable the farmers to realise higher net income from their enterprise on a sustainable basis”.

The definition brings into focus, the all-important issue of farmers' empowerment through information, knowledge and skilling, in consonance with the popular Chinese proverb, “Don't offer a person with a fish a day, but teach him how to fish.” The farmers in India today prefer to be empowered than offered merely a temporary succour. And knowledge empowerment is vital to manage and exercise agriculture as an enterprise that generates targeted profits.

This definition places emphasis not only on transferring the technologies and management practices but also on risk management practices. It draws attention to evidence based decision making, for negotiating the risks which arise during pre-production, production and post-production stages. This definition covers all sub-sectors, namely, field crops, horticulture, animal husbandry, poultry, fisheries, agro-forestry, farm linked activities (secondary agriculture), etc., thus signifying a cross-sectoral approach to the farming system. Most importantly, agricultural supply chain referred to in the definition makes the farmer an active stakeholder and legitimate partner at every stage of the agricultural value system.

This operational definition, in sum, concludes with two outcomes of extension process i.e. higher income from farming which is a national vision, and realising the income gains on a sustainable basis.

1.3.1. Information, Knowledge and Skill

Information is the first step towards change. By access to information, the farmer is offered an opportunity for empowerment and motivation at the first stage. It refers to creating awareness in the farmer on what inputs and tools relating to his activity are available, where and at what cost the same can be accessed, and the availability of management data. Some illustrations include information on production inputs like seeds, fertilizers, pesticides etc., or post-production data like warehouse & cold store availability, market preference and prices, etc.

Information without knowing what to do with it or how to use it becomes infertile. It can be upgraded to knowledge, by teaching the farmer the power of applying the available information. Hence, knowledge teaches the farmer 'what to do with the available information'. With this, the farmer moves to the second stage of empowerment. At the farmers' level, the knowledge can continue to remain ineffective, unless she/he is also imparted the necessary competence to deploy such knowledge. The art of using the available information and acquired knowledge can next be upgraded as an empowered tool through enabling the farmer with expertise to use the same. And this is what is referred to as a skill.

In combination, agricultural extension is both an art of doing, and a science of adopting the practice of farming, relying on information, knowledge and skills to empower the recipients. An example is presented in the following paragraph to better clarify the meaning and role of information, knowledge and skill in agriculture and allied activities.

Whitefly is a serious pest that affects cotton crop to the detriment of farmers by resulting in substantive yield loss. The recommended pesticides for its control are:

- Chemical control: Acetamiprid 20% SP 100 g/ha or Chlorpyrifos 20% EC 1250 ml/ha
- Spray any one of the following plant products alone or in combination with the recommended dose of insecticide (at 2 ml/litre of water)
- Neem seed kernel extract 5% (50 kg) and neem oil at 5 ml/litre of water
- Fish oil rosin soap 25 kg at 1 kg in 40 litre of water
- Notchi (*Vitex negundo*) leaves 5% extract, *Catharanthus roseus* extract 5%
- In the early stages with high volume sprayer, use a gooseneck nozzle to cover the under surface of the foliage to get good control of the pest. If high volume sprayers are not available, 375 litres of spray fluid may be used per hectare for application in the low volume motorised knapsack mist blower
- Use of synthetic pyrethroids should be discouraged to avoid the problem of whitefly - Fenvalerte and deltamethrin cause resurgence of whiteflies, so avoid repeated spraying of pyrethroids
- The plant protection measures should be adopted on a community basis in a specified cotton areas
- Biological control: *Verticillium lecanii* 1.15% WP 2500 g/ha

(Source: Tamil Nadu Agricultural University, Coimbatore)

The Extension functionary can impart this awareness and thereby the farmer is **'informed'** about the recommended pesticides and other treatment interventions and the availability.

The added input provided by the Extension functionary is that the pesticide should be used when the threshold level of the larvae (on the under-surface of the leaf) is breached, and that the spraying is to be done on the leaf under-surface for its effectiveness. This now becomes usable **'knowledge'** for the farmers. However, for the pesticide to be effective, the liquid mixture is to be prepared diligently, in a certain ratio and sprayed on the under-surface without admixture or a cocktail with other pesticides. The farmer's ability to prepare an optimal pesticide mixture and appropriately apply it as a spray for effective control of the whitefly is his **'skill'**.

A farmer in this example, is **appropriately empowered** as he has information about the recommended pesticide & the nearest location where it is available; knows that the spraying is to be targeted at the under-surface of the leaf where the larvae multiply; and has the competence to prepare the pesticide mixture and spray it at right time and in right manner. With this package of information, knowledge and skill the farmer is now sufficiently empowered to negotiate the risk of whitefly attack on cotton crop. This is how the agricultural extension system imparts a combination of information, knowledge and skill and renders the farmer empowered.

Information, Knowledge & Skill are the three faces of Extension, that impact on awareness, decision making and application in the hands of farmers. This collectively empowers the agricultural ecosystem and makes for a more self-reliant farming system.

1.4. Evolution of Agricultural Extension

From Food sufficiency to Doubling Farmers Income: Agricultural Advisory Services, in pre-independent India, were operated mostly through sporadic and voluntary efforts in various parts of the country. Robust agricultural development efforts, in the early post-independence period, were organized through Grow More Food Campaign (GMFC, 1947), followed by Community Development Programme (CDP, 1952) and National Extension Service (NES) blocks in 1953. Subsequently, in the pre-Green Revolution period, interventions like Intensive Agricultural District Programme (IADP, 1961) and Intensive Agricultural Area Programme (IAAP, 1964-65) were rolled out. Then, came the period of Green Revolution, beginning 1965-1967, supported by intensive extension efforts like National Demonstrations (1965), Farmers Training Centres (FTC, 1966), Small and Marginal Farmers Development Agencies (SFDA, 1971), Krishi Vigyan Kendra (KVK, 1974), and Lab-to-Land Programme (1979).

In the mid-1970s, Training and Visit (T&V) System of Extension was implemented in Madhya Pradesh and Rajasthan on a pilot basis, that was to effect a paradigm shift in the philosophy of agricultural extension. Following its significant impact, it was scaled up throughout the country, from 1984 to 1995, through the World Bank supported National Agricultural Extension Project (NAEP). The needed research backup came from National Agricultural

Research Project (NARP), the two being supplementary and complementary, strengthening each other. Subsequently, another process of extension reforms was initiated under the National Agricultural Technology Project (NATP, 1998), with integrated extension delivery attempted under Agricultural Technology Management Agency (ATMA) at the district level. Currently, it is this vehicle that serves the agriculture extension services throughout the country. Further, technological backstopping was strengthened by augmenting KVK Programme (in over 700 districts by now). Besides public extension services, there has been growth in private extension providers like input agencies, farmers organisations, NGOs, agri-preneurs, media etc.

Currently, the agricultural extension services are available on a pluralistic platform. The DFI Committee proposes to re-architect agriculture extension as an important engine for doubling the farmers' income. The ATMA project did attempt to broaden the ambit of extension, by going beyond merely the production framework and encompassing the post-production activity, namely, by including marketing. However, the latter has continued to remain on the periphery of efforts. The DFI approach will make agricultural extension promote agricultural activities as a value system and help the farmer to produce in response to the signals in the markets & aim to generate sustainable growth in farm income.

1.4.1. Agricultural extension today – a critique

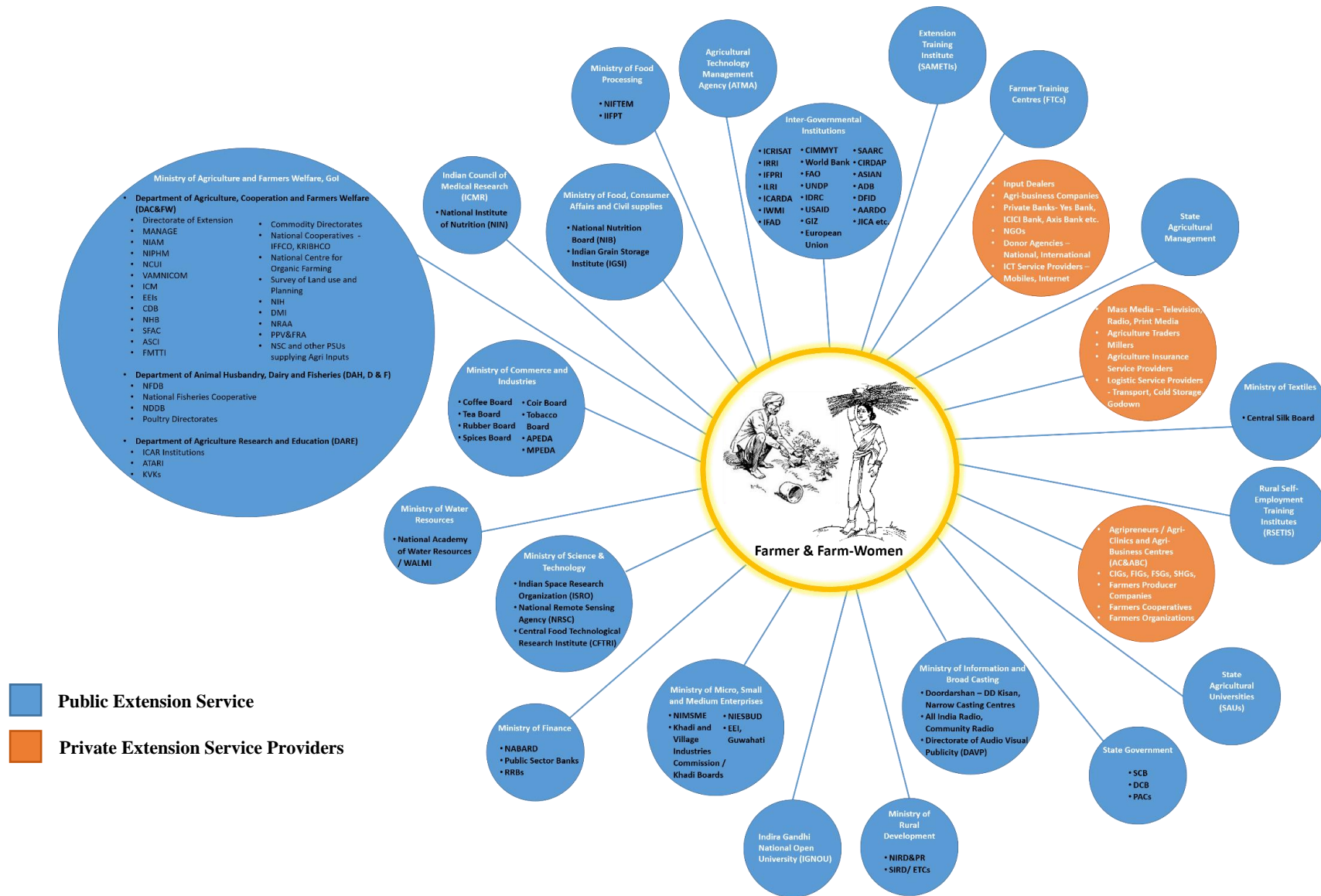
Currently extension and advisory services are provided by various agencies representing public and private sector players. An examination of the availability of extension manpower, including ATMA staff across the states in the public extension system (PES), shows that the ratio of extension service provider (ESP) to operational farm holdings is around 1 : 1156. Considering specialised needs in hilly areas, as also irrigated areas, the reach of the extension functionary to farmers is further diminished.

Active deployment of ICT (information & communications technology) can, to a great extent if deployed intelligently, address the concerns of manpower deficit. The ICT platform enables the ESP to widen his/her coverage without affecting the quality of services. The outreach can be faster, wider and real time. ICT is a highly effective tool in disseminating needed information, and the Extension system is increasingly realising its role. There is an exhaustive list of public and private extension service providers. Figure-1.2 is indicative and depicts the interface between public and private extension players impacting farmers. Despite a large network of public and private extension service providers, following concerns are recognised:

- i) **Do the institutions/organisations have adequate manpower to disseminate the technologies developed by them to every farmer in all corners of the country?**

On account of various reasons including the absence of an institutional mechanism, the farmers across the country are deprived of access and benefits from an array of technologies developed by multiple research institutions dotting the country's landscape. The technologies mostly remain confined to the geographical areas in proximity to the research institutes. There is hence an urgent need to create platforms, at both national and state levels, on which all the research

Figure 1.2 Public and Private Extension Service Providers – overview



centres can upload their recommendations. This will constitute the first step towards sharing and dissemination of innovations across larger geographies

ii) Does there exist an institutional mechanism to review and converge the number of extension functionaries and the extension approaches adopted by the private sector?

While the private sector also has a contributory role in agricultural extension, it is natural that they would concentrate more on providing information to farmers that is related to their commercial interests, and marketing of their products. These efforts need to be made complementary and supplementary to public extension efforts. There is scope to develop a mechanism to converge all the private extension efforts onto a single platform, integrate it with public extension efforts, and achieve the needed coordination to serve larger areas and an increased number of activities. Synergy in effort by the two systems will benefit the farmers better. This will become an example of **public-private platform of extension machinery**.

iii) Does the public extension service have adequate and technically competent manpower to interact with and empower the farmers in the current state of affairs?

Agricultural Extension has largely been focussing on production aspects, whereas farmers' requirement today is more post-production related. Public extension provides advisory services, whereas input supply is controlled by private sector. It is feared that in spite of right advice by public extension, farmers purchase wrong inputs influenced by aggressive sale by private input dealers. Aggressive marketing strategies of agri-input business companies are ahead of slow moving public extension, creating further confusion. Due to manpower shortage that is technically well equipped, many a time, the accuracy of information on the technology & farm management practices transferred to the farmers is doubtful. Both manpower strengthening and their capacity building to encompass need based services are the need of the times today.

iv) Is the public extension designed to be result based and outcome oriented?

Public extension is often criticised for targeting activity based achievements, rather than having targets based on end outcomes. Quality of extension suffers from a tendency for repetition of a limited set of extension activities and from procedural bottlenecks. There is a need to emphasise on targets which bring focus on outcomes that result in profitability enhancement at the farmer's end. This approach will reorient extension services to address agro-climate based crop alignment, productivity gains, resource use efficiency, post-harvest storage & marketing and risk negotiation aspects in the agricultural value system.

v) Does extension also educate to correct the wrong ways of using inputs by the farmers?

It is frequently pointed out, that both public and private extension systems highlight on "what to do", rather than also educating on "what not to do". The latter is equally critical for farmers

who are practising agriculture from generations and may be carrying the baggage of certain undesirable farm practices by sheer transfer of habits from generation to generation. With new technologies and understandings forthcoming, some practices that could be even more recent, may need to be dissuaded in light of such developments. Farmers need to be educated holistically, not only in new practices but also on the need or ineffectiveness of ongoing habits to pre-empt risks and failures.

vi) Is extension serving all aspects along the agricultural supply chain?

The system has mainly focused on the input supply chain and crop cultivation activities. Due to lack of support to farmers from public extension system regarding marketing of produce, which determines the major income of the farmers, intermediaries take immediate advantage and depriving the farmers of their optimal value capture. Extension advisory on post-harvest management and marketing is mostly absent today. Similarly, market intelligence, setting up of secondary agriculture units at village level, links with agro-processing industries, post-harvest pledge loans, etc. need to be developed.

vii) Is extension comprehensive in its outreach, and inclusive in its coverage – covering women, tribals and farmers in disadvantaged areas??

Agriculture cannot always engage the farmers throughout the year, as only critical periods requires their intense involvement, and rest of the time requires supervision. And there are months in a year when crop is harvested, land is fallow and there is no on-farm work for the farm-family. A lot of productive time of the farmers remains unoccupied in a year, thereby wasting a human talent. There is scope for on-farm, off-farm and non-farm activities which can generate additional job opportunities, and this is very important from the point of doubling farmer's income. This desirable intervention by agricultural extension is yet to be fully recognised and requires to be promoted effectively as part of their mandate. Appropriate focus on women, tribals and the reach into disadvantaged areas is also not as extensive as is expected.

An examination and analysis of the issues brought out above suggests the scope for improving the content and dimension of agricultural extension and imparting it greater relevance & dynamism, as required in the context of doubling farmers' income strategy.

1.5. Agriculture Technology Management Agency (ATMA)

Extension services have evolved through the decades, in step with the changing dynamics of India's agriculture. The last major initiative as regards agricultural extension has been National Agricultural Technology Project (NATP), under which Agriculture Technology Management Agency (ATMA) was pilot tested during the period of 1998-2004 in twenty eight (28) districts across seven (7) states. The results in these 28 districts were encouraging and found to significantly drive improvements. These reforms were decentralized decision making; bottom up planning; linking farmers to market; ICT in agriculture; public-private partnership; promotion of farmer's organisations; and gender mainstreaming. Buoyed by this, the Government introduced this concept in 252 districts in Phase I in the year 2005 and

subsequently upscaled it to all the then 652 districts. ATMA is a multi-agency platform with emphasis on procedural as well as institutional reforms, leading to effective extension delivery.

1.5.1. Strengthening and reforming ATMA to meet DFI challenges.

While ATMA continues to remain a platform of relevance, the outcomes realised have been less than it's potential on account of some dilutions, discussed below:

- Poor participation and commitment on the part of senior officials
- Lack of clear understanding about the principles and practices of ATMA
- Lack of convergence among flagship programmes/schemes under agriculture and allied sectors
- Untimely release of funds from State to ATMA (district unit) and block units
- Diversion of ATMA functionaries into non-core activities
- Capacity building of extension functionaries was not sustained
- Inadequate infrastructure support to extension
- Attrition ridden and unstable contractual manpower; also allied activities like animal husbandry & fishery sector did not receive required manpower
- Absence of effective monitoring mechanism at district level through the mandated ATMA Governing Body (GB)
- Extension services needed to be made more outcome oriented, with a balanced emphasis on both production and post-production activities. This did not happen to levels of satisfaction
- Farm school concept of Farmer-to Farmer extension not fully operationalised
- Poor quality of interaction among members of Farmers Advisory Committee (FAC)
- Lack of integration of agripreneurs with ATMA activities
- Non-evolution of effective Public Private Partnership (PPP) models
- Quality of Strategic Research Extension Plan (SREP) less than desired
- Poor efforts in promotion and sustenance of farmers groups (FIGs, CIGs, SHGs, FPOs, etc.)
- Ineffective linkages between ATARIs and SAMETIs at the state level and ATMAs and KVKs at the district level and below

ATMA advocated fundamental reforms by way of decentralised decision making. However, in the more expansive phase of its implementation, the top down method of decision making continued to prevail even after its adoption in the field. Though decision making powers were delegated to ATMA Governing Board (GB) at the district level, they eventually ended up merely in endorsing the decisions from the top defeating the very purpose of decentralised decision making.

ATMA was also intended to facilitate linking farmers to market, to ensure that producers could capture optimal share in consumer's rupee. Yet, all the developmental agencies restricted their extension services to advisory on production aspects, without catering to marketing concerns. Extension functionaries were neither trained, nor were they made accountable for the targeted outcomes. The extension manpower basically suffers from inadequate knowledge or market-centric capabilities as their orientation and training content has culturally been production-centric. Compounding the problem, the technology back-stopping by KVKs has also been inadequate in this respect, since the latter too are not well equipped in regards to market-knowledge and competence. This is a serious issue and warrants priority attention in implementing a value based approach to agriculture and derive optimal incomes for the farmers from farming.

The ATMAs are responsible for proper planning and implementation of Strategic Research Extension Plan (SREP), supposed to consider important aspects such as agro-climatic zones, agro-ecological regions, available resources and institutions within a district, a participatory approach to existing and proposed farming systems, extension and research gaps, prioritisation and strategies such as intensification and diversification including sustainability. However, it largely overlooked these aspects, as also the needed convergence. In result, SREPs became a mere mechanical exercise based on replicating the previous year plan. In effect, the plan preparation and implementation became ritualistic rather than dynamic in nature, failing to bring desired changes in terms of sustainable practices and farmers' income. Planning needs to evolve and involve multi-disciplinary stakeholders from both public and private sectors.

Considering that integrated farming is important in case of small & marginal farmers, ATMA as a platform was to promote all allied sectors of agriculture. However, the ATMA platform continued to be dominated by the agriculture department, depriving allied departments from getting the required support. It was the crop segment consisting primarily of field crops, and horticultural crops to an extent that continued to occupy the core concern of extension machinery. Further, ATMA is mandated to bring all the public and private stakeholders in agriculture sector on a single platform. This has not happened as expected due to psychological barrier between the sectors that has been historically in existence.

Besides a lack of good PPP models, there is a lack of clarity of the concept and sharing mechanism at implementers' level. The other factors that impeded adoption of PPP approach were, fear of legal implications & non-approval at district level, etc. With the mandated requirement of minimum 10 per cent allocation for PPP activities in ATMA cafeteria, a beginning was intended for partnering with the private sector in extension activities. This did not happen in practice and remained more of a form, and the engagement of private sector was mostly in the nature of outsourced service providers.

Promotion of farmers' organisations in the form of Commodity Interest Groups (CIGs) etc. at village level was an important guiding principle of ATMA. However, due to lack of operational guidelines for formation of CIGs, inadequate training and experience of extension functionaries

in group formation, over-emphasis on target achievement rather than quality and sustainability of the groups, the spirit of mobilisation got lost. Further, the group formation concept under ATMA did not focus much on the federation of groups, which is a natural extension of CIGs, evolving into farmer producer organisations (FPOs).

The character of agricultural extension has been changing, with adoption of ICT in agriculture. ICT itself is undergoing cataclysmic changes, and along with increasing penetration of internet, and spread in ownership of basic phones & smart phones; the power of inform-action-dissemination through SMSs and mobile applications has influenced agriculture extension. Interventions by Kisan Call Centre (KCC) and mKisan portal have increased the farmer-reach. However, messaging through the more conventional media channels like community radio stations and TV could have been better.

Thanks to increased literacy rates and aggressive marketing, number of publications of agricultural magazines and their readership has shown an upward trend. What is not a very happy situation is, that capacity building in use of ICT in agriculture has not been commensurate with the emphasis on its infrastructure.

As regards gender mainstreaming, ATMA brought desirable results in terms of increased participation of women in extension activities. This is despite there being no focussed intervention on providing training and extension support to women farmers. Even today, mainstreaming efforts through programmes and activities organised jointly for men and women relegate the farm women to the periphery. Even though farm women are part of block, district and state level farmers' advisory committees, their participation has been passive, perfunctory and not very substantive in decision making. This is not due to lack of willingness or ability on part of the women, but is attributable to system failure, which should have provided hand holding support.

1.5.2. ATMA – professional implementation to realise its potential yield.

ATMA is a well-conceived extension delivery mechanism in the Indian context, adopted as it was after a successful pilot over five years in 28 districts of 7 states. The systems responded with great enthusiasm during pilot period bringing significant positive results in all the expected areas. An evaluation Study conducted by IIM, Lucknow validated the approach. Even in the first phase of its expansion to 252 districts, ATMA institution made a worthy beginning and demonstrated good potential.

The evaluation study conducted by Agriculture Finance Corporation (AFC) in 2009 strongly supported the institution of ATMA and activities promoted thereunder. Unfortunately, by the time ATMA was scaled up to cover 652 districts in the country, some aspects that had imparted robustness to the concept and its implementation in the first phase came to be diluted. These included routing the funds through state treasuries, causing delayed allocations to ATMA; and placing SAMETIs under the control of the state governments diluting their autonomy. These were only peripheral issues though.

In the first place, ATMA itself suffered from certain inherent weaknesses. For example, funds identified for training and extension activities under different flagship schemes of both central & state governments were spent without the necessary convergence, resulting in duplication of many efforts at field level, besides non-realisation of the impact that can be expected from synergy.

The concept and basic guiding principles of ATMA were also not implemented in letter and spirit. The officials implemented ATMA as any other scheme, and not as the dynamic platform conceptualised to promote reforms and practice convergence. Institutions like SAMETI that were established to push the reforms through capacity building of extension functionaries busied themselves with repeating regular & routine training programmes compromising the very spirit and purpose. However, it will be wrong to say that ATMA is an ineffective concept. It would rather be more appropriate to say, that its spirit (*Atma*) remained unappreciated & unrecognised, slipping into yet another scheme.

The DFI Committee assesses that the concept of ATMA remains relevant even now and that it is necessary to refresh the institutional mechanism and implementation procedures to harvest the advantages of a platform that aims at public-public-partnership and simultaneously public-private-partnership. Essentially, both models of PPPs need to run with a spirit of synergy. This is possible only when the essence of ATMA that lies in decentralised decision making is practised.

1.6. Annotation

The extension system is an important pillar in agricultural development, to empower farmers with relevant information, technology, skills and support, all of which are necessary to enhance farming viability & sustainability, farmers' income and agriculture as an enterprise.

The role played by extension service needs to be perceived and approached as a value adding activity for the betterment of farmers. There is need to further the reach and role of extension, to meet the needs of the day and to align with advancements in technology.

The farmers have demonstrated their ability to absorb new technology and would readily respond to the contemporary need for practising agriculture as an enterprise, that warrants adoption of appropriate technology and farm management practices at the level of three (3) broad segments of this enterprise, namely, pre-production, production and post-production.

Equally true, is that the Public Extension System (PES) has proved capable of transferring new technologies to the farmers during the post-independence decades and this helped India transit from food deficit to food sufficiency status.

In the current context of Indian agriculture, which is one of production-surpluses particularly in foodgrain segment, as also fruits and vegetables sector, the challenge to both Public and

Private Extension System (PPES) is to enable producer-farmers to respond to market signals and produce as per domestic and global demands and thereafter harvest the advantages to monetise their produce at optimal value. ATMA is capable of meeting this challenge, provided its spirit (The *Atma*) is appreciated and brought into practice in a professional manner.

Key Extracts

- The DFI Committee defines Agricultural Extension as the empowering system of sharing information, knowledge, technology, skills, risk & farm management practices, across agricultural sub-sectors, all along the agricultural supply chain, so as to enable the farmers to realise higher net income from their enterprise on a sustainable basis.
- Agricultural Extension is intended to educate a person how to think, and not what to think. As a result, persons can accurately determine their specific needs and find a solution to their problems.
- Imparting skills to farmers on “on-farm production, post-production practices and non-farm activities” is critical for enhancing the farmers’ income.
- Agricultural Extension is a crucial link between the research system and farmers. There is the need to have an e-platform for pooling, sharing, processing, classifying and disseminating the technologies to the state and district level.
- ATMA remains a relevant concept and its implementation needs to be strengthened as a platform of convergence and certain autonomy offered to make the services more dynamic, need based and comprehensive in outcome.

Chapter 2

Changed Role of Agricultural Extension

As the country developed, the situational needs of agriculturists also changed and has continued to change. The role of agricultural extension also needs to align with the current realities faced by the recipients, especially in respect to the current national mandate for doubling farmers' income. Extension services require to realign themselves with sustainability aspects of farming, in both production and in post-production marketing.

2.1. Indian Agriculture – Current Context

India is among the fastest growing major economies of the world. Over 58 per cent of the rural households depend on agriculture as their principal means of livelihood. Agriculture as a sector contributed 13.5 per cent to the nation's Gross Value Added (GVA) in 2015-16. Within the sector, the sub-sectors of horticulture, livestock and fisheries have been contributing a larger share of value to agri-GVA since the last decade. Agricultural development continues to remain critical for economic growth, poverty reduction and ensuring food and nutritional security of the country besides meeting other mandates of the agricultural sector.

Green Revolution which brought sufficiency on the food production side, was due to a combination of technologies viz., hybrids and high yielding varieties, fertilizers, improved agronomic practices, assured irrigation and price support policy. This revolution was made possible through an organised and committed effort of Agricultural Extension System (AES). The high production levels achieved is a sufficient evidence of the success of the system that ably supplemented the input intensive production interventions, by transferring modern technologies and farm management practices to the farmers.

However, the interventions mainly benefited irrigated regions and resourceful farmers, bypassing the larger segment of rainfed farming and resource poor farmers. The current phase of agricultural development aims at greater inclusiveness and equitable transformation, whereby all farmers are able to reap economic benefits. The DFI Committee is guided by the fact that more than 85 per cent of the farm holdings are small and marginal, and are economically challenged. To achieve income growth, there is a need for deploying scales of operation, and therefore, the need for promoting new generation farmer collectives, such as Commodity Interest Groups (CIGs), Farmer Producers Organisations (FPOs) and Village Produce Organisations (VPOs) – in the form of Cooperatives, Companies and Societies.

Indian agriculture continues to face challenges, some new and some old, such as:

(i) declining availability/quality of soil, water and other natural resources; (ii) decreasing size of farm holdings; (iii) inefficient use of inputs and their increasing costs; (iv) scarce and more costly agriculture labour; (v) drudgery in farming operations; (vi) growing risks in farming at all its stages from pre-production to production to marketing; (vii) increasing information gap, knowledge gap and skill gap; (viii) poor access to credit and investments; (ix) slow diffusion of relevant technologies; (x) competitiveness of quality and prices in domestic & export markets;

(xi) inadequate focus on processing and value addition; (xii) inadequate rural infrastructure; (xiii) regional imbalances; (xiv) problems in retaining rural youth in agriculture; (xv) poor access to resources and services for women in agriculture; (xvi) weak institutional/sub-system linkages and convergence; and (xvii) extreme events of climate change on the rise.

Even issues that were less controversial until recent years, such as disposal of farm residue, agro-biodiversity conservation, disposal of agro-chemical wastes etc., are now threatening the farming eco-system. The real challenge remains in diffusion of the research & development technologies developed by the National Agricultural Research System (NARS) to the farmers, through an effective extension delivery system. Hence, the need to recognise a slackened agriculture extension system and impart it the needed strength & support.

2.2. Extension Support required by Farmers

Agricultural Extension has to meet changing demands of dynamic agricultural system. Majority of the farmers have successfully shifted from subsistence to commercial agriculture i.e. they now generate surpluses that not only meet family consumption needs, but are available for markets. Thus, farmers increasingly seek market oriented information such as market preference for crop and variety, market demand and prices on real time basis, details on buyers, availability of logistics (aggregation, transport, storage facility, etc.). These constitute business enabling information, which has not been traditionally addressed by public extension. In a way, this has remained a structural weakness which needs to be addressed (see DFI Volumes III & IV) and reorient and capacitate extension system to take these to the farmers.

The size of the land holdings is gradually reducing which can make the production commercially unviable. The situation demands alternate ways to bring in scale of operation by adopting contract farming and/or establishment of farmer producer organisations, either as companies/cooperatives/societies. Whereas, small land holdings are amenable to operation in a more efficient manner, the movement of produce to markets requires aggregation for logistical efficiency, besides cost effective purchase of inputs. Farmers therefore need details on agri-business companies providing specialised services and possessing interest in contract farming, ways and means of establishment of farmer producer organisations and their linkage with the extension, credit institutions, common infrastructure, processing opportunities etc. This demands new set of information, knowledge and skill on the part of farmers, as also reoriented approach to extension on the part of the extension system.

Migration of people from agriculture into urban areas combined with wage spiralling on account of wage labour under MGNREGA, as also other economic activities in the rural areas, has engendered labour shortage and high labour cost. But, these changes in the rural structure are inevitable and welcome too from the perspective of welfare of rural society. This is also a reflection of the slow growth in economic returns from agricultural activities and its inability to compete.

What is desired is ensuring that optimal value is captured from all that is produced and a

production environment that in itself is market-led is facilitated. Attracting and retaining youth in agriculture is emerging as a great challenge and can be addressed by encouraging agriculture as an enterprise by the extension system that is based on vertical integration of production, processing and marketing systems aided by new science & technology.

Water is a scarce commodity which needs to be used judiciously by farmers. Information relating to method of irrigation, quantity and quality of water, time of irrigation, water use efficiency by adopting micro-irrigation systems and sensors, besides crop alignment etc. now need to constitute the new context of advice that the Extension machinery is expected to offer to the farmers.

Pest management is addressed by present extension with due attention. However, accuracy of the information such as time and method of application, quantity of application need to be emphasized in extension. Proper use of pesticides and its impact on health through wrong usage has to be taught to farmers, as not only is it important for the health of farmers and farms, but also consumers. The urgent need however is technology based pest surveillance and information sharing with farmers for timely, safe and preventive intervention. Simple technologies such as QR codes on pesticide supply can help build traceability and checks to mitigate spurious medication and chemicals.

The shortfall of farm workers & increasing labour cost create demand for farm mechanisation. However, farm mechanisation can be hindered by small size of land holdings and high capital investment. Involving agri-business companies in popularising and facilitating farm mechanisation, promoting Custom Hiring Centres, skilling para technicians, facilitating maintenance support, demand a proactive extension system. The manpower needs new knowledge and orientation in this regard.

Health conscious consumers are seeking food products, that are safe to consume as also those produced under conditions of organic farming, conservation agriculture and Good Agricultural Practice (GAP) environments. Hence, certification process of organic product, with market linkages need to be taught to farmers. Capacities of extension functionaries need to be built in this direction.

Farmers are beginning to realise the importance of first level aggregation as a value addition activity, including primary curing and processing, so that they can capture a larger share of consumer spend. Farmers need to be educated on activities that help capture greater value for themselves and the techniques that can also add value to the produce. These first-mile, off field activities do not necessarily require much capital intensive machinery, and can be managed manually by the farmers. Effectively, farmers need to be educated to take valuable advantage from activities that were normally performed by an intermediary aggregator, or take advantage of services of Primary Rural or *Grameen* Agri-Markets (PRAMs/GrAMs) as proposed by DFI Committee (DFI Volume IV). Extension functionaries themselves need to be trained in these areas, so that they can efficiently deliver the message to the farmers and motivate them to adopt

activities that capture greater value from their produce.

Where required, high technology processing can also be facilitated for large farmer groups to create brands originating at villages. Industrial processing to add value to the product is preferably a group activity considering the quantity of produce required, investment required for infrastructure and machinery and linking to markets. Contract farming and farmer producer organisations emanate as pre-requisite for such activities. Hence, capacity of farmers as well as extension functionaries need to be built, for group mobilisation to link them to markets, value addition and processing, which is rarely addressed in the present extension system.

Production is seasonal, whereas consumption is perennial. It is important for farmers to store the long holding produce and release it to market when they can fetch good price. There comes the need of educating farmers on storage and the advantage of availing interim pledge loan on goods stored. In this direction, capacity of extension functionaries should also be built in understanding the value of and propagating use of WDRA registered warehousing. So far, extension at best has worked to propagate low cost storage which has higher risk and does not offer credit linked benefits.

Doubling the farmers' income is possible when agriculture is treated as an agri-business. Basic elements of agri-business include selecting the right cost, book keeping, finance management (balancing inflow and outflow of money), judicious resource management, labour management etc. To disseminate such learnings to farmers, it is necessary to revisit the status of knowledge and capacity of extension officials who then can spearhead this change. Managerial competence of farmers and extension professionals needs to be enhanced through relevant capacity building.

Agriculture provides ample opportunities for the farmer and his family to undertake several income generating agri-enterprises which are on-farm, off-farm and non-farm in nature. Agri-enterprises such as nursery, seed production, custom hiring, vermi-composting, bee-keeping, managing common storage, custom hiring and processing units, agri-tourism, milk chilling unit, fingerling production (for fishery), spawn production (for mushroom) etc. require skills, investment and market linkages. Income addition to farmers through these activities contributes significantly for doubling income not only for the enterprising farmer but also for others who use these quality inputs and services. Secondary agriculture, thus, needs due emphasis.

Extension also needs to focus on these areas so as to create small-medium enterprises (SMEs) at village level. These are activities that will vertically enhance the cultivable area of a farmer and assume importance in the light of little scope for horizontal expansion of cultivable area.

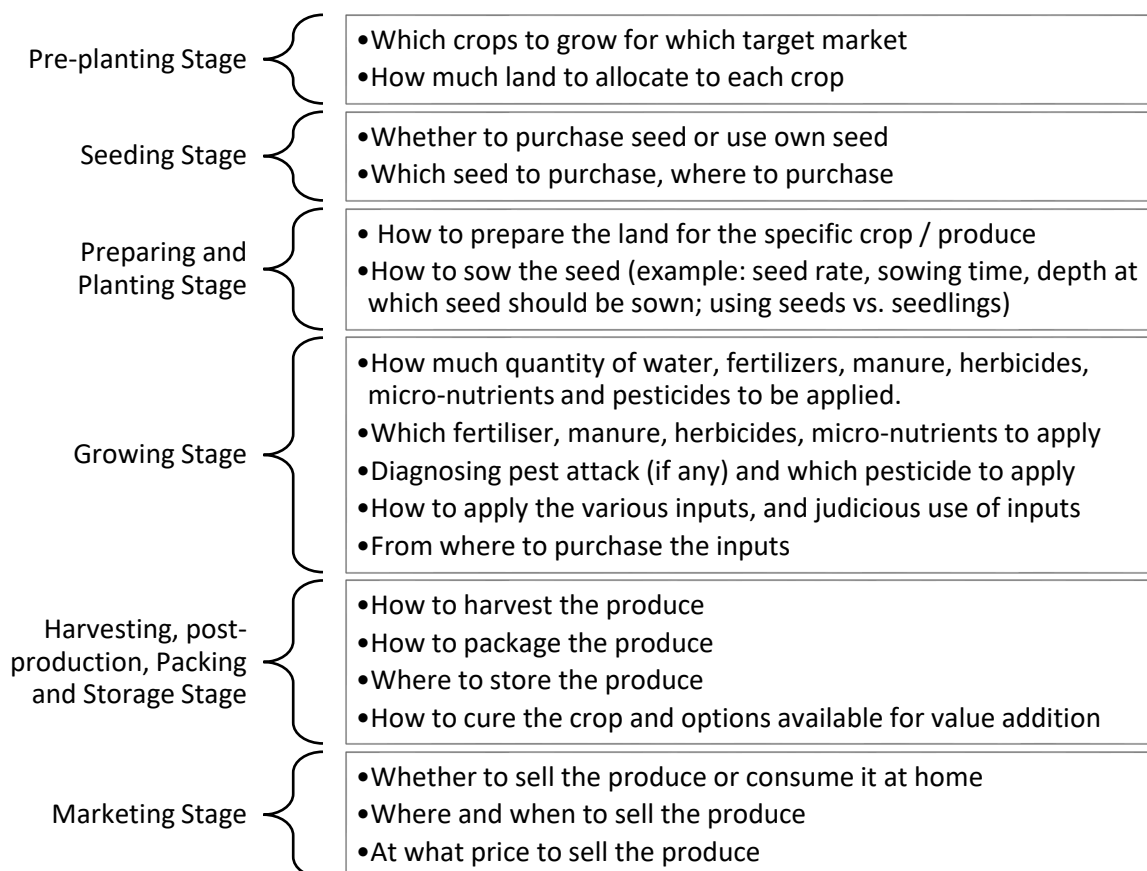
Right market and right time of marketing play an important role in enhancing the income of farmers. Necessary information dissemination mechanism on real time basis, negotiation and marketing skills for farmers and extension functionaries is need of the hour. Extension system has to gear up to organize more and more buyers-seller meet to minimize the involvement of

middle men. Evolving and popularising direct marketing models such as Rythu Bazars (as in Andhra Pradesh) and online trade platforms such as eNAM have to occupy the rightful place in the mandate of extension system. Therefore, extension functionaries need to remain updated of reforms and pass on the associated opportunities to farming community.

Intensification and diversification strategies in agriculture significantly contribute to doubling of farmers' income. Both the strategies are based on existing resources available with the farmer's family but efficient utilization is the need. Intensification focuses on shifting from local and indigenous varieties/practices to improved ones. For example, shifting from manual labour to mechanization, local varieties to improved varieties. Similarly in diversification, practising dairy with agriculture, growing vegetables, flowers along with agriculture, bee keeping with horticulture, etc. are expected to add additional income to farmers. Extension needs to educate farmers on effective time & labour utilisation, resource blending, etc. for promoting intensification and diversification. It is these practices that will increase manpower efficiency, optimal utilisation of resources, risks negotiation and result in sustained growth in farm incomes.

The farmers need information at all stages of crop production and post-harvest management, as in the figure 2.1.

Figure 2.1 Information needs of farmers for an agricultural cycle



Source: adapted from (Mittal, Gandhi, & Tripathi, 2010), (Aker, 2011) and (Meitie & Devi, 2009)

The farmer also needs to know as to when to carry out the above processes, i.e. the appropriate timings of the processes. In a biological production system like agriculture, timings are often governed by weather conditions, especially rainfall forecasts. The nature of information would naturally vary depending upon cropping system, soil type and by local weather. The type of information required by the farmer is dynamic in nature. For example, in the current times, farmers are more interested in knowing about achieving balance between organic & inorganic nutrients, information on cold storage facility, warehousing & post-harvest loan, marketing, export, etc.

Extension system can also be used to identify a distressed individual, provide necessary advice to overcome the distress, most importantly offering psychological counselling and where needed guidance on actions that can mitigate the distress. Such counselling is also intended to be an integral part of extension advisory. A team of researchers from the Punjab Agricultural University (PAU), Telangana State Agricultural University and Marathwada Krishi Vidyapeeth are presently working on creation of a “**stress index**” (SI) for farmers and preparation of a training module for village-level volunteers to counsel vulnerable farmers. Extreme steps such as taking one's life can go beyond economic factors such as indebtedness and can be caused by social & psychological pressures. A good counselling, can serve to alleviate the situation and help the farmer step back from a precipitous state of mind, even under stressful situations of agrarian crisis and save a human life. Extension system has to be equipped with this sensitive counselling knowledge.

Division of hereditary property among siblings is leading to fragmentation of land holdings. As a result of fragmentation, the number of small and marginal farmers is increasing and this enlarges the number of farmers and farm holdings that need to be reached, largely addressed by public extension. ICT tools can help to mitigate the need to physically reach every farmer for all topics, particularly the one that is a pure information & repetitive, as some information can be shared through audio-visual means.

Small and marginal farmers when mobilised under contract farming, or grouped into farmer producer organisations can be reached out collectively, especially when they undertake common ventures in terms of crop planning, crop types and post production activities. Farmer groups that collaborate, to group together conjoined land holdings, also have added advantage at input level including use of farm mechanisation. Extension functionaries need to constantly impress on such advantages and build collaboration for synergetic gains.

2.3. Negative Impact of Imperfect Information Dissemination

Lack of good and reliable information could result in:

- high yield gap;
- low seed & varietal replacement rate;
- poor crop nutrient management; and

- widespread use of spurious/low quality agricultural inputs.

The reduced presence of public sector extension in agricultural extension system beginning with 1990s, the era of economic liberalisation in the country, has adversely impacted the flow of information among farmers. Presently, less than half of the farmers have access to agricultural information, and there exist other aspects like large farmers having access to better sources of information and greater focus of information on fertilizers and insecticides, with lesser attention to other stages of agricultural production. Poor access to information has caused inappropriate adoption of agricultural practices leading to major yield gaps in field crops.

Likewise, in case of pesticides, the problem of spuriousness has been attributed largely to weak law enforcement. While weak enforcement is an issue, spuriousness is as much a result of failure on the part of public & private extension systems.

Spuriousness of inputs is a serious problem, because not only does the concerned input (seed, fertilizer etc.) not yield the promised potential, but also adds to the farmer's cost of production without him accruing any additional yield and income.

A pan-India study by FICCI in 2015 brought out, that market size of spurious pesticides in India was around Rs. 3,200 crore in 2013. This accounted for about 25 per cent by value and 30 per cent by volume of domestic pesticide industry. It has been estimated, that fake pesticides lead to an annual crop loss of Rs. 6,000 crore in India (Iyengar, 2010).

This highlights the importance of extension and the urgent need to enhance the level of knowledge and awareness among farmers.

2.4. Agriculture demands added Role from Extension Manpower

Extension is a delivery mechanism across agriculture and allied sectors, in addition to its role in dissemination of conventional knowledge. Meanwhile, the extension landscape has undergone changes, becoming more pluralistic with increasing participation of the private sector (dealing with agro-inputs, agribusiness, and financial services), non-governmental organisations (international as well as local); producer groups, cooperatives and associations; consultants (independent and those associated with or employed by agri-business/producer associations) and ICT-based services. All these have brought additional manpower and resources to the Extension and Advisory Service (EAS) along with new knowledge, skills, and expertise. Yet, the cumulative number has not kept pace with the increasing number of farmer households or they have not come together to coordinate their efforts and achieve a more universal coverage of area & farmers and realise synergistic outcome of extension services. Further, this pluralism has also brought additional challenges of ensuring quality, providing technical backstopping, and ensuring collaboration and synergy among diverse EAS providers (Suleiman and Davis, 2012). Changing role of Extension in this context, transcends beyond transfer of technologies, to perform activities which empower farmers to adopt latest technologies resulting in enhanced productivity, production, resource use efficiency and

thereby profitability, uplifting the living standards of farming families.

At every stage in the agricultural value system, technological interventions in form of inputs, infrastructure and other developmental initiatives need to be ensured through extension. Hence, in the changing times, the role of extension is to be redefined for efficient and effective delivery of information, knowledge and skill considering the extension services provided to the farmer. Today, extension has to become an integral part of agricultural value system.

In order to bring synergy and achieve effective convergence, the extension service provider may have to function as an enabler and facilitator, which will go a long way in enhancing farmer's income. Towards this, he may have to proactively embrace the following roles:

Table 2.1 Roles under Agricultural Extension

<ul style="list-style-type: none"> • Providing information on ongoing schemes and programs in agriculture & allied sectors. • Capacity building and skilling in emerging areas • Advocacy on farmers' interests. • Counselling for farmers' well-being. • Credit facilitation. • Critical assistance in risk management including climate change, crop insurance etc. • Documentation and reporting roles • Enforcement of Farmers' Charters • Issuing advisories on soil health management, water conservation, pest management etc. • Facilitating access to production and post-production inputs & data. • Facilitation & feedback • Serving as friend, philosopher and guide to farmers 	<ul style="list-style-type: none"> • Engaging in research planning • Promoting projectised mode of extension delivery • ICT enabled services • Intermediation • Linking farmers to markets • Building managerial competence. • Linking various support & service networks • Organizing user/producer groups • Planning, Monitoring and Evaluation • Promotion of PPP models • Promotion of farmer led innovations • Redressal of grievances • Technology selection, etc. • Feedback to research system
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2.4.1. Climate change

Climate change is emerging as a major challenge to the practice of agriculture. Farmers are left with no other option but to adopt climate resilient strategies. ICAR through NICRA (National Innovation for Climate Resilient Agriculture) has identified 151 districts vulnerable to drought. These districts will need the special attention of the Extension machinery to undertake drought proofing. Further, district level contingency plans have also been prepared by ICAR-CRIDA which need to be integrated with ongoing extension programmes. Massive sensitization of extension functionaries has to be undertaken, who in turn need to educate farmers. This sensitization is gaining importance as every sub-sector such as agriculture, horticulture, animal husbandry and fisheries is bound to be impacted by climate change. Farmers are not familiar with these changes. Hence, there lies a gap between existing problems, current agricultural

practices and required advisory.

In fact, the relative adverse impact of climate change on the small & marginal farmers will be higher and their relatively lesser strength to adopt coping and adaptation measures will only exacerbate their situation. Hence, extension system has to be highly sensitive vis-a-vis the needs of the small & marginal farmers.

2.4.2. Farmers' aspirations

Increasing literacy rate, awareness, urbanisation and mass media exposure have contributed to increased farmers' aspirations and expectations from agriculture. In majority of the cases, agriculture is the single source of income to take care of his family expenditure and agricultural expenses. Due to this increased dependency, any fluctuation in agriculture returns is badly affecting the life of farmers. Therefore, extension has to popularise diversification and also income generating activities which are non-farm in nature to bring stability in the income of farmers. It is very important to involve farmers at every stage of agricultural supply chain, so that farmer's share in the value system and the consumer's rupee would increase. This would also serve as an antidote to mono-cropping / mono-sub-sector based agriculture.

2.4.3. Capital intensity

Modern agriculture is capital intensive, based as it is on use of costly inputs such as seeds of improved varieties, fertilizers, pesticides, machineries etc. Even the labour cost is increasing. Modern production practices such as precision farming, protective cultivation, fertigation and processing require heavy capital. In short, agriculture is today more market linked and the farmers need to buy most of the factors of production from market apart from land.

In fact, in case of lease, which is widely prevalent even though unofficially (in the absence of legally enable lease system), the cultivator pays heavily even on the land that he leases in. In Punjab, for example, lease charges are extremely exorbitant and almost unaffordable. In view of this, credit extension has emerged as important component in extension. This opens new dimension in extension, where extension service provider has to work very closely with credit institutions on one side and farmer on other hand.

2.5. Present Context – Transition from Production to Income Basis

Seven sources of growth

The income of the agricultural households mainly originates from four sources, viz., crops, livestock including fish, non-farm business, wages and salaries. Agriculture and sub-sectors explicitly cover the first two components of the household income, and are within the purview of the Ministry of Agriculture and Farmers' Welfare. The other two components, though doubtless important for agricultural households, are not directly affected by agricultural policies even though there are indirect linkages. The DFI Committee has identified the following six (6) major sources of growth operating within the agriculture sector (DFI Volume-II), apart from two (2) other sources construed therein.

- (i) Improvement in crop productivity.
- (ii) Improvement in livestock productivity.
- (iii) Resource use efficiency or saving in cost of production.
- (iv) Increase in cropping intensity.
- (v) Diversification into high value crops.
- (vi) Improvement in real prices received by farmers.

Further, the following source of growth operates outside the agriculture sector, but can contribute to farmers' incomes, by reducing the number of claimants to the income generated in the agriculture sector.

- (vii) Shift from farm to non-farm occupations.

The agricultural extension system at present has been primarily concerned with first two sources i.e. improvement in crop and livestock productivity. However, livestock extension is limited by manpower and the available manpower at best can be used to serve the existing livestock farmers rather than aggressively promoting expansion of this sub-sector. Further expansion is expected to yield substantial additional income to the farmers contributing to doubling of farmers' income, and therefore, the need for a more robust extension in livestock domain.

Technologies such as soil testing based fertilizer application, time and method, dosage of fertilizer and pesticide usage would contribute significantly to productivity while reducing the cost of cultivation/production. Such practices need to be vigorously promoted through extension.

Increasing cropping intensity and diversification towards high value crops need additional investments. Extension has to link interested farmers to the various on-going developmental programmes of both central and state governments, in the form of incentives, subsidies and credit from financial institutions. Private extension services by agri-business companies dealing with important inputs may be used to serve farmers interested in increasing in cropping intensity and diversification. ICT may be effectively used to supplement the efforts of public and private extension serving this category of farmers.

The recent reforms promulgated in the Model APLM Act 2017, patterned on market facilitation rather than market regulation, and which promotes liberalisation and competition in marketing needs to be shared with the farmers. Various direct marketing models such as eNAM, private markets, models like Rythu Bazar which ensure maximum farmer's share in the consumer's rupee, besides bringing in transparency are other systems that need to be promoted. These approaches have to be popularized so that maximum number of farmers will benefit and role of middle men will be minimized. ICT enabled real time prices in nearby markets, may be

communicated to farmers so that farmers can time their harvest and sell their produce for best price available by evaluating alternate options.

It is equally important to promote non-farm income generating activities, if needed, by imparting skills to the farmers so that their leisure time is productively utilised for generating additional income. Farmer groups require to be mentored and linked to agri-business companies so that inputs can be directly purchased from them cost effectively. Post-production activities that improve post-harvest management to consolidate, safeguard and market the produce need to be encouraged at village level so that employment opportunities are created in rural areas, contributing significantly to farmers' income.

2.6. Meeting the New Challenge – Broadening the Extension Perspective

2.6.1. Efficiency of extension

The nation has phenomenal resource centres like the nation has robust research infrastructure in 'National Agricultural Research System (NARs)' and comprises various ICAR institutes, Central Agricultural Universities (CAUs) and State Agricultural Universities (SAUs). The extension methodology adopted is the communication channel. Thirdly, there is a large user base of receivers, namely, the farmers. An efficient extension is one that ensures the transfer of knowledge from source (NARs) to receiver (farmers) through the most appropriate method, without communication distortion, leading to its adoption. **The adoption process at farmer level takes place in six stages i.e. awareness, interest, desire, action, conviction and satisfaction.**

Similarly, extension methods are classified as:

- i) Individual Contact Methods – e.g. farm and home visit by extension functionary.
- ii) Group Contact Methods – e.g. training & demonstration, where a group of farmers are educated (SHGs, farmer forums, etc.).
- iii) Mass Contact Methods – e.g. television, radio, social media, video-clips where a larger number of farmers can be reached.

Mass contact methods are used at awareness and interest stages of adoption; Group contact methods are used at desire and action stages; whereas Individual contact methods are used in conviction and satisfaction stages.

Extension methods may be appropriately combined with stages of adoption to save time, cost and manpower resource. However, in practice, time taking and costly individual and group methods are extensively used even at awareness and interest stages, in spite of shortage of manpower. This may be avoided.

2.6.2. Effectiveness of extension

Effective extension depends first on selecting the right information and matching the

information to the appropriate stage in the cycle for adoption by the recipients. Extension is most effective when it understands not only the value adding activities of the farmer in his own value chain, but also understands the larger agricultural value system with its varied actors and the scope of integrating with such other value chains. The effectiveness of the information disseminated also depends on selecting the appropriate combination of extension methods.

As discussed, mass media can be used at awareness and interest stages. Later, during activity implementation, a more direct medium can be adopted gainfully. In the present context, mass media such as television, social media, SMS and emails can be widely used based on the situation. Technologies can be introduced through innovators and early adopters in village situation to ensure the success of technology demonstration and subsequent adoption by other farmers. **Effectiveness is a measure of accuracy, availability, applicability and analysis of the outcome.**

2.6.3. Cost-effectiveness of extension

Proper blend of extension methods used at appropriate stage would be cost-effective and result oriented. Appropriate use of ICT in extension can enhance time duration and cost efficiency of the service. Extension through farmer organisations would bring down cost of extension. It is possible to ensure market led extension considering the experience and expertise of private sector in the post-production domain by adopting public-private-partnership (PPP) models. Extension in association with private sector and scientific institutions may be effective in disseminating information on high technology processing and value addition systems.

2.6.4. Real time extension

Farmers require real time information with respect to weather, market, natural calamities like flood, cyclone, hailstorms, fire and pest attack. Weather forecasting requires interpretation of weather parameters in the context of crops to inform the implications to farmers. Market information may provide location of the market where maximum price can be obtained for farm produce.

Forewarning on natural calamities calls for use of all the available mass media channels and manpower to reach the farmers instantly. Farmers also require information on availability of inputs and location on real time basis. Inflow and outflow of commodities in the market may be informed to farmers instantly so as to decide the demand and supply positions and decide on what to grow or when to sell and how much to sell. ICT may be extensively used for the purpose. The helplines and SMS facility are very useful to farmers. All the extension functionaries may be well connected via IT platform to deliver real time extension.

2.6.5. Location specific extension

Even though generic information is available at macro level, it has to be properly interpreted to the local conditions by extension service provider before disseminating to farmers. Extension systems need to be capacitated appropriately in this regard. Readily interpreted, location specific messages may be sent to farmers directly using ICT platforms such as SMS, group

messaging apps, etc. It is important to establish a national platform of ICT, where location specific extension services can be provided at various levels by different stakeholders to farmers.

2.6.6. Integrated & inclusive extension

Strategic Research Extension Plan (SREP) under ATMA is prepared by adopting integrated farming system approach, where extension and research gaps of all the sub-systems are identified through participatory methods. Extension strategies and activities are worked out to address the prioritized gaps and implemented through district action plan. It includes besides agriculture, sub-sectors such as horticulture, dairy & livestock, poultry, fishery, aquaculture etc. This integrated extension service may be especially strengthened as it contributes significantly to the income of the farmers. As experienced so far, the reality is that it leaves much to be desired. Both public & private extension systems including NGOs need to be made more aware & knowledgeable through capacity building exercises on SREP.

Extension needs to be more inclusive, to include the various stakeholders - all categories of farmers, women farmers, farmers in tribal and disadvantaged areas. Suitable strategies and models need to be developed for various categories.

2.6.7. Agricultural value chain extension

Extension has to provide advisory services at various stages of the value chain and empower them with knowledge and capacity to integrate with other value chains, so that they are able to derive maximum benefits from the agricultural system. The sector-wide value system, also known as the agricultural value system, is an integration of independent value chains & actors besides individual farmers. The entire output value system commences at farms and ends at a market. The system-wide actors include the transporter, warehouse keeper, marketer, processor, consumer, etc., all together forming the output supply chain and being the market channels for the farmers to monetise their production. Each actor has an individual model to capture value for the role he plays and extension needs to understand as to how to utilise the value system for the farmers' benefit. Extension needs to understand and link farmers with the consumers' preferences. Similarly, there is an input value system, which targets the farmer with an aim to add value through enhancing the internal core competencies and activities of the individual farmer. **Extension is a value added support activity in both the input and output systems.**

To develop a level of future-readiness, the extension mechanism needs to be involved in the sector-wide value system, so as to better direct the unit level value chain activities and procedures at each farm. As a commercial activity, a farm requires to prioritise on the basis of ability, to capture value from the first buyers or from end-consumers. Besides access provided at physical markets, electronic markets are expected to add to the farmers' choice of customers and open access to more markets. This means that the farmer can participate more easily in different agricultural value systems, each governed by a target market and the produce type handled. e-Markets are expected to be more transparent and competitive than physical markets.

In case of perishable produce types, knowledge of operations and marketing in local languages is crucial, especially for proper post-harvest handling, preconditioning, packaging, timely transport, and storage if needed. An ICT enabled Value-System-Knowledge-Platform (Input provider-Farmer-output service-market-consumer) is required for each such produce. The concepts and principles of *e-commerce*, *e-business*, *e-auctioning*, and *e-marketing*, and their applications to agri-business need to be well understood. Skill development–Competency Development, is essential for various value chain partners in the agricultural value system.

During the decade of 2000-10, there have been some innovative initiatives (e.g. Hariyali Kisan Bazar, AGMARKNET, e-Krishi Vipnan, e-Mandi, e-CHOUPAL etc.), besides strengthening traditional information sources such as individual State Agricultural Marketing Boards, Commodity Boards, Commodity Exchanges, National Federations, and Agri-Business organisations. However, there is absence of inter-linkages (inter-operability) among these including the various Boards. This demands establishment of a comprehensive information networking system that straddles across commodity groups and markets, while delivering real-time, authentic information in a user-friendly format through localization. It essentially calls for an inter-operable architecture that adopts inter-data base intelligence.

The AGMARKNET Portal, operating for over 15 years, has emerged as the national knowledge portal linking farmers to domestic and global markets. The portal has various features:

- ealert.agmarknet.nic.in to facilitate and access agricultural produce price of market information by the public through e-mail/SMS
- Disseminating market prices information in 11 Indian languages (Hindi, Gujarati, Panjabi, Marathi, Bengali, Oriya, Assamese, Tamil, Kannada, Telugu and Malayalam)
- Monitoring of transactions with farmers below MSP
- Information service on weekly/monthly price and arrivals trends, market profiles, commodity profiles, commodity grades and standards, market research studies, market atlas, application status of AGMARK certification, AGMARK grading statistics, directory of wholesale markets, linkage with different government websites, government schemes, etc.

Both AGMARKNET (a Ministry of Agriculture initiative) and e-Choupal (a private sector initiative), have emerged as examples of operational systems that have received national and international appreciation and awards, for their impact at grassroots level.

The Government of India has already launched its pan-India online National Agriculture Market Portal (<http://www.enam.gov.in>) on 14th April, 2016, with a view to developing a unified National Agriculture Market (NAM). This will integrate spatially dispersed primary wholesale markets via a virtual platform and enable transparent and competitive price discovery on farmers' produce. The integration of e-NAM (pan-India electronic trading platform for APMCs) with AGMARKNET 2000 (a pan-India with 3297 Nodes for Agricultural

Produce Marketing Information System), will help optimise the value system for about 400 agricultural commodities. The Model APLM Act 2017, also envisages private electronic platforms which can integrate with the national system, while operating independently.

In the country, there are about 22,000 rural (primary periodic) markets, the first contact points of farmers with the market economy, both for selling and buying. As there are high price differentials, between the terminal wholesale and the rural primary or secondary markets, there is room for arbitrage which is exploited by the traders to their advantage. The DFI Committee recommends (see DFI Volume IV) that the periodical rural markets be taken advantage of, and promote retail-cum-logistics hubs, referred to as Primary Rural Agri-Markets (PRAMs /GrAMs), hosting facilities for aggregating the produce, and where needed to undertake pre-conditioning activities, and link the harvest with wholesale terminal markets. The onwards connection to large demand centres – terminal markets – can also be facilitated when these proposed PRAMs are inter-connected through a virtual network under the e-NAM program.

The ability of the farmers to target the value ascertained at distant wholesale markets, means essentially that wholesale markets are the main points for price discovery, and the rural markets are the price takers, with due consideration for transport and other costs.

The various Trade regulatory and facilitating agencies, have established electronic interfaces (e.g. e-Trade, e-PQIS, GrapeNet, AnarNet and e-Biz etc.) between them as well as with the trading community to allow electronic delivery of services facilitating enhancements in both exports and imports. ICT enabled platforms, such as GrapeNet and AnarNet, are required for about 400 agricultural commodities to reap the benefits of globalisation. In the context of doubling income of the farmers, the role of information and communication technology can be a catalyst in breaking the entry barriers in marketing and bringing transparency in market operations and transactions. The marketing services which can be leveraged with the help of ICT for the benefit of farmers by giving access to information and enabling farmers to take informed decision for marketing, are as follows:

- a. e-NAM platform with National Agriculture Market.
- b. Integration with AGMARKNET.
- c. Farmer and Farm Database.
- d. Price Discovery & Marketing Decision Support System (DSS).
- e. Creation of an IoT based warehouse receipt system in APMC yards and private wholesale market yards.

2.6.8. Extension for risk management

All probable risks in the local production system can be taken into consideration while building the capacity of extension functionaries. Drought resistant varieties can be recommended for rainfed areas, pest resistant varieties can be recommended for pest vulnerable areas, and climate resilient agriculture may be taught to overcome climate change adversities. Most importantly, crop insurance scheme, namely, Prime Minister Fasal Bima Yojna (PMFBY) may be promoted

by undertaking sensitisation programmes. This will help in compensating the farmers in case of crop loss due to certain natural calamities. Extension has to ensure that farmers' claims are addressed instantly by insurance authorities while settling the claims. Extension functionaries may be trained in this direction. A number of other risk management strategies will have to describe the extension advisories.

2.6.9. Extension for sustainability, health and nutrition

The farmer has to manage natural resources such as land and water judiciously, so as to sustain the productivity of agriculture year after year. In view of this, integrated nutrient management, integrated pest management, integrated farming systems, watershed management, organic farming, diversified agriculture and the like, have to become core principles of extension system in technology transfer.

Alternate cultivation practices like organic farming conservation agriculture and the like may be addressed through specialised extension services so that the health of the natural resources is protected and agriculture produce is certified branded and market to benefit from premium prices. This will create a win-win situation for all the stake holders. However, in promoting organic clusters, extension service must ensure availability of required inputs such as bio-fertilisers, bio-pesticides, biological control agents, certification and linkage with niche markets. Production of biological inputs and biological control agents create opportunity for farmers to generate additional income. This cycle has to be attended to in totality for sustainability of agriculture and organic farming as a business.

2.6.10. Building capacity of Extension functionaries

Conventionally, the Extension Service Provider (ESP) is an individual who has graduated in one of the disciplines of agricultural sciences, and accordingly considered as suited to take up tasks in extension. It is however, incorrect to assume that a technically trained person would innately have the necessary skills to operate as the human interface to pass on knowledge and influence the working behaviour of the farmer. After all, everyone selected in government extension system has not formally studied extension as a specialised subject. Evident from the preceding sections the extension functionary has to communicate increasingly on matters that touch across disciplines, and subjects that are closely linked with management of manpower, material and markets, and not only the production aspects of farming, as presumed today. This approach alone will make extension services comprehensive and farmer-appropriate.

Since extension functionaries interface closely with the farmers and can have a meaningful impact on agriculture as a system, the Committee felt there is an urgent need to build capacities of all Extension Service Providers (from public, private and civil society), in agriculture and allied sectors. To make extension more relevant and meaningful, there is need to develop an HRD policy for the extension officers in the locally relevant agricultural sub-sectors, along the chain comprising pre-production, production and post-production stages.

As the agricultural sectors undergo major advances, in association the extension providers also

need to keep pace with such developments, through continuous learning. Extension functionaries are expected to be a skilled human resource capable of assisting the farmers to take up the challenges of conceptualising, developing, deploying and managing farmer-centric, supply chains. For long the extension functionaries have generally remained focused on input management. Given the importance of marketing in letting the farmers capture optimum value of their produce and earn better farm incomes the extension focus has to shift to post-production management. This consists of agri-logistics, value addition & processing and marketing.

The Committee recommends that all extension service providers should undergo mandatory need based and diagnostic-skill based training, to prepare themselves for the changing agricultural environment. The training could be for about 2 to 3 months, and would require training not only on communication skills but also include courses on men and material management. For example, protected cultivation requires specialised skills, including infrastructure repair and maintenance, calibration of instruments, crop-specific protocols for humidification and ventilation, and others. These aspects need to be known by extension workers, including similar examples in animal husbandry and other sectors. This training should optimally result in a certificate as a qualified resource in extension. The officer can also be provided the option to select specialised subjects that he or she prefers to specialise in, based on self-assessed aptitude and past qualifications.

Extension functionaries should also undergo a short term refresher course, periodically or once every two years. Such training or refresher courses may be linked to the extension professional certification and also be made mandatory to continue to be assigned field responsibilities. The subjects chosen for refresher courses can be designed to suit the subsequent desired career progression path of the extension functionary. Similarly, regular assessment of institutions that will provide the training services may also be undertaken. Such institutional assessment for extension can be assigned to MANAGE, Hyderabad, a premier national institute dedicated to agricultural extension.

Agriculture sector employs 80 per cent of all economically active women, who comprise 33 per cent of the agricultural labour force and 48 per cent of self-employed farmers. Beyond the conventional narrower definition of 'productive workers', almost all women in rural India can be considered as 'farmers' in some sense, as they work in the family farm enterprise or as hired workers. Hence, skilling the women in agriculture would strengthen the existing human resource efficiency. In sectors such as horticulture, dairy, poultry, apiculture, agro-forestry etc., women entrepreneurs are increasingly showing promise. It would hence help to increase the number of women extension officers and support women empowerment. The skilling agencies should consider offering a higher number of jobs in extension by gender.

Organising farmers into farmer producer organisations (FPOs), or entire villages into producer organisations (VPOs) is one of the priority areas, to orient farming into large enterprises. This form of organisation which involves a large number of stakeholders working as a collective, requires specialised skills to negotiate the constraints towards such mobilisation. Selected

extension officers need to be imparted with training and the skills to support the creation and operations of farmers as groups. Skills needed would include management, negotiations, conflict resolution, besides financial management.

Agricultural sustainability is closely linked to environmental research, bio-energy, natural resource conservation, land use management, carbon accounting, global climate change, health & nutrition, agricultural industry, trading cycles, econometrics and more. Each is an intensive subject but cross-disciplinary awareness and decision making in these matters needs to be imparted to extension functionaries. The extension officers are normally selected from a range of agricultural sciences and this cadre can benefit from training programmes on other subject domains, including management, logistics and finance. After all the farmer's extension requirements are multiple, and no single extension service provider can be expected to know everything.

There is clearly a need for “new knowledge and innovation”. In addition to extension services linked to conventional production extension functionaries can also play an important role in supply chain management and market led agricultural and food production systems. Every activity in the modern agricultural supply chain involves “creation, processing and communication” of information to guide a value based mode of functioning.

The transition from agrarian to agri-business society will need to be effected through the leveraging of ICT as a knowledge tool, as discussed earlier. Extension functionaries themselves need to be trained on using such tools and in turn, to pass on to farmers the basic skills to look up and assess available data.

2.7. Extension Methodologies for Doubling Farmers Income

2.7.1. Dominance of public extension

Presently, extension services are predominantly provided by the public extension system, which includes State Agriculture and line departments, Agriculture Universities, ICAR Organisations, KVKs, ATMAs, Commodity Boards and several other Central and State Government organisations. As a system, this forms a big corpus and if integrated well, it can provide the needed pace and quality to extension delivery in the country.

As many as 113 ICAR institutions/centres dot the country's vast agricultural landscape, focusing on generation of technologies in a specified crop or sector. All the ICAR centres have their own extension departments which are mandated to standardize extension methodologies, approaches and models relevant to their mandated crop or sector.

It is observed, that these ICAR extension units are mostly involved in extension of their technologies to limited pockets. Ideally, the standardised extension methodologies, approaches and models relevant to their mandated crop or sector need to be integrated into mainstream extension in preference to engaging in direct extension activities themselves. After all, with

their core mandate around R&D, ICAR Centres cannot be expected to pursue extension responsibilities beyond a certain level.

The State Agriculture Universities (SAUs) are mandated to cater to teaching, research and extension. University extension is not expected to substitute mainstream extension, but as mandated to strengthen it and upgrade its knowledge of technology and delivery capacity. The Universities are supposed to build the capacity of extension functionaries of the State agriculture and line departments, develop effective extension methodologies such as farmer producer organisations, use of ICT in agriculture etc. and stream them into mainstream extension. It is expected to provide technical back stopping and capacity building support to mainstream extension functionaries.

University extension has an important function as a “concept nursery and think tank” while organically integrating with mainstream extension when covering their service area. University extension need not cover only university technologies but should disseminate all the technologies relevant to farmers in the service area sourced from different corners. This has not been the approach as of now.

The National Institute of Agricultural Extension Management (MANAGE), an autonomous body under the Ministry of Agriculture and Farmers' Welfare may be mandated to develop standardised extension approaches and ensure that technologies from across the universities are converged on a single platform at national level. A standard mechanism and common platform will ease the dissemination to Extension Education Institutes (EEIs) and SAMETIs for further dissemination to mainstream extension i.e. State Agriculture and line departments. The same procedure may be adopted for commodity boards, as also other state and central government departments. This cascading effect is essential.

2.7.2. Challenges in public extension

Major challenges in Public Extension, according to (Stefanie Kaegi, 2015)¹, have been (i) lack of qualified public extensionists, ready to work in remote areas, (ii) dovetailing of national research and extension plan with farmers' requirements is challenging and yet a limiting factor for effective public extension, (iii) public extension agencies have to cover a range of services, not only for extension, and (iv) depending on State priorities, public agricultural extension delivery is neglected.

A more comprehensive picture of the important challenges in the Public Extension System (PES) are categorized as follows:

¹ Stefanie Kaegi (2015): “The experiences of India’s agricultural extension system in reaching a large number of farmers with rural advisory services”, a Background paper to the SDC face-to-face workshop “Reaching the Millions!”, in Hanoi, Vietnam, March 2015; down loaded from https://www.shareweb.ch/site/Agriculture-and-Food-Security/focusareas/Documents/ras_capex_india.pdf, on 14th August 2017;

Table 2.2 Challenges in Agricultural Extension

Category	Challenges
Human Resource Development (HRD)	<ul style="list-style-type: none"> • Inadequate resources – human, physical and financial • Skill deficit including ICT skills • Inadequate competency and skills of extension functionaries • Poor performance incentives for public extension officers
Linkages	<ul style="list-style-type: none"> • Poor linkages – Research, Extension, Farmer, Market • Lack of convergence – Poor linkages between Public-Public, Private-Private and Public-Private
Finance	<ul style="list-style-type: none"> • Credit deficit • Release of funds – Procedural delays and lack of transparency
Policy and Governance	<ul style="list-style-type: none"> • Low political priority and support for extension • Inadequate operational flexibilities • Weak accountability towards user systems (farmers) • Weak Public Private Partnership • Absence of current day adjusted Extension Policy
Market Linkages	<ul style="list-style-type: none"> • Lack of Market and Profit Orientation • Lack of focus on Value addition
Infrastructure	<ul style="list-style-type: none"> • Poor Infrastructure – mobility, connectivity, ICT
Management	<ul style="list-style-type: none"> • Top down approach in programming and decision making • Lack of farmers' participation in Extension planning and implementation • Generic Extension • Lack of emphasis on Projectisation • Over involvement of Extension functionaries in Non-Extension works • Administrative procedural delays
Advisory System	<ul style="list-style-type: none"> • Production Oriented Extension • Incomplete Extension (not fulfilling the complete package of production system and the post-production chain of activities) • Service delivery skewed in favour of dominant power structure
Empowerment of Farmers	<ul style="list-style-type: none"> • Inadequate focus on Women in Agriculture

** DFI Committee, 2017*

It is estimated, that around 1.2 lakh number of extension functionaries are available under the umbrella of public extension in the country. With inclusion of vacant positions (approximately 30 per cent as on date), manpower available with ICAR organisations, Agricultural Universities and KVKs, public extension has the largest manpower base in service of farmers in the country. Other advantages of public extension are coverage of broad spectrum of agriculture (horticulture, field crops, animal husbandry, fisheries) and reaching every corner of the country. Of this however, around 15 per cent of the manpower available in extension operates at supervisory and administrative positions which are not available for field level extension. Hence, the present farmers to extension functionary ratio of 1156:1 stands to be further affected.

Some of the limitations are poor status of resources, infrastructure, mobility, linkages with research and marketing system, focus on production oriented technologies and neglect of post-

production services, provision of generic information, target orientation, repetition rather innovation, poor PPP and ICT applications and hence ineffective manpower.

One of the more severe limitations of the public extension system is its less than desired manpower strength and technical competencies of extension manpower & associated infrastructure, in sub-sectors other than agriculture (field crops), namely, horticulture, livestock & dairy, poultry, fishery, plantation and the like. These sub-sectors, in current context constitute the drivers of change. There is an absolute need to strengthen extension services in these sub-sectors and enable a more active role under ATMA. Simultaneously, the crop sector extension system also needs to be upgraded to meet the new strategy of growth based on the principles of 'fork to farm'.

2.7.3. Emergence of private extension

Private sector is growing at a high pace and covers important areas relating to inputs and services required for agriculture i.e. seeds, fertilizers, pesticides, machineries, credit, insurance, contract farming, export, advisory etc. Many private players like progressive farmers, farmers' organisations (CIGs, FPOs), including cooperatives are direct stakeholders under this system. Other private sector involvement is through agri-entrepreneurs, input dealers, agri-business companies, NGOs, private banks, private media including TV, radio, print media, internet, donor agencies, consultancy firms etc. Manpower estimation in private sector extension has not been conducted. This manpower is primarily dedicated to specific area/theme, market and its service operations are profit oriented. Hence, it serves those who can afford to pay and thus is circumscribed in coverage of area and farmers. This also makes the shared information specific to related products and hence the extension is more purposeful and result oriented, in respect of those it caters to.

Unfortunately, the linkage between private sector and public sector extension is weak for various reasons. It is important to support and coordinate private sector extension on a projectised mode for providing end-to-end solutions to farmers. PPP models can be evolved for implementation with supportive policy and provide funds for PPP initiatives. Additional manpower available from private sector can expand extension outreach to more farmers and regions. ATMA governing body should be able to identify areas of partnership between the two, as also delineate areas of operations for the two, such that the district geography and farmers are reached universally and their specific needs catered.

Normally, private extension is active in irrigated areas, where more intensive and commercial crops are raised; in dealing with big farmers; in plantation areas; and in promoting their own products in rest of the areas. In the process, the larger majority constituting the small and marginal farmers, especially in rainfed and remote areas are left unattended to by private sector. The public extension therefore has to continue to serve on priority the small and marginal farmers. They should remain their primary focus.

2.7.4. Private extension - 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 marginalised areas, enterprises and sections of society is not yet established”. The private extension sector in India faces many concerns and challenges:

- (i) Accountability towards Clientele
- (ii) After-Sale service and maintenance
- (iii) Over emphasis on profit and market share
- (iv) Exploitation tendency towards farmers
- (v) Quality concerns and regulation
- (vi) Limited coverage in terms of geography as well as beneficiaries
- (vii) Driven by incentives for investments in Agriculture and Allied Sectors
- (viii) Constraints in scalability and replicability of successful private extension initiatives
- (ix) Limited policy support or convergence with Government programmes
- (x) Limited access to technologies developed by Public Institutions
- (xi) Limited collaboration between other private extension programmes

A large number of scientists, extension functionaries and professionals from other organized sectors such as, Agri-business companies, NGOs, Media, ICT domains retire from services every year. There is scope to make use of this rich resource pool for the benefit of farmers.

2.7.5. Combining manpower and ICT

The use of Information and communication technology (ICT) is sweeping across all sectors. ICT is a tool useful to disseminate information and it includes print media such as newspapers and agriculture magazines; electronic media such as television and radio; information technology tools such as internet, emails, web portals, mobile based technologies, video-conferences, video films etc. Due to increased literacy rate, complete reach of TV and radio to every corner of the country, internet and mobile revolution and penetration to the villages, ICT has emerged as a cost effective platform for reaching the farmers in real time. Communication distortion, common in manpower based extension, is mitigated in ICT based extension. Against this background, some quarters profess that ICT can to a large extent, substitute the manpower in extension. In this context, it is important to understand some of the limitations and strengths of ICT in extension and adopt the same intelligently in an optimal manner.

In manpower based public extension, there is an institutional mechanism that exists and human interface has an important role in changing the attitudes and in confidence building of the receivers. In ICT applications, the emphasis is more on transfer of messages rather than adoption. Source and credibility of information and the intention of message are always in question. Overlapping of messages has always caused confusion. It has been scientifically proved that involvement of multiple number of senses results in better learning. In view of this,

ICT tools can be effectively used in 'Adoption' stages such as awareness, interest and desire. **Further, extension is preferably handled by human interface, especially where there is need to intervene in early adoption stages.**

Ideally, public extension should focus on providing extension advisory services to large majority of resource poor farmers, while private extension can afford to focus on small majority of resource rich farmers, and both should work together on supplementary, complementary and PPP mode. ICT can supplement the efforts of manpower based extension executed by both public and private extension and contribute significantly for delivering time and cost effective, credible extension services to farmers and more importantly in real time.

2.7.6. Convergence of extension services - public, private and ICT enabled models

Given the plurality of institutions and agencies numbering more than 2,000 functioning under various ministries of the central & state governments, private sector, NGO etc., contributing to agricultural extension activities in varying degrees, there is much value in promoting collaboration among all these sources. The Ministry's apex institution, namely, MANAGE with the mandate to promote capacity building in agricultural extension, can take the lead to serve as the nucleus of this network, and develop a platform for knowledge convergence and solutions for various challenges plaguing the agricultural extension & advisory service delivery system, drawing on the comparative strengths and experiences of individual institutions in India.

This Convergence Platform is expected to bring together different plans, executed at different levels by various agriculture and allied sectoral departments, such as Comprehensive District Agricultural Development Plan (CDAP - RKVY), Strategic Research and Extension Plan (SREP-ATMA), District Credit Plan (DCP), and District Irrigation Plan (DIP - PMKSY), District Profile of KVKs and Detailed Project Reports (DPR) of Watershed Programmes etc. In addition, Block Action Plans (BAPs) mandated under ATMA need to be activated for a bottom up approach to planning for the year's agriculture activities.

This arrangement can bring in sectoral convergence in a given micro-production system. It will also enable to identify capacity gaps within each sector and help design and standardise training strategies needed to enhancing farmers' income by reducing the cost of production, increasing production through productivity gains, remunerative price realization and value addition at various stages along the supply chain. In this context, following aspects are to be considered:

- i. Public extension can make space for partnership with multiple actors referred supra through supportive policy, partnership mechanisms, adequate funds and monitoring process.
- ii. Liberal access to technologies developed by Public Institutions be made freely available to all actors including private sector.
- iii. The Input Support Agencies, the companies, corporates, NGOs, Agri Clinics and Agri-business Centres (AC&ABCs) etc., can also play an important role in promoting and

operating public private partnerships in Extension in Agriculture and Allied areas.

- iv. Collaboration can be developed to promote participatory extension arrangements between the Public and Private Extension Service Providers. It is expected that large number of MoU based partnerships can come up at various levels to make the extension services respond to the local situations. However, such operations need policy directions (otherwise provisions do not get implemented as seen in ATMA).
- v. ATMA can be a good platform for working out operational flexibilities and resource sharing, keeping in view large number of government, private sector & NGO based extension players existing in the field.

There exists a vast network of public institutions that own a range of infrastructure extension services for the farmers. However, the existing infrastructure is not fully utilized by public extension system. In parallel, the private sector operating in the same service area do require similar infrastructure support and therefore can be given access to public system owned infrastructure. Some of the infrastructure facilities available with public institutions are:

- i. Advisory centres and facilities for testing, soil, fertilizers, pesticides, water & seed
- ii. Training centres
- iii. Demonstration farms
- iv. Nurseries for planting material
- v. Seed production and processing farms
- vi. Bio-control laboratories
- vii. Agro-processing units
- viii. Godowns / warehouses
- ix. Cold-chain pack-houses, reefer vehicles and cold storages
- x. Veterinary hospitals
- xi. Artificial insemination centres
- xii. Custom hiring units
- xiii. Feed mixing units
- xiv. Bio-fertilizer / Bio-pesticides production units
- xv. Agriculture Information Kiosks (FIAC etc.)
- xvi. Printing press

In addition to the above, the public extension system has over decades built a cafeteria of facilities. The available infrastructure can be used to better serve the farming commodity, if it is allowed to be used jointly by both public and private extension systems, including NGOs.

2.8. Public Private Partnership (PPP) in Extension Services Delivery

Krishi Vigyan Kendra (KVK) has facilities and hires Subject Matter Specialists (SMS) to actively implement mandated activities i.e. technology assessment, refinement and frontline extension. Besides, each KVK is in possession of about 50 acres of land. This provides ample opportunity for Agri-business activities on a Public Private Partnership (PPP) mode, supported

by KVK by providing space and technical support, whereas production, processing and marketing are done by Agri-preneurs.

A sharing arrangement between KVK and Agri-preneurs, can be agreed upon. This system will ensure income generating activity in the vicinity of KVK which is a demonstration in itself, augmenting financial resources for KVK, and most importantly, providing additional extension service to farmers for enhancing their income. Activities such as custom hiring, milk chilling unit, nursery, bio-fertilizer, bio-pesticide, honey processing, fish fingerlings production, processing etc., can be taken up in PPP mode. This may be initiated on pilot basis in selected 50 KVKs representing all States including A&N Islands and ATARI Zones and scaled up thereafter to cover all the KVKs.

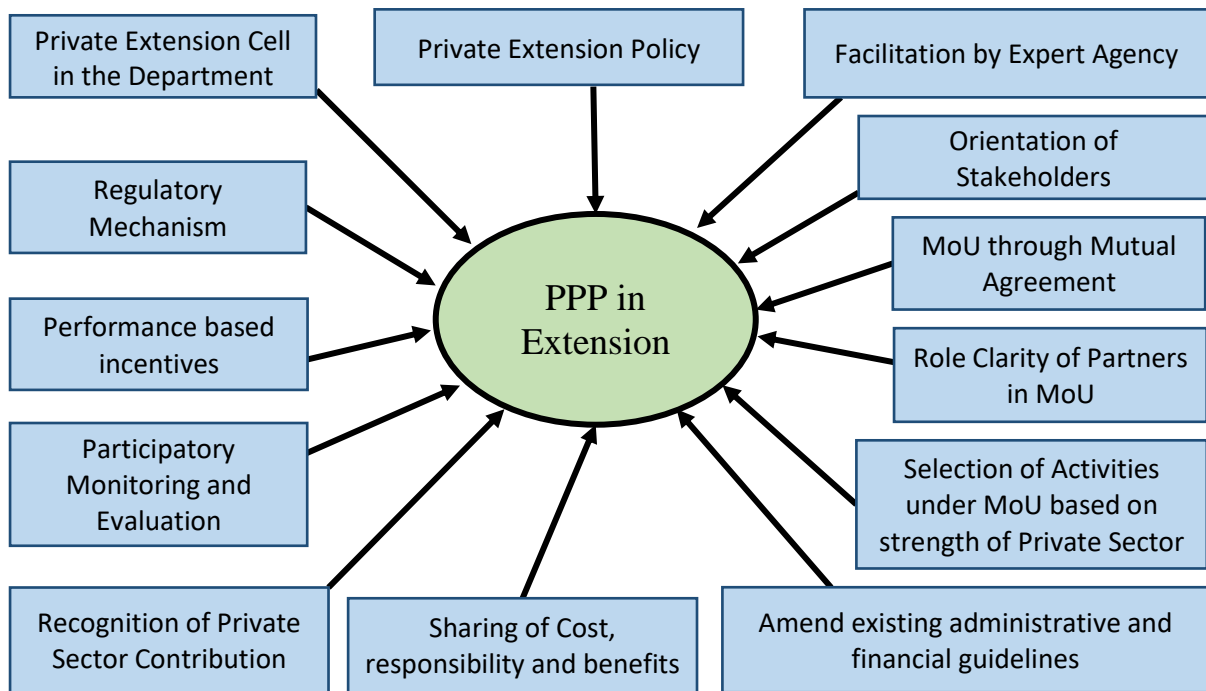
In fact, the amendments effected to the RKVY Guidelines will be financing agri-entrepreneurship and establishment of incubation centres at various research institutions including KVKs. This provision can be made use of in promoting enterprise activities by the KVKs and Agricultural Technology Management Agency (ATMA).

The guiding principle of ATMA provides opportunities for promotion of Public Private Partnership in agricultural extension delivery mechanism. A minimum 10 per cent of the funds of ATMA are already earmarked for public private-partnership (PPP) initiatives. However, in the field, this provision has not been utilised well. There is scope to make this possible, as conceptually it bears merit. Some of the important reasons for poor performance of PPP in the field are:

- (a) Absence of credible inventory of private extension service providers in the district
- (b) Non-operationalisation of GoI guidelines for implementation of PPP models
- (c) Absence of decision making powers at district level on PPP projects
- (d) Generic inhibition (mental block) in public system for initiating PPP
- (e) Non-availability of rigorous monitoring mechanism in place to ensure PPP activities (if any) at district level.

To impart the needed clarity to operationalization of PPP projects, successful models and best practices may be catalogued and popularized. Decentralization of PPP decisions to District level and a progressive National Level Ranking Frame Work (NLRFW) for Extension Service Providers (Public and Private) also need to be put in place. The MANAGE and ICAR Extension Division may work together and publish such NLRFW, through wider consultation.

Figure 2.2 Proposed model for upscaling PPP in Agricultural Extension Management



Source: Chandrashekara P., 2011. PPP in Agricultural Extension Management – A case study of Hoshangabad Model)

MANAGE, in partnership with Agriculture Department of Madhya Pradesh and Dhanuka (a private agro-chemicals company) implemented a pilot project on “PPP in Agricultural Extension Management” at Hoshangabad District in Madhya Pradesh. The two of them worked together for benefit of farmers on PPP mode in implementation of extension programmes. Based on the learnings, a PPP model proposed for upscaling PPP is depicted in Figure 2.2.

2.9. Annotation

Agriculture Extension can result in a domino effect, by bridging the lab and the land in a two way communication mode; as also connecting farmer to farmer, besides lab to lab more effectively. Further the lab and land need to be connected in a bi-directional mode to mutual benefit.

The public extension system acquitted itself well during the earlier growth phase of subsistence agriculture and helped guide the country into a position where larger marketable surplus is now produced. It is however, found wanting in the changed circumstances of today. In the contemporary socio-economic and technological context, a revisit of the role of the agricultural extension system is required, where farmers prefer empowerment, that allows them to choose options for efficient monetisation of their produce and effective risks management.

The majority of the farmers are small & marginal, who are yet to realise their full potential, and therefore need to be a priority of the public extension system. Such small farmers are typically bypassed by the extension system, by both public and private sector extension. To that extent, the public extension system needs to focus on meeting the needs of the majority.

The profit-centric private extension system, can be provided greater space to render services that address the needs of large farmers.

Greater synergy and partnership between the public and private extension efforts can meet the extension needs of all farmers. Differentiation at production stage (where public system possesses better strength) and post-production stage (private system can play a more active role) can be assessed and developed at State level. A value system based platform at the district level, led by the private sector, can be promoted in partnership with the government led ATMA platform, thereby addressing the end to end needs of the sector.

A shortcoming of the current agricultural extension system is its less than needed focus on horticulture, dairy, livestock, fishery and poultry sub-sectors. These, having been recognised as the engines of agricultural growth, warrant greater attention from the extension service systems, so as to meet the objective of doubling farmers' income.

Extension needs to fully leverage ICT enabling technologies by effectively blending them with manpower based extension. This will optimise cost of public extension, while simultaneously making extension more robust. A case study on Doubling Farmers' Income through effective agricultural extension under DATES Project, of the University of Agricultural Sciences, Raichur in Karnataka indicates the significant positive impact of manpower and ICT blended extension on the income of the farmers. A common platform for technologies and knowledge inputs, categorised by the needs specific to ecology of the region and crops, including market linkage will help to converge efforts of all extension services, public and private.

Key Extracts

- To achieve inclusive economic growth, there is a need for renewed emphasis on promoting new generation farmer collectives such as, Commodity Interest Groups (CIGs), Village Produce Organizations (VPOs), Farmers Producers Organizations (FPOs) and Farmer Producer Companies (FPOs).
- The changed production and market context has thrown up new challenges to the extension system. Farmers need business enabling information, which is not traditionally addressed by the extension system. In this context, capacity building for new competencies is critical.
- The DFI Committee recommends that all the identified sources of income growth be integrated into the extension policy framework and delivery mechanism of the extension system. The role of extension, be broadened across the agricultural value system.
- Agricultural Universities may focus on building the capacity of extension functionaries of the State Agriculture and Line departments, rather than engaging themselves directly in extension activities. Their involvement may be confined to a limited geography more in the nature of testing new approaches and demonstrating their utility.
- Public and private extension systems require to converge; and MANAGE can serve as nucleus platform for State, Central and Private sector programs in Extension.
- KVKs may open up their land and building infrastructure, as also other facilities available for PPP activities with Agri-preneurs. ATMA may aggressively and proactively promote PPP for which KVK and ATMA may be given functional freedom.

Chapter 3

Extension System – Roles, Responsibilities & Model

Impact of extension gets diluted and the outcomes remain limited if the extension system does not gear up to dovetail the works undertaken by a panoply of actors - public, private and NGOs. Convergence in knowledge shared, the target region or individual recipients, and the larger value system is needed to realise synergistic impact on the outcome.

Inputs received by the DFI Committee indicate that at each level - national, state and district, a large number of research and extension institutions working in parallel, tend to target the same set of individual farmers. In doing so, the spread of extension remains limited, with multiple resources duplicating one another's efforts, besides professing variant technologies, resulting in a discordant atmosphere and questionable output. There is need for strong linkages between and among extension sub-systems, and convergence required among the various actors. In this direction, there is need to redefine the management and administrative aspects to promote an inter-linked mechanism in agricultural extension.

3.1. Centralised Management of Decentralised Activities

3.1.1. Research System linkage with MANAGE at national level

With large presence of ICAR centres/institutes numbering a high of 113 spread across the country, a wide range of technologies is generated across the multiple sub-sectors of agriculture. It is observed that the ICAR extension units of these Institutes/Centres are by and large confined to a limited geography in their close proximity. While they cannot be expected to own responsibility for all the agri-production regions, diffusion of technology amongst wider farming audience has to be ensured. Ideally, new information and knowledge relevant to a crop or sector, once standardised, should preferably be introduced into the mainstream extension system without delay. It is recommended standardised extension approaches and technologies reach an integrated platform at the national level, from where the same can be disseminated to EEIs and SAMETIs for further diffusion into mainstream extension i.e. state agriculture and line departments. An appropriate platform for this purpose be developed. The same procedure may be adopted in case of commodity boards, namely, Coffee Board, Tea Board, Spices Board, Tobacco Board, Silk Board, Coconut Development Board, etc. and other Central Government Research Institutions.

Converging all standardised practices and technologies on a common extension platform can happen through national level repository of knowledge, proposed as an 'e-National Bank for Agricultural Technologies (e-NBAT)'. Simultaneously, the technologies generated by private sector research organisations and international organisations may also be deposited at "e-NBAT". This repository can be managed by a national institute like National Institute of Agricultural Extension Management (MANAGE).

3.1.2. Empowered Directorate of Extension (DOE)

The fast changing role & responsibilities of and expectations from agricultural extension

warrant redefining the role of Directorate of Extension (DoE), which is currently a subordinate office of Department of Agriculture, Cooperation and Farmers' Welfare (DAC&FW). It provides technical backstopping to the Extension Division for execution of various extension initiatives. The organisation with its current status does not enjoy the needed autonomy to look beyond the implementation of various extension initiatives.

The changing role of extension from implementation to facilitation, requires conceiving of new ideas that focus on empowering farmers to approach their core activities from a business perspective. This calls for designing and pilot testing of new strategies and models for effective outreach of key initiatives of the department. The DoE can function as a promoter and propagator of innovations in agricultural extension programs executed by both central & state governments, as also private sector & NGOs. It can also undertake concurrent monitoring and evaluation of these programmes. This is possible if DoE is offered greater autonomy and concurrent flexibility in deciding and implementing its activities.

The DFI Committee recommends, that an Expert Committee/Core Group be set up to immediately consider and redefine the role of DoE and its strengthening needed to meet the new challenges in agricultural extension. Basically, DoE would be required to provide appropriate feedback to the Ministry for policy formulation, monitor the related programme implementation and serve as a link between the Ministry and Extension systems in the country.

Both DoE & MANAGE will need to work in tandem to help enhance the delivery capacity of the agricultural extension system across the country.

3.1.3. Right technologies for Right people in Right time

MANAGE is mandated to assist state and central governments in strengthening of agricultural extension management. It is to carry out training, research, extension, consultancy, documentation and dissemination of knowledge in the field of agriculture extension management and policy advocacy. It is also responsible for building international bridges and promote two way exchange of extension related knowledge.

The basic responsibility of MANAGE is to assist Government of India in formulating sound extension policies. The assistance is provided based on brainstorming, workshops, research studies, surveys etc. Similar services are also provided to state governments as agriculture is a State subject. It also services private sector organisations as per demand.

The Institute also enables proper implementation of programmes by the extension agencies under public (both central & state) and private systems. This support is offered by way of undertaking studies and offering feedback, that serves to make necessary corrections.

Thirdly, it organises national level capacity building programmes for senior officers who are directly involved in policy making and programme administration.

In addition to the above, MANAGE can now be entrusted to own and manage the proposed

single window technology and knowledge platform, namely, e-National Bank for Agricultural Technologies (e-NBAT).

MANAGE can function as a “concept nursery” in agricultural extension management, based on national and international learnings for the benefit of Indian farmers. The Institute should apportion a minimum of 50 per cent of time share for policy advocacy and mentoring the implementation of programmes. MANAGE faculty development programmes may be given priority. With a view to optimising the output of MANAGE, the time share of multiple activities proposed is:

- i. Policy advocacy and mentoring of programme implementation – 50 per cent;
- ii. eNBAT related activities – 25 per cent;
- iii. Remaining activities – 25 per cent.

3.1.4. Linkage amongst MANAGE, EEI and SAMETI

It is important to bring in organic linkage among national level apex body, namely, MANAGE, Regional level EEIs and State level SAMETIs to streamline agricultural extension management. Suggestions made in this regard are as follows:

- i. The Director General, MANAGE may be brought in as Co-chair in the Governing Board / Executive Committees of EEIs and SAMETIs.
- ii. MANAGE to evolve an institutional mechanism for mentoring activities of EEIs and SAMETIs, especially in identification of training priorities, preparation of training modules, aligning its training calendar and ToT (Training of Trainers) component with capacity building needs of EEIs / SAMETI faculty, training evaluation etc., thereby reorienting the reforms process in the States towards enhancing the farm incomes.
- iii. All financial proposals of EEIs and SAMETIs to DAC&FW may receive inputs from MANAGE.

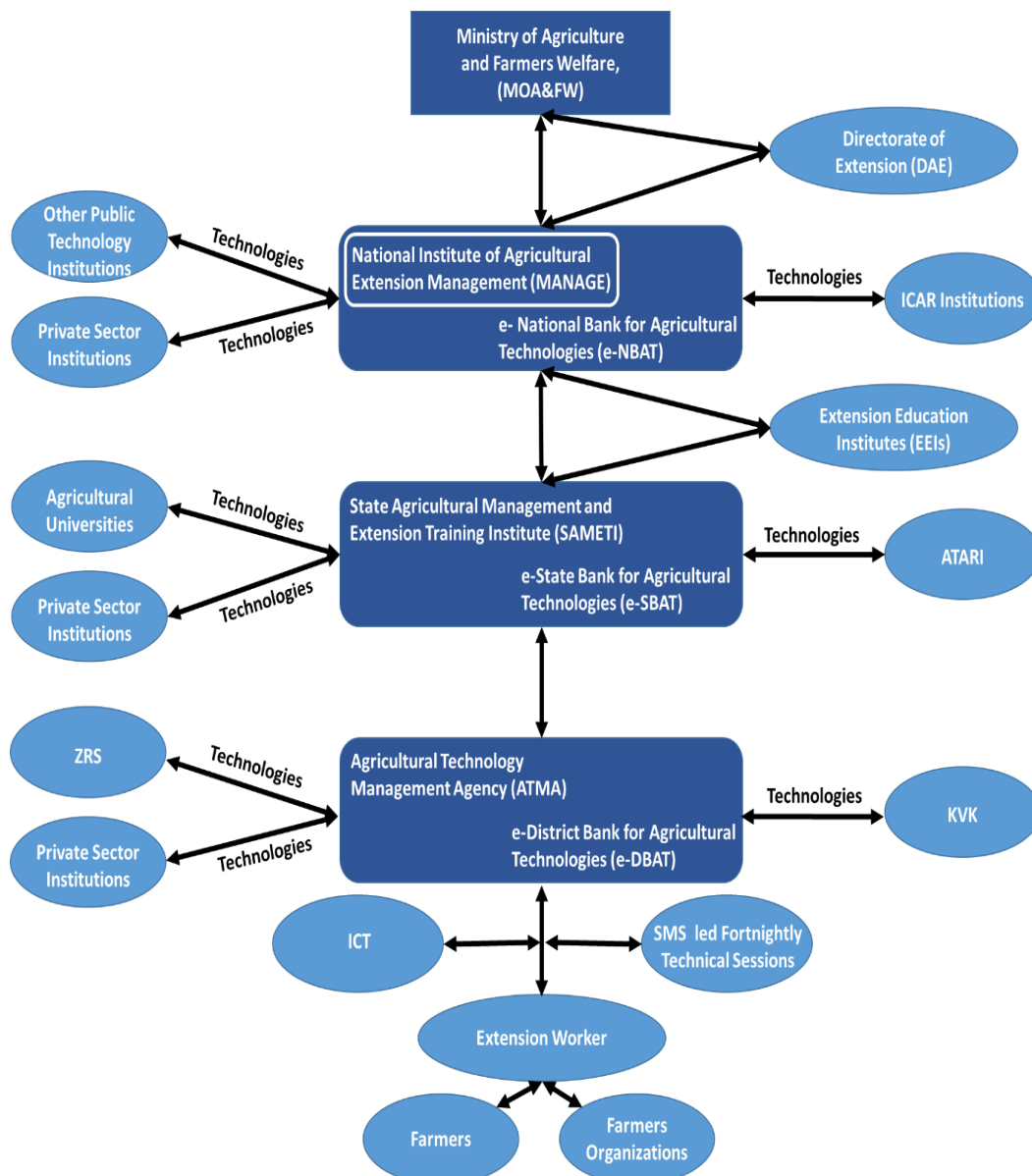
3.1.5. Repositioning the EEIs

Given the need for adopting market led extension, it is time that the Extension Education Institutes (EEIs) move beyond their traditional role of capacity building of extension functionaries in their respective regions. Since, the SAMETIs are increasingly expected to function as extension arms of MANAGE in the States, the EEIs cannot afford to continue with their ‘me too’ role. In order to differentiate themselves as institutions that can add greater value to the extension services within their jurisdiction, niche set of competencies not currently available in the national extension system should become their new mandate. This would transform the EEIs into Centres of Excellence, each specializing in areas relevant to their locational priorities and agro-climatic conditions.

In order that the four EEIs that now exist develop new competencies, they may be taken through a visioning exercise. This should help them identify location – appropriate extension priorities, with reference to field crops; horticulture & plantation; livestock & dairy; fishery, piggery &

poultry etc. Enhancement of farmers' income has to describe the new sharpness of their extension competence. The emerging structure would comprise MANAGE as a national level knowledge resource for extension; the SAMETIs as delivery channels of both traditional and market driven knowledge products; and the EEs serving as the 'eyes and ears' of MANAGE in pushing the frontiers of new extension knowledge for promoting high value production systems. The EEs would effectively serve as a higher order knowledge loop to pilot innovative and bold knowledge experiments. In this role, EEs shall don two responsibilities on behalf of MANAGE, namely, feedback and feed forward agents.

Figure 3.1 Extension model for Doubling Farmers Income



3.1.6. Research System linkage with SAMETI at state level

The State Agriculture Universities (SAUs) are tasked with a triple agenda comprising academics, research and extension. Their extension outreach programme is defined by validation and popularisation of technologies and farm management practices developed by

them within their service areas. Obviously, they are not expected to connect with every farmer, in their service area, which is primarily the mandate of the state extension machinery. However, SAUs can provide technical backstopping and capacity building support to mainstream extension.

As was the practice under Training and Visit (T&V) system of extension during the period of 1970s-1990s, the SAUs should be tasked to undertake fixed interval orientation and training programmes for the senior officers of all the departments of agriculture & allied sectors, ATMA, Subject Matter Specialists, as also of those in the private and NGO sectors, in alignment with the requirements of the following production & marketing seasons. This pool of senior management with new knowledge can then train the Extension Officers of their respective organisations. This will trigger the earlier system of “Training of Trainers (ToTs)”. Also SAUs can interact with the proposed District Agri-Value System Platform (DFI Volume IV) at regular intervals. They would thus come to play an important role from one end of the agricultural value chain platform.

It is neither desirable nor feasible for the SAU Extension Directorate to participate in direct extension beyond a certain geography. Being increasingly burdened with such tasks and implementation responsibilities of some government schemes, their attention vis-a-vis their principle mandate consisting of academics and research is getting diluted. The field interface of SAUs can at best be to organise frontline demonstrations (FLDs) so as to validate new technologies and organising ‘Krishi Melas’ at different levels.

However, for SAUs to become more effective and field relevant, as source of new knowledge and technologies, they should go beyond their limited basket of recommendations and source relevant technologies and practices from other SAUs, CAUs, ICAR institutions, private sector etc. from within and outside the state. The technologies pooled from outside may be tested for adaptation under the agro-climatic conditions within their service area, and then disseminated into the mainstream state extension system.

To enable the SAUs to fulfil this mandate, it is advisable to establish **“e-State Bank for Agricultural Technologies” (e-SBAT) at the SAMETIS, on the lines of e-NBAT.**

3.1.7. State nodal cell (SNC) and its role

The State Nodal Cell (SNC), facilitated by State Nodal Officer, State Coordinator, State Gender Coordinator and supporting staff, should ensure timely receipt of District Agriculture Action Plans (DAAPs) and formulation of State Extension Work Plan (SEWP) with duly incorporated farmers’ feedback obtained through State Farmer Advisory (SFA) Committee and further ensure its approval by the State Level Screening Committee (SLSC). The SNC should also focus appropriately on monitoring the implementation of the approved SEWPs by the SAMETI (at state level) and ATMA (at the district level).

The SNC has to ensure (i) timely release of funds to SAMETI and ATMAs; (ii) coordination

& convergence of activities among SAMETI, ATMAs, extension arms of all the state departments, Extension Directorate of SAUs, NGOs and private sector extension agencies in preparing SEWPs; and (iii) implementation as per plan through ATMA and Block Action Teams (BATs).

3.1.8. State Agriculture Management & Extension Training Institute (SAMETI)

SAMETIs have well defined role of building capacities of the State Extension Functionaries. SAMETIs are part of the state level institutional mechanism of the ATMA component of Sub-Mission on Agricultural Extension (SAME).

The Key functions and expectations from SAMETI are as follows:

- i. **Provide** capacity building support in Extension Management related areas to the extension functionaries from public, private and non-governmental sectors.
- ii. **Provide** consultancy services relating to project planning, appraisal, implementation, monitoring & evaluation, etc.
- iii. **Develop and Promote** application of management tools for improving the effectiveness of agricultural extension services.
- iv. **Organise** need based training programmes for middle level extension functionaries.
- v. **Develop** modules on Management, Communication, Participatory Methodologies etc., as a sequel to the feedback from training programmes.
- vi. **Organise** Annual Workshop involving all the agricultural related training Institutes in the State to achieve complementarity in training and capacity building for functionaries of agriculture and allied departments.
- vii. **Coordinate** with MANAGE in organizing the DAESI (Diploma in Agricultural Extension Services for Input Dealers) programme.

Towards meeting the aforementioned set of expectations, SAMETIs are to draw-up and execute an Annual Training Calendar for capacity building of the state extension functionaries. Besides the need for harmonising the training content & schedule for optimal utilisation of manpower & infrastructure, SAMETIs will have to prioritise training and extension needs as reflected in Centre/State and District Plans and Programmes.

SAMETIs may also have to broaden their focus from capacity building to extension management issues like:

- i. Linking farmers to market
- ii. Group led Extension
- iii. ICT in extension
- iv. PPP in Extension
- v. Gender mainstreaming

- vi. Good Practices in ATMA management
- vii. Linking up with ATARIs for stronger ATMA-KVK linkages
- viii. Participate and guide ATMAs in implementing Extension reforms
- ix. Establish institutional and knowledge linkages amongst MANAGE, EEIs and respective State SAUs

In order to ensure regular training and skill upgradation of State and District / Block level extension functionaries, and reach out to the grass root level extension functionaries and farmers through field visits, varying manpower strength is provided to the SAMETIs, linked to number of Community Development Blocks in the states.

- States with less than 100 C. D. Blocks: A staff strength of 7 including 1 Director and 4 Subject Matter Specialists – 11 states in this category as on date.
- States with 101 to 400 C. D. Blocks: A staff strength of 11 including 1 Director and 8 Subject Matter Specialists – 19 states under this category as on date.
- States with > 400 C. D. Blocks: A staff strength of 15 including 1 Director and 12 Subject Matter Specialists – 2 states in this category as on date.

These ratios may need to be re-examined since in some large states, the number of Blocks created are less when evaluated against their geography and extent of cultivated area. In these state the Taluks/Tehsils and C. D. Blocks are co-terminus, while in other states, each Taluk/Tehsil is divided into more than one (1) Block.

There is a strong need for developing standard selection procedures with uniform service conditions for recruitment of faculty members for SAMETI. This will ensure manpower competence and quality. MANAGE can be tasked to develop a manual for selection and lay down service conditions. SAMETIs should be enabled to draw good faculty from a common resource pool developed and certified by MANAGE, including experts from different agricultural science disciplines with proven contribution in extension management. Such an inventory of certified faculty resources may be updated and maintained by MANAGE at the national level and shared with the States.

SAMETIs can access the proposed eNBAT platform and strengthen their state-specific eSBAT platform, and further segregate the technologies & practices relevant to districts and blocks within their jurisdiction. This delineation of location - specific technologies & practices is important to enable extension functionaries and farmers to access the same with ease and avoid confusion. SAMETIs should support the districts to build eDBAT (e-District Bank for Agricultural Technologies as a Tier-3 platform.

3.1.9. ATMA to mantle the extension delivery at district level

ATMA receives e-District Bank for Agricultural Technologies (e-DBAT) from SAMETIs. It is further strengthened by pooling technologies received from private sector research

organisations at District level and technologies identified by SREP. e-DBAT provides inventory of all the relevant technologies required for the district after being customized as location-specific technologies in consultation with KVKs.

3.1.10. Strengthening of ATMA

The Funds earmarked for extension programmes by central and state governments may be released in time directly through Direct Benefits Transfer (DBT) portal to the implementing agency, namely, ATMA. It may have to be ensured that the funds are released well before the cropping seasons duly matching with Annual Action Plan prepared by ATMA and consistent with the Farmer-Charter. It is also suggested that:

- i. Funds earmarked for training, extension, HRD/capacity building activities under all agriculture & allied sector schemes of both central and state governments, be placed at the disposal of ATMA, to enable them to take up these activities with the pooled resources strictly as per the Block Action Plan (BAP) and in gap-filling mode;
- ii. The above be ensured by the State agriculture and allied sector departments, and operationalised and monitored under the guidance of ATMA Governing Body (GB);
- iii. At least 10 per cent of the ATMA Fund, augmented through the suggested resource pooling, may be necessarily operated through PPP mode as per GOI Guideline. This should essentially be in a cost sharing basis to promote private sector investment, rather than through outsourcing or by paying service charge to the service provider.
- iv. Efforts may be made to mobilise/tap CSR funds.

The Chairman, ATMA Governing Body (GB), may ensure initiation and operationalisation of at least five Corporate Social Responsibility (CSR) projects in a year in his district. To accomplish implementation of at least 10 per cent of Extension activities in PPP mode, it is also suggested that the selection of PPP partner should be delegated to ATMA GB coupled with requisite flexibility and powers to signing of Memorandum of Understanding (MoU) at district level.

The proposed arrangement is expected to invite private sector investments into agriculture, in a need based manner, thereby reducing the operational delays in signing of MoU at state level, as is the present practice. The poor performance of promoting PPP modes has been attributed among other reasons to fear of legal accountability. The GB and its Chairman need to be given protection and security against such fears by notifying clear guidelines, containing do's and don'ts, as also a model template for different activities.

A robust ICT enabled Monitoring, Evaluation and Learning (MEAL) mechanism may have to be established at all levels i.e. Centre, State and District. The MEAL system be adequately supported with participatory tools of social assessments involving all stakeholders – Farmers Advisory Committees, Civil Society Groups, representatives of Line departments and Peer institutions with adequate manpower, infrastructure and funds.

Project Director and Dy. Project Director at the district level; and Block Technology Manager and Assistant Technology Manager at the Block level constitute the lead team under ATMA. It is advised that the sanctioned posts of one PD and two DPDs; and one BTM and three ATMs be recruited on a regular basis, with due emphasis on technical experience and professional competency. Proper guidelines incorporating service tenure, emoluments, travel and contingency support may be issued centrally (refer to Manpower for ATMA, chapter 4, section 4.3).

Agriculture development programmes and related ones of other departments like Rural Development, Panchayat Raj, Social Welfare, Tribal Development, Water Resources, Food Processing, Fertilizers etc., generally **operate in vertical silos**, with very little or no horizontal convergence, especially at the block level and below. Hence, **field level convergence is one of the major challenges existing today across the departments**. The major task, therefore, will be to reorient the District and the Block functionaries for the task and provide them opportunities for experience sharing across the departmental boundaries, so as to obtain required coherence. The data base integration of different departments through cross-database intelligence and providing 'view only' access to all field functionaries and the citizens at large will bring in the much needed understanding and coordination & convergence.

Effective enforcement of guidelines for coordination and convergence of extension work with research, line departments, private sector, NGOs at state and district levels be ensured, duly reflecting the role and relationship with District and State Administrations. **Formulation of convergence matrix may be made mandatory while seeking approvals for all work plans at Block, District and State levels.**

Proper orientation and appreciation of ATMA concept and strategy, especially regarding its structural and functional aspects are very essential. The module for this may be designed by MANAGE and delivered through SAMETIs for District and Block level functionaries of Agriculture and Allied Departments. Special emphasis may be laid on involvement of extension functionaries of allied departments during orientation, considering the high growth potential they hold. In fact, it is time to stop calling certain domains including Animal Husbandry, Fisheries and Aquaculture as allied, and recognise their independent status at par with Agriculture comprising field crops and horticulture. Each of these deserve the recognition of an independent sub-sector within the generic and larger sector called 'Agriculture'.

The scope of SREP may be extended to include emerging opportunities like market linkages based on value-chain & supply chain approach, skill development, agri-Start-ups and income generating livelihood options (off-farm and non-farm). These latter set of activities combined with secondary agriculture will expand the farming-space for gainful employment and additional incomes.

There is need to revisit the contents and methodology for development of Block Action Plan

(BAP) which shall invariably indicate role space for both public and private sector extension service providers, including technical inputs from KVKs and financial support from all sources. Accordingly, the Block level, Cluster level and Village level extension operations will need to be streamlined to meet emerging challenges in farming system within the respective community development blocks.

Delivery of service: Accountability of Extension Service Providers (ESPs) including ATMA may have to be defined clearly, with inclusion of parameters like regular programmatic visits, systematic training programmes, linkages with research and markets, enhanced adoption, coverage of improved technologies, empowerment of farmers, income gains, ICT use, PPPs promoted etc. An appropriate Mobile App could be developed and made available for this purpose.

It is a globally accepted principle of management, that if outcomes can be measured, then improvement is more certain. Hence, key performance indicators (KPIs) need to be developed based on quantifiable parameters, which if achieved should have accelerated the pace of desired change. Agricultural Extension should be concerned not only with the transfer of technology and behavioural change among farmers for higher adoption, but also own responsibility for developing management tools, that will help the ESPs to examine & measure the extent of adoption and interpret the change occurrences at the target end.

A convergence matrix may be designed, tested and adopted for implementation covering all the schemes of all agriculture related departments to ensure convergence and implementation on “gap filling” mode.

ATMA should promote both Public and Private Extension Service Providers (ESPs) to facilitate coverage of extension operations in the entire district, in view of manpower and resource constraints. These ESPs may include Agri-preneurs, Agri-Start-ups, Farmers Knowledge Groups, Farmer Producers Organisations, Agri-business Companies, Farmer Organisations, Media Channels, Exporters, CSR Foundations, NGOs, Achiever Farmers and SHGs. A systematic data base, Competency Development Plan and their location specific involvement may be worked out as per demands of Block Action Plan. Perhaps, similar recommendation is applicable for KVKs also. ATMA will benefit from maintaining a directory of private ESPs including agri-preneurs in the district to be able to draw up a comprehensive District Extension Service Plan (DESP). It is possible this way to optimise the productivity of manpower, efficiency of resources and effectiveness of plan implementation.

ATMA has to play a key role in agri-entrepreneurship development in agriculture and allied sectors. ATMA may give wide publicity to Agri-Clinic and Agri-Business Centre (AC&ABC) programme in the district, enlisting of potential agri-preneurs for the training program, assisting agri-preneurs in preparation of Detailed Project Report (DPR) based on existing production systems, mentoring trained agri-preneurs in post-training period for obtaining of loan and integrating their services for supplementing its own extension activities, linking with

incubation centres (ZTM & Business Development Units). Due representation may be provided for agri-preneurs in various fora of ATMA.

A Farmer Friend (FF) bears the potential of serving as a critical extension link at the cutting edge of delivery chain. Both, the Centre and States may ensure adequate funds for positioning and capacity building of farmer friends. As there are about 3 lakh number of Farmer Friends, and the suggestion of DFI Committee is to increase it to 6.50 lakhs FFs (1 for every Village), it is proposed that this valuable human resource may be attached with the existing Common Service Centres (CSC) under the Digital India Programme for information access through Internet, so as to facilitate forming of **Farmer Knowledge Groups (FKGs)** in all the villages of the country.

Training and HRD components of extension services may be given adequate emphasis by bringing in synergies in the programmes and activities of national, regional, state and district level institutions, both public and private, based on comparative advantage to avoid duplication of efforts and to ensure judicious use of manpower and material resources. This entails an urgent need for revisiting the whole Training and HRD framework, and resolution of the emerging challenges in agriculture and allied sectors in the context of doubling farmers' income.

A comprehensive portal on farmers training programmes being conducted by various agencies in the country be developed and operationalized at national level with an option provided to all Training Institutes (as envisaged under the Agricultural Mission Mode Project (AMMP) of NEGP – Service-8), to upload data & information.

It would help to continuously update the knowledge of functionaries and leadership (approximately 5 x 2.25 lakh = 11.25 lakh members) of Panchayati Raj Institutions (PRIs) about ongoing agricultural extension programmes and schemes and seek their involvement /support, through ICT enabled media. This task may be undertaken by ATMA. This involvement will not only promote a more healthy & organic connect with the farmers, but also will amount to respecting the provisions of 73rd Constitutional Amendments, under which agriculture and allied activities have been listed. Active involvement of peoples' representatives at the district level and downwards will improve the quality of the District and Block Plans, as also their implementation. The official class will then become more accountable to the farmers.

There exists both need & scope to establish one AC&ABC in every revenue village (6.50 lakhs villages), that can provide need based multiple services at the door-step of the farmers throughout the year. Each AC&ABC can offer need based agri- services through a particular agri-venture to cater to the cluster of villages. Each agri-venture can provide direct employment to at-least 7 persons (1-agri professional and 6 support personnel) on an average including the agri-preneur himself. This will translate into generating 45 lakh rural jobs in the first 5 years of establishment, and can be expected to grow further along with business expansion of agri-

ventures.

Each of the ATMAs may target to establish at least 10 AC&ABC in a district per year at the rate of 1 (one) per Block as an annual activity. ATMAs may ensure the quality of services provided to farmers by AC&ABC, by undertaking constant monitoring. (Chandra Shekara, 2007).

ATMA should be the platform for convergence and service delivery of all schemes and programmes of agricultural development at the district level and below. ATMA governing structure be enlarged to provide representation to various organisations and stakeholders involved in CDAP, including those from National Resources Management (NRM), Water Resources, Power, MGNREGA, Rural Livelihood Mission, Tourism etc. All committees implementing Ministry of Agriculture schemes may be subsumed in ATMA Governing Board and Management Committee. Further a mechanism may be designed for redressal of grievances of farmers linked to farmers' charter.

3.1.11. KVKs to provide technical backstopping to ATMAs

Krishi Vigyan Kendras (KVKs) play a very important role as frontline extension system and are mandated mainly for technology assessment and demonstration for its application and capacity development under different farming situations across the country.

There are by now about 700 KVKs operational in the country. The major activities of KVKs include conducting of on-farm trials (OFTs) to identify location-specific technologies in various farming systems; frontline demonstrations (FLDs) for exhibiting the production potential of the technologies in crops/animal husbandry and other agricultural enterprises, and skill-oriented training for farmers, farm women, rural youth and extension personnel. To demonstrate the potential of technologies, KVKs provide technological inputs, information and knowledge, and also serve as a knowledge and resource centre at the district level in the country.

The KVKs are now required to reorient their focus on acclimatisation of technologies to the local situations, rather than mainstream extension work, and on priority to provide technical backstopping support to public and private extension functionaries of the district.

Convergence between agricultural research and extension, as agreed to between the Department of Agriculture Cooperation & Farmers' Welfare (DAC&FW) and the Department of Agricultural Research and Education (DARE) (June, 2015 Convergence circular) must be ensured in letter and spirit. It is important, that the Commissioner/Director (Agri.) of State Governments, Directors of ATARIs of ICAR, and Directors (Extn.) of SAUs lead and ensure strong operational linkages between ATMAs and KVKs at district level and below.

It is essential to delineate specific roles for all stakeholders including those in public and private sectors in agricultural development strategy, and by keeping the needs of the farmers as the basis in formulation of BAPs. These BAPs be organically integrated to evolve District

Agriculture Action Plans (DAAPs) for implementation at district level jointly by ATMA and KVK. All coordination related issues in implementation of DAAPs be resolved by a Two-Member Coordination Committee at State level on bi-monthly basis, comprising Director (ATARI) representing Research system and Commissioner/Director (Agriculture) representing Extension system (comprising allied departments and private sector also).

ATMA-KVK linkage be strengthened further by creating functional inter-dependence or by fostering organisational linkages. This can be operationalized by way of:

- (i) Supplementing and complementing each other's mandated tasks viz., assessment and refinement of technologies of KVK system and its upscaling by ATMA system.
- (ii) Adequate representation at appropriate level in governance of both the institutions.
- (iii) Active participation in developing and operationalizing each other's Annual Action Plans.
- (iv) Joint identification of clientele and programme sites for each other's programs.
- (v) Providing services of KVK Scientists as mentors to the Block level formations of ATMA i.e. BTTs, BFACs, Farm Schools, BAAPs, CIGs/FIGs etc.
- (vi) Capturing entire HRD and training requirements of ATMA (in respect of Farmer Friends, VEWs, ATMs, BTMs, PDs, DPDs and Field functionaries of Agriculture and Allied Departments and Operational functionaries of Private sector/NGO sector) by the KVK system (to be funded by ATMA). Further, ATMA may formulate Block-wise HRD Plans well in time, preferably at the beginning of the year along with allocation of funds for the same and may share it with KVKs.
- (vii) Joint actions in grounding Field Programmes and making them farmer-participatory. Technical backstopping for all activities may be provided by KVK, while farmer's participation may be ensured by ATMA.

The Commissioners/Directors of Agriculture and Allied Departments of the State and the senior representatives of the Private sector may be brought on the Management and Research Advisory Committees of ATARIs, to address demand-driven agenda for KVKs and ATMA.

It would further help in institutionalisation, if a Convergence Matrix (CM) is prepared which will list out scheme-wise and component-wise allocations and activities.

Every proposal for funding under the existing schemes or new schemes should be accompanied by a Convergence Matrix relating to that department, with a detailed explanation on the extent to which, convergence has been achieved.

Every authority scrutinising and approving the programme must do convergence scrutiny to satisfy himself/herself, that convergence has been realised. The departments and institutions in the convergence matrix should align their efforts in decision making.

- (i) Monitoring of convergence arrangements amongst ATMA, KVK and Line Departments may be accorded highest priority. The process may be reviewed in every SAC of KVK and ATMA GB meeting.
- (ii) Implementation of Convergence Guidelines (17.06.2015) jointly issued by DAC&FW and DARE/ ICAR may be taken up with ATMA Officials and KVK Scientists at State / District level with MANAGE facilitation.
- (iii) This may pave way for inclusion of convergence module in the regular training programme of MANAGE, SAUs, ATARIs, EEIs and SAMETIs etc.

Catch-Up Grant & Accreditation Protocol: One-time, need based, Catch-Up Grant can be considered in favour of about 2,000 training institutions (KVKs, ATMAs, SAMETIs, AUs (State and Central)), as also their constituent and affiliated Colleges, ICAR Institutes, private organisations etc.), for up-gradation of their training infrastructure. This one time up-gradation at an estimated financial spend of Rs. 200 crore, will help improve physical infrastructure, IT infrastructure furniture and fixtures, training aids and equipments. However, the need identification has to be based on proper diagnostics of the current status and the gap to be bridged to meet the desired standards.

Appropriate accreditation protocols, procedures and institutionalisation may be suggested by MANAGE, in collaboration with Institutions of International Excellence.

3.2. Other Important Potential Extension Service Providers

3.2.1. Agricultural credit extension services for small and marginal farmers

Digitization in farm financing and farm credit system would promote transparency, quick delivery and timeliness of credit/finance availability to farmers. It will take time to cover all the farmers, though as always the innovators and resourceful will take the system benefits first.

Hence, it is necessary to have a well thought out module on farm credit in all the training programmes across the training system, both public and private. This is the right time for NABARD and the ICAR / SDA Systems to come together and design the proposed module, set its delivery mechanism and take it forward through State Level Bankers Committees (SLBCs), District Level Bankers Committees (DLBCs) and Cooperative banks for endorsement.

More efforts have to be made at the grass roots level to streamline the processes, may be through Farmers' Organisations (FOs), NGOs, Extension networks, Banks etc. Eventually, there is need felt for a farm credit app enabling farmers to access the various credit options and their smooth delivery. This will establish a one-stop convenient source for all the financial information and services. The concept of having a single unified interface could prove beneficial as compared to having multiple websites of different banks and financial institutions. This would popularise the availability of institutional credit and simultaneously help farmers to be more prepared in accessing the same.

Timely delivery of farm credit by the banks to the farmers in advance of farming operations should be the basic guiding principle in farm credit extension. The delay can only drive the farmer to approach the money lenders, and avail of loan at high interest rate. This is the beginning of vicious cycle of indebtedness of farmers. The district administration along with the DLBC should ensure timely release of farm credit and monitor disbursement on day to day basis during peak demand season i.e. beginning of monsoon. Important aspects to be considered are:

- NABARD has established more than 1,40,000 Farmers Clubs. PLP (Potential Leaked Credit Plans) of NABARD can facilitate Agri-Start-Ups India by supporting Farmers Clubs.
- Credit facilities for off-farm and non-farm activities.
- Credit facilities for livestock and fisheries farmers.
- All the training institutions may impart training to the farmers on the access & usefulness of institutional credit.
- Digitalized access to credit may be created.
- Kisan/Rupay Credit Card may be popularized.
- Non formal sources may be regulated.

Family loans to farmers: Farmers require finance for agricultural production and personal reasons such as health, education etc. In order to ensure timely activities on his farm, financial freedom and flexibility are required at farmers' end. Credit requirement of farmer has to be worked out considering total family credit requirement, and not just on the basis of one crop for one season. Total family credit includes expenses relating to crop production, enterprises, off-farm and non-farm activities, essential family expenditure on health, education etc. **Thus, composite family credit is the need of the hour.** However, the implementation has to be designed, so as to check diversion of credit from agriculture to non-agricultural activities and from production to consumption expenditure except in accordance with the limits of sanction vis-a-vis consumption loans.

There is need for establishment of (a) "ACCNet – Agricultural Credit and Cooperation Network", (b) "National Database on Kisan Credit Card (KCCs)", and (c) "Agricultural Risk and Insurance Management;

3.2.2. Agri-business companies

Spearheading Market led Extension in collaboration with ATMA: The emerging potential of agri-business companies and other private sector players may be harnessed for technology, manpower, and funding support to attain the synergy for effective Extension delivery. A special purpose vehicle (SPV) for promoting CSR activities in Extension may be launched from MANAGE. Extension activities seeking tax exemption may be brought under the SPV.

India requires ICT enabled Agri-value systems for about 400 agricultural commodities (one for

each commodity) involving all stakeholders to facilitate “farm to table” / “pond to table” / “sea to table”. In fact, in order to depict a market led approach it should more appropriately be:

- Table to farm
- Table to pond
- Table to sea

Concepts and Principles of e-commerce, e-business, e-auctioning, e-tendering and e-marketing, and their applications to agri-business need to be understood. Skill development and competency development are essential for the stakeholders in the agricultural value system-warehousing, logistics, pledging, clearing and settlement all based on digitalisation.

There is no centralized database providing details of location and capacity of the available storage structures/warehouses and associated road network, rail network, seaport network and airport network. There is a requirement for providing information to farmers on pre-harvest & post-harvest storage structures on “Any-Time, Any-Where” basis and popularisation of electronic Negotiable warehousing system that offers an opportunity to the farmers to store their post-harvest commodities in a recognised warehouse to avoid distress sale.

The system of electronic Negotiable Warehouse Receipt (eNWR) facilitates the farmer to trade online or avail himself of post-harvest loan using it as a collateral. There now exists scope to popularise this, as the Ministry of Food and Public Distribution has launched this new initiative recently (September 2017). This can be supplemented by the availability of post-harvest loan under interest subvention scheme of the DAC&FW. However, the two Ministries need to work together on developing and adopting a simplified and comprehensive approach to popularising this instrument.

The private sector has also taken initiatives for launching ICT enabled Warehousing Management Systems which is encouraging.

3.2.3. Input dealers as Extension delivery points

Agri Input Dealers, who number more than 3,00,000 spread across the country can be effectively used as Extension Delivery Points by displaying the literature related to schemes and programmes of both central and state governments, new technologies and extension messages including weather and market information.

Primary Agricultural Credit Societies (PACs) are other important rural institutions, which can serve as ‘Delivery Points’. There are as many as 63,000 number of PACs which are normally visited by all the farmers in the villages. They may also be used for facilitating other services like farming machinery on custom hiring etc.

Mobile based ICT platform may be created to provide location specific agricultural extension services based on the content produced by institutions like KVKs, SAUs, ICAR centres and

others.

3.2.4. Farmer to Farmer Extension: Guidepost for the future

This is one of the most effective methods of technology dissemination, wherein the innovators and progressive farmers share the technological information with the fellow farmers. However, they need to be oriented about their roles and responsibilities in this context and trained as para extension personnel.

The Farm Schools (FFSs) are being organized on the fields of such farmers, where they become both a host and a teacher for the technology in which they have already excelled or have had a unique experience and achievement. This requires to be encouraged and funding arranged under other flagship programmes.

One of the methods tried by the ATMAs and KVKs was to expose such farmers' innovations for validation by the research system and using these innovators as training resources and disseminators. Some successful examples include FOs & FFSs wherein, innovative farmers have been deployed to promote farmer to farmer extension.

Extension system shall be supported through establishing model farms, model farmers, farming system models and model villages as hubs for extension activities.

3.2.5. Farmers cooperatives and collectives

Group approach to enhance farmer's income: Inadequate manpower, lack of mobility, resources and supportive facilities are some of the important bottlenecks in effective extension today.

Taking such successful examples like those of AMUL, Mahagrapes, Rubber Producers Companies and the like, Farmer Producer Organisations (FPOs), Self Help Groups (SHGs) and Joint Liability Groups (JLGs) offer a solution to the structural challenges in agriculture and may therefore be promoted vigorously. Such mobilisation may be prioritized as an extension service. A group approach would also help in providing extension, credit, infrastructure and post-harvest market linkage – such as aggregation, transport, storing and branding facilities to the farmers in an easy manner.

The Commodity Interest Groups (CIGs) promoted by ATMA and NABARD may be established as “Building Blocks of FPOs”. Professionally established CIGs may be federated at block and district levels for providing storage, processing, value addition, marketing facilities. This latter intention as envisaged for ATMA has not been attended to actively. Hence:

- ATMA functionaries may be trained in operationalisation of Commodity Interest Groups. Sufficient time may be provided to accommodate natural stages in social mobilisation;

- Roadmap for promotion of CIGs into Federation and Company/Cooperative at different levels, may be put in place, at the time of formation of CIG itself, for which concerned ATMA may be made responsible;

A network of Cooperatives at the local, state, and national levels should assist in agricultural input (seeds, fertilisers, credit etc.) services, agricultural marketing processing. Procurement and marketing are key functions of the Agricultural Produce and Marketing Cooperatives (APMCs). Under the new Model APLM Act 2017, they are now renamed as Agricultural Produce and Livestocks Marketing Cooperatives (APLMs) so as to bring the much needed attention to livestock apart from crop sector.

The need for development of a network of Cooperative Societies (CoopNet) and automation of each cooperative society (e-Cooperatives) to facilitate governance and operational efficiency in the cooperative structure is good for rural India.

In respect of extension service, the critical advice is to orient the extension functionaries to appreciate the need and importance of mobilising farmers into different types of groups. Besides, the functionaries need to be taught the art of and approach to counselling the farmers into group formation. The extension system can play an important role in linking the farmers to the cooperatives. This is a new and priority skill and capacity that the Extension functionaries need to acquire today.

3.2.6. Blending of ATMA with good practices of Training and Visit (T&V) system

New Extension Approach for Doubling Farmers' Income: Inadequate manpower is a constraint in effective delivery of extension services at district level. This has to be addressed by using available manpower intelligently in public extension, by filling the vacant positions in public extension and by promotion of private extension service providers, (agri-business companies, NGOs, agri-preneurs, progressive farmers, FPOs, input dealers, private electronic and print media, private banks, donor agencies etc.).

There is need to create dedicated space for private extension activities, besides evolving appropriate Public Private Partnership models, where state agriculture and line departments work jointly with private sector in delivery of extension services.

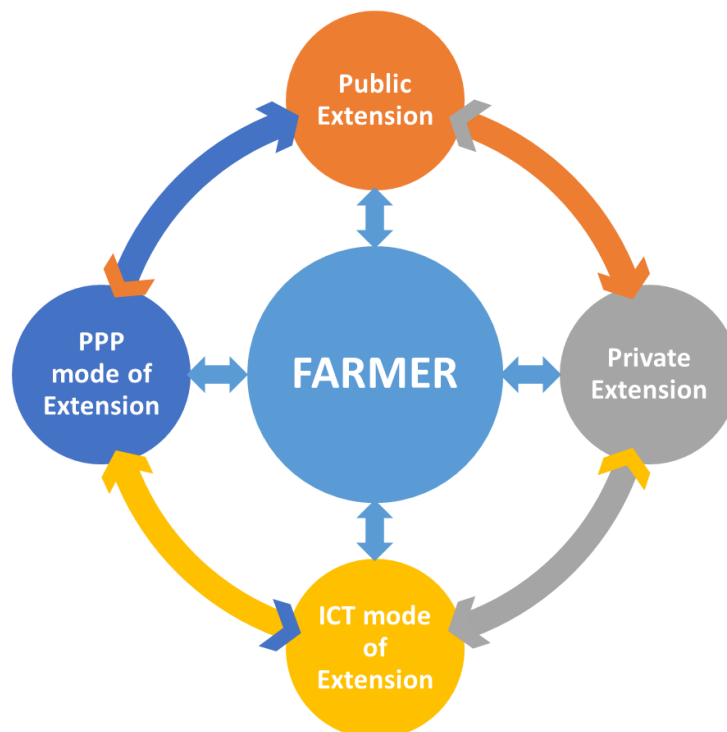
Decisions regarding promotion of private sector and PPP may be decentralised to the district level with adequate financial & administrative powers and necessary flexibility. Association with private sector cannot be micro-managed as their participation depends on relative strength, common interest, local production systems and acceptability.

The private partners may be incentivised by linking them to ongoing developmental programs. Public and private ICT players may be encouraged to provide ICT support in extension delivery. This combination of public, private, PPP and ICT will enhance the robustness and take care of extension needs of the district with greater depth and spread.

Private partners may be encouraged to play diverse role at different stages of agricultural value system around the seven (7) sources of growth identified for doubling farmers' income. The seventh source relating to shift of farmers to own-agriculture activities calls upon the extension wing to deal with sociological issues of migration, and not so much economic aspects of it.

Some of the areas, such as farm (agricultural) mechanisation, precision farming, processing, storage, value addition, post-harvest activities, market linkage, agri-logistics may be attractive to private sector as they match their business interest. While involving NGOs, their expertise, experience and interest may be considered as the basis. Extension contact with groups may be preferred over individual contacts as it is time and cost effective, impactful.

Figure 3.2 Doubling Farmers' Income - Extension Approach



Continuous technical backstopping of extension functionaries at district level and below has to be ensured through fortnightly orientation by subject matter specialists available at KVK and ZRS (Zonal Research Stations) located in the districts. This time tested and proven good practice drawn from T&V system may be adopted, where Subject Matter Specialists (SMS) train extension functionaries in technologies relevant for local production system in the first and third week of every month for a day. Care has to be taken to ensure the participation of extension functionaries from allied sectors, as well as the private sector.

Application of ICT should be made an integral part of fortnightly technology orientation. These sessions should focus on obtaining feedback from the farmers and on discussing the solutions to be communicated. Proper monitoring mechanism has to be institutionalised to sustain the quality of deliberations.

Doubling farmers' income should become the dominant theme in fortnightly sessions and field level issues affecting the income should be examined & solutions offered. Interventions required for the following fortnight, in respect of the appropriate sources of growth may form the core agenda of the discussion. Ways and means of generating additional income from non-farm occupations may be highlighted.

Expertise is available at district level, with certain institutions and can be tapped. NABARD district office, District Level Bankers' Committee (DLBC), Lead District Manager, Rural Self Employment Training Institute (RSETI), District Industries Centre (DIC), Divisional Forest Office, etc. are examples. There are also NGOs and professional associations, who too have many things to contribute and should therefore be brought into the solution paradigm.

All the district level plans prepared, such as SREP of ATMA, C-DAP of RKVY, PLP of NABARD, NICRA of ICAR, District Irrigation Plan of the District Administration etc. should be guided by a common agenda of doubling farmers' income. Each of these plans must address the relevant component of change in respect of seven (7) growth sources (vol. II).

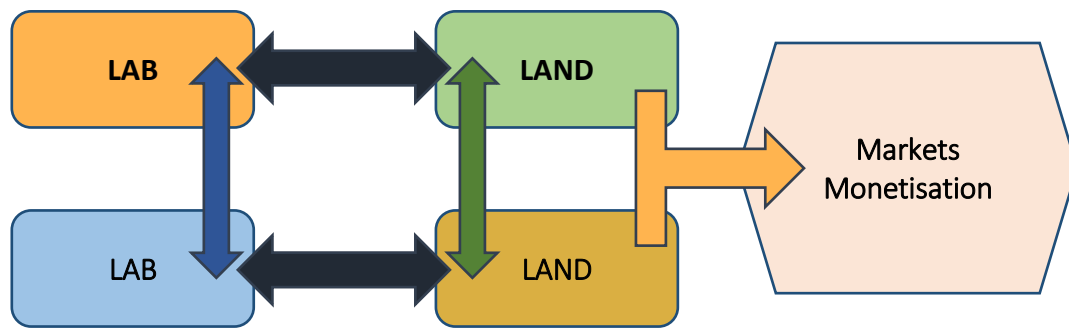
The District Administration and Zilla Parishad have to work in tandem to bring about integration of DFI strategy amongst various district level plans. The District Planning Committee has an important role in this regard. This should then become the basis for integration at state and national levels.

3.3. Flow Pattern of Technology

Close observations at the field level indicate the need for certain value additions on "lab to land approach in technology transfer". Firstly, there is need for land to lab feedback mechanism and lab to lab for multi-disciplinary approach. Further, farmer to farmer extension can be promoted through land to land approach. All efforts must of course be linked to end outcome of capturing greater value from the target markets. The four-directional flow comprises the following four aspects:

- Land to Laboratory (Farm to Lab)
- Laboratory to Land (Lab to Farm)
- Land to Land (Farm to Farm)
- Laboratory to Laboratory (Lab to Lab)

Figure 3.3 Technology Flow



Closely linked to this framework is the need for an overriding approach in respect of technology development and technology transfer to capture greater value from markets, by optimising on use of agri-logistics and by enabling fair and remunerative returns on farmers' produce in the market.

The end outcome of such technology transfer needs to be improved monetisation of farm produce. This will require keeping the markets and consumer demand as overriding factors in determining the type and category of technology flow to farmers.

3.3.1. Extension as part of agricultural value system

The current focus of extension is mainly on production enhancement led by productivity gains. However, the extension needs to expand beyond production, and work on (i) reducing the cost of cultivation/production, (ii) aggregating the farm produce; (iii) reducing the number of marketing intermediaries; (iv) value addition to produce or value added activities to realise better farm gate prices.

In order to implement the desired approach of “**Market-led Extension**”, the extension functionaries will have to undertake farmer orientation and sensitisation activities by providing them information on advantages of online trade platform like e-NAM and other alternate marketing channels, direct marketing of produce to terminal markets, primary village level processing, becoming contracted supplier in the existing value chain of an agro-processor, the positive aspects of warehouse based pledge loan facility, etc., with a view to overcoming distress sale and earning optimal returns on their produce.

Market-led Extension should include subjects relating to, (i) efficient and effective market structure, that enables a transparent and competitive price discovery; (ii) online trade, futures trade, exports; (iii) storage & warehousing, and post-harvest loans; (iv) Mechanism of Minimum Support Price and MSP based procurement; (v) Agri-value system based agriculture; (vi) crop insurance and credit so as to encourage the farmers to choose better and financially viable cropping system, realize better farm price and retain their interest in farming; (vii) importance of primary processing; and (viii) benefiting from integrated agri-logistics, including multi-modal transport.

To begin with the extensive capacity building of extension functionaries on crop-specific supply chains, and incorporating a 'fork to farm' approach, is a prerequisite for introduction and advancement of a market-led thrust in agricultural extension.

3.3.2. Project approach in Extension

Extension should follow project approach by undertaking proposals of suitable size to provide project specific end-to-end support and facilitation to farmers, including backward linkages (production) & forward linkages (marketing) and an integrated farming systems approach through convergence. Project proposals may indicate potential income gains and risks and returns to investments to facilitate informed selection of projects.

While doing so, the projectisation of schemes, programmes and resources of public and private sectors and adopting regionally differentiated best partner approach, may be followed. Resources of PRI Institutions need to be fully leveraged and provided a prominent role in planning and implementation of extension programmes. They should become the fulcrum of governance in case of all the sub-sectors of the generic Agriculture.

3.4. Annotation

Extension is a strategic public sector service for greater good of farmers, covering a large number of subject matters, as part of nation building exercise. Extension is also a strategic service undertaken by the private sector in areas specific and related to their business interests. From the farmers' perspective, the source of extension provided, can at times be divergent to their core interests. Coordination and convergence of efforts in this area is an imperative need. The public sector involvement in extension may need to take responsibility to audit and monitor the information and technologies being shared with farmers.

A common repository of validated knowledge and technologies, will allow for extension works to be more effective and credible. A national repository, though regulated, need not be restrictive in nature but should allow for innovative application of the available knowledge.

Further, in recognition of the shortage of manpower in public extension system and increasing & differentiated demand for extension & advisory services from the farmers, large number of private players capable of providing the needed services, and many a time on payment, should be provided space. Similarly NGOs with their strength in mobilising the farmers at grassroots level, and capacity to test unconventional technologies and approaches should also be proactively co-opted.

It would be more gainful to bring public, private and NGO based extension systems together in reaching out to differentiated needs of the farmers across geographies and capabilities. The increasing availability of ICT tools and its demonstrated usefulness in delivering extension services, requires that they are optimally deployed to achieve higher efficiency and real time delivery of extension services. Deployment of ICT should be as comprehensive as possible. Such tools will also contribute to achieve optimal convergence between public and private

extension systems as also with the NGO sector.

Extension services have not been market-led in orientation and this is the need of the hour. Largely, the focus so far has been on optimising field level activities, input-services and on-farm risk management. Farmers are seeking more business or enterprise oriented inputs from extension services. To service this need, will necessitate a differentiated approach for inducting relevant skills in extension functionaries. Project based extension services, encompassing the entire supply chain from access to inputs, ending in final monetisation of the farm output need to be encouraged.

Key Extracts

- Converging platform for all the technologies generated at national level may be established under MANAGE i.e. the e-National Bank for Agricultural Technologies (e-NBAT) for processing, validating and further dissemination.
- ATMA should be the platform for convergence of all the extension delivery systems.
- Expert Committee may be setup to redefine the role of Directorate of Extension to suitably address challenges in extension.
- Linkage between MANAGE, EEI, SAMETI may be strengthened. SAMETIs need to reorient their programmes to support extension reforms.
- Reintroduction of training on T&V lines of Extension functionaries by Subject Matter Specialists will be helpful in improving the content and relevance of Extension.
- Scope of SREP may be extended to include market linkages based across sectors, skill development, agri-startups and off-farm income generating livelihood options.
- ATMA should promote agri-startups, use Common Service Centres (CSC) in dissemination and increase farmers' friend strength at the rate of one (1) per village.
- One time catch-up grant may be provided for upgrading performance of training institutions in the country after identifying gaps.
- Banks are potential extension providers for Agricultural Credit Extension Services, including for provision for family loans for farmers. This extension type requires greater organisation and strengthening.
- Close coordination between ATMA and Agri-business Companies, including promotion of Farmers Producers Companies is expected to strengthen the extension services by making it more market oriented and based on value propositions.
- Co-operatives especially PACS and farmers collectives should be suitably used as Extension Delivery Points.
- Market-led Extension approach is emphasised with outcome to capture best value.
- Extension is an integral part of the agricultural value system and extension systems may be reoriented to serve this purpose of supporting the sector specific supply chain.

Chapter 4

Human Resource Use Efficiency in Extension

Human interface will remain important, but there is scope to restructure and improve human resource efficiency in extension by reassessing the interface in the light of continuous developments in modern day communication and road networks. In this context, ICT enabled tools and outcome based targets are discussed.

4.1. Factors in Manpower Requirement in Agricultural Extension

Adequacy of manpower is an important factor in effective delivery of extension services. The manpower requirement has typically been determined on factors such as geographical area, net cultivated area, crops and cropping pattern, number of households/operational holdings and system of cultivation-irrigation or rainfed.

The existing sanctioned strength of extension functionaries, vis-à-vis the positions filled, and relative strength of private extension service providers, determine the total manpower available. The manpower deployed in extension services includes agripreneurs, DAESI (Diploma in Agricultural Extension Services for Input Dealers) trained input dealers, paratechnicians, NGOs, agri-business companies, Farmer Producer Organisations (FPOs), Cooperatives, etc. Besides, extension is supported through modes such as mass media network, Kisan Call Centre (KCC), network of Krishi Vigyan Kendras (KVK), State Agricultural University (SAU), Central Agriculture Universities (CAUs), credit personnel of various financial institutions, Indian Council of Agricultural Research (ICAR) extension outreach programs etc.

Conventionally, manpower based extension has been the primary vehicle for engagement with the clientele. In an environment where, the level of literacy among the farmers was low and they suffered from long held and strong belief system, that always defied the behaviour change interventions, face to face interface between the extension functionary and the farmer was more credible and effective. Since manpower was always a constraint and other forms of medium had their own advantage in communication, alternatives like traditional art forms and modern forms like print, audio, video and electronic form since the advent of television as a pilot in mid 1970s and more substantively since 1980s came to describe the extension methodology.

However, the effective reach of extension manpower is also determined by other aspects such as mobility, connectivity, infrastructure and communication systems available for extension. Beginning 1990s, when Information Technology brought about an inflection point in the way society came to correspond and communicate, the power of ICT is now available for information diffusion and sharing, either as a sole medium or in combination with manpower.

While, ICT has the potential and offers scope to embark upon information, knowledge and skill based agricultural extension, human interface continues to have relevance and effectiveness in India especially in the context of behavioural change communication. Even as Indian GDP (now GVA) has grown multi-fold, there is always a financial constraint, which limits the

strength of manpower that can be deployed for various services, including agricultural extension. The strategy, therefore, for achieving the defined goal of extension service system has to be an optimal blend of manpower and ICT, each being deployed to harvest its respective strength. The deployment has to be such, that the outcome is more than sum of the two. This aspect is discussed further in the following chapter. The DATES project referred to in chapter 2 (section 2.9) of this volume demonstrates this combined approach and its success in doubling farmers' income.

4.2. Status of Manpower in Public Extension

Indian extension is dominated by public extension. As agriculture is a state subject, majority of the extension functionaries come from agriculture and allied departments of the state. To strengthen ATMA, additional manpower is provided to states by the central government.

As per the information culled out in the year 2012-13, while there were 13.83 crore operational farm holdings, the agricultural extension manpower in position in the country was 1,19,048, which worked out to 1162 operational holdings served by one extension functionary. This ratio applies to the broad agriculture sector and will further vary from one agricultural sub-sector to another, and unfortunately to the disadvantage of emerging domains like animal husbandry.

Assuming that each operational land holding belongs to one farmer/farm family, the ratio is unfavourably much poorer compared to the ratio specified under Training & Visit system of extension. The previously ascertained ratio ranged from 250 to 800 farm families per extension functionary under T&V. In hilly areas, the recommended ratio was one (1) extension functionary per 250 farm families, in irrigated areas it was 400 farm families, and in areas practicing dryland agriculture, it was 800.

There are several national institutes under different divisions of the Agriculture Ministry, which are involved in providing various services to farming community, but have limited manpower for extension purpose. Commodity Boards under Ministry of Commerce and Industry i.e. Coffee Board, Tea Board, Spices Board, Rubber Board etc. have their own extension systems which work almost independently; and so is it in case of Central Silk Board under the Ministry of Textiles.

The Department of Animal Husbandry, Dairy and Fisheries (DAHDF) hosts National Fisheries Development Board (NFDB) and National Dairy Development Board (NDDB), under its umbrella which too have their own limited manpower for extension purpose.

All the ICAR centres have their own extension wing with limited extension reach. Further, all the SAUs and CAUs have separate Directorate of Extension, with their own extension manpower to provide extension services in their designated service area. Even though Krishi Vigyan Kendras are meant to provide technology backstopping, they too are involved in extension functions. The Ministry of Food Processing Industries, Department of Rural Development, Ministry of Small and Medium Enterprises (MSME) and Indian Council of

Medical Research (ICMR), have their own institutions with limited manpower for extension of technologies generated by them. The Ministry of Science and Technology actively provides value added extension services through ISRO, NRSA and CFTRI. IGNOU has hundreds of programmes meant for different stakeholders in agriculture value system. The Ministry of Finance caters to farmers' credit needs through NABARD, Public Sector Banks, RRBs. Several Inter-Governmental Institutions like FAO, USAID, GIZ, ICRISAT etc. also provide specialized services through their limited manpower. The Ministry of Information and Broadcasting has its own farmers' outreach programmes through Doordarshan, DD Kisan, All India Radio, Community Radios and Directorate of Audio Video Publicity. A listing of public and private extension service providers in India, shows the availability of large number of national level institutions, that provide direct and indirect support to agricultural extension. This is in addition to various state level organisations of similar nature, which also are large in number.

It is important to recognize the following recent developments in the country which have impacted agricultural extension positively. They are:

- Improved literacy rate
- Increased reach of mass media
- IT and mobile revolution
- Deepening internet penetration
- Enhanced road connectivity to villages
- Increased mobility of extension functionaries
- Increase in reciprocal calls and visits of farmers to extension functionaries
- Improved awareness bench mark of the farmers
- Vigorous outreach mechanism of central and state governments
- Aggressive marketing and extension approaches adopted by private extension service providers
- Presence of large number of NGOs working in rural areas and serving agriculture and allied activities.
- Institutionalised Corporate Social Responsibility (CSR)

In view of the changed scenario, the DFI Committee is of the opinion, that the required minimum ratio of extension service provider to farming family can be revisited. Based on its analysis, the Committee recommends that ratios between Extension functionary to Farm families desired are as follows:

- (i) Hilly areas – 1:400
- (ii) Irrigated areas – 1:750
- (iii) Rainfed areas- 1:1000

The recommended ratios are based on the scope for optimal blending of manpower and ICT, besides increased strength of private extension services. Further, it takes into account the contemporary need to emphasise on not only agriculture as before, but also service more intensely other sub-sectors, namely, horticulture, dairy & livestock management, poultry, fishery and farm linked on-farm and off-farm activities. More importantly, unlike before when production segment received priority attention, the income based approach to agriculture as required now, demands that post-production segment including agri-logistics, primary processing and marketing too are paid due attention. The status of extension manpower density in different states is in Table 4.1

Table 4.1 Status of manpower in Agricultural Extension

States	Holdings Number (A)	Agriculture Extension manpower in position* (B)	No. of operational holdings per extension official (A/B)
ANDHRA PRADESH	13175100	4167	3162
ARUNACHAL PRADESH	109298	1145	95
ASSAM	2720223	2779	979
BIHAR	16191391	10231	1583
CHATTISGARH	3746480	4313	869
GOA	78020	95	821
GUJARAT	4885610	3501	1395
HARYANA	1617311	3018	536
HIMACHAL PRADESH	960765	1084	886
JAMMU & KASHMIR	1449397	5812	249
JHARKHAND	2708928	4129	656
KARNATAKA	7832189	3226	2428
KERALA	6830789	3933	1737
MADHYA PRADESH	8872377	10775	823
MAHARASHTRA	13698965	15770	869
MANIPUR	150620	629	239
MEGHALAYA	209561	402	521
MIZORAM	91880	538	171
NAGALAND	178411	1053	169
ODISHA	4667466	3794	1230
PUNJAB	1052554	1398	753
RAJASTHAN	6888436	5495	1254
SIKKIM	74928	357	210
TAMIL NADU	8118224	8320	976
TRIPURA	578479	2913	199
UTTAR PRADESH	23325456	12976	1798
UTTARAKHAND	912650	1031	885
WEST BENGAL	7123347	6164	1156
ALL INDIA	13,83,48,461	1,19,048	1162

Note: Source of information - <http://agcensus.dacnet.nic.in/stateholdingsizeclass.aspx>

**Figures given include dedicated manpower deployed for extension purposes under support to State extension programs for*

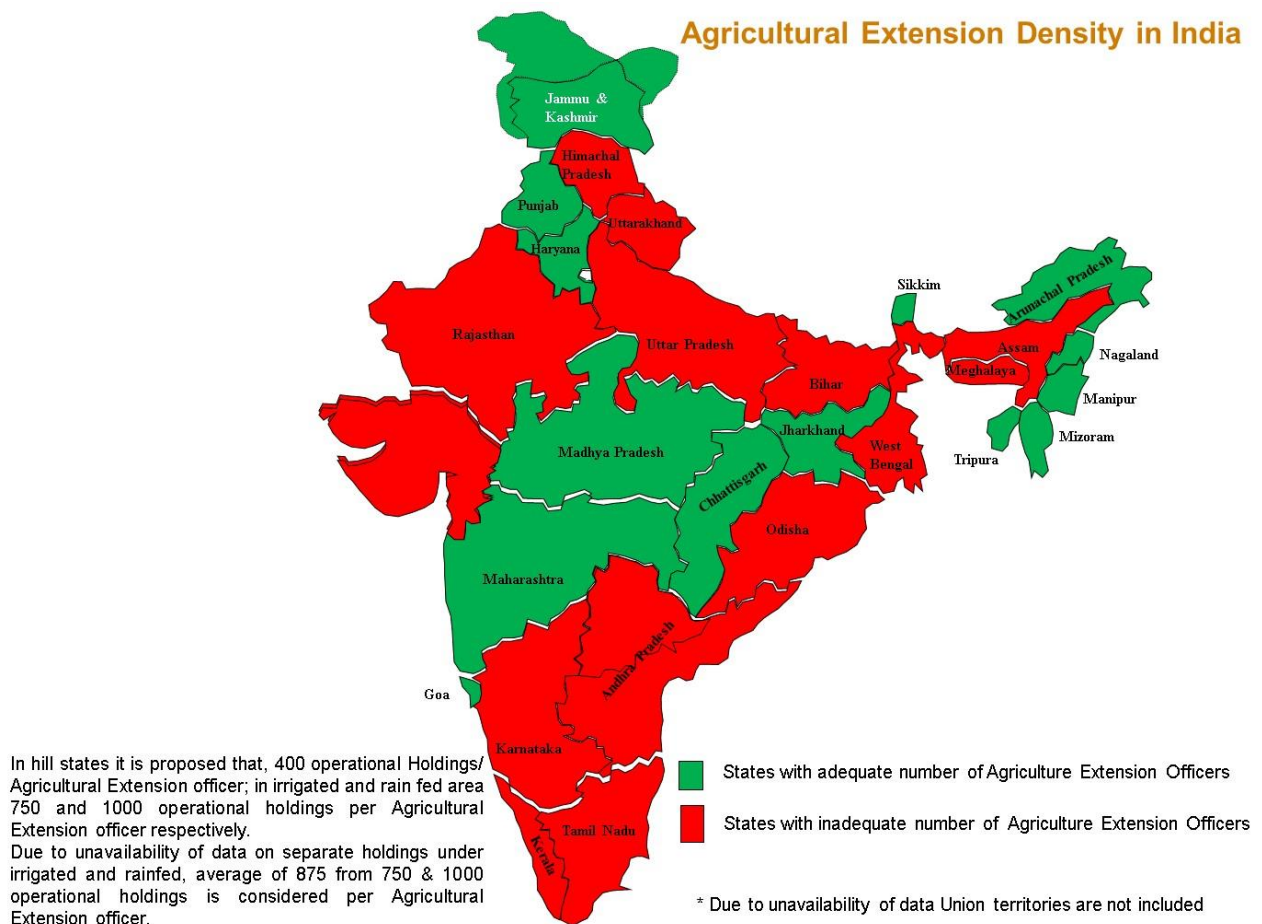
Extension reforms, 2010 (ATMA Scheme) and all other manpower posted by the State Government (excluding ministerial and office support staff).

Table 4.1 indicates that if 30 per cent of vacancies are filled up, many states would get at par with the desired ratio. These include Arunachal Pradesh, Assam, Chhattisgarh, Goa, Haryana, Himachal Pradesh, Jammu and Kashmir, Jharkhand, Madhya Pradesh, Maharashtra, Manipur, Meghalaya, Mizoram, Nagaland, Punjab, Sikkim, Tamil Nadu, Tripura and Uttarakhand.

But other states would continue to suffer shortage of manpower and hence need additional sanctions. These include Bihar, Gujarat, Karnataka, Kerala, Orissa, Rajasthan, Uttar Pradesh and West Bengal.

However, if only existing manpower is considered and compared against the DFI recommended ratio of ESP to farm families, the states-wise manpower status in terms of adequacy or inadequacy is depicted in the figure 4.1.

Figure 4.1 Agricultural Extension Density in India



4.3. Manpower for ATMA

In order to strengthen the state extension manpower, ATMA scheme was modified in 2014 to put in place a committed team of extension functionaries at state, district and block levels. The

ATMA Guidelines provide for manpower at different levels as follows:

- District level (Project Director-1; and Dy. Project Directors -2; Supporting Staff (Accountant and Computer Operator))
- Block level (BTM-1 and ATMs-2) for each ATMA.

This works out to a Technical Manpower strength of about 33 for ATMA in a district having on an average 10 Community Development Blocks. As per the total sanctioned strength of each state in line with its eligibility, a total of 27,937 positions were sanctioned across different states. However, as on 15.4.2017, only 13,672 positions were filled, while 14,265 were reported vacant. If these ATMA vacancies are filled up, total number of extension functionaries in the country will go up to 1, 33,313 (ATMA + Regular extension staff) which will improve the ratio of farmers served by each extension functionary from 1162 to 1037. Happily, there exists scope to further improve this ratio, only if all the existing 30 per cent of state extension staff is filled up by all the state and UT governments. **In such an event, the ratio will improve from 1037 to 798.**

The need of the hour is to follow multi-pronged strategy to maintain as good a ratio as illustrated below:

- (i) Filling up of vacant positions in State Agriculture and Allied Departments.
- (ii) Retaining the suggested manpower on long term contract basis in ATMA to provide uninterrupted extension services to the farming community. Long term contract recruitment of extension functionaries in ATMA is expected to overcome the existing problems such as:
 - delay in recruitment;
 - non-recruitment;
 - frequent attrition;
 - uncertainty created by outsourcing agency;
 - daunting legal issues;
 - short-term and non-renewal contract resulting in positions lying vacant for long durations;
 - non-observance and frequent deviations from GoI Guidelines;
 - hierarchy issues; and
 - poor professional expertise due to frequent changes.
- (iii) Intensively promoting use of ICT, agri-preneurs (> 20,000 Agri-clinic / Agri-Business Centres), DAESI trained Input Dealers etc., and Private sector extension service providers to complement public extension delivery.
- (iv) Reorienting and involving the following institutions in delivery of credit linked extension activities.

- Public Sector Banks with 31,117 rural branches; and 18, 096 semi-urban branches.
 - 63,000 Primary Agricultural Cooperative Societies (PACS).
 - 368 District Central Cooperative Banks (DCCBs) with 12, 858 branches.
 - 30 State Cooperative Banks (SCBs) with 953 branches.
 - 19 State Cooperative Agricultural and Rural development Banks (SCARDBs) with 788 branches.
 - 772 Primary Agricultural and Rural Development Banks (PA&RDBs) with 1,049 Branches.
 - Micro Financial Institutions (MFIs).
 - Private Sector Banks (approved by RBI).
 - Non-Scheduled Financial Institutions (NSFI).
 - MUDRA Bank.
- (v) Farmer Friends, Para-technicians, Common Service Centres (CSCs) numbering 1.57 lakh, Self Help Groups (SHGs) numbering around 90 lakhs, JLGs, FPOs etc., can be leveraged for delivery of core extension services.
- (vi) There are 1.71 lakh milk cooperatives in the country, where farmers visit physically at least two times in a day. The venue of milk cooperatives can be well used for dissemination of real time messages on market and weather through either display board or through electronic display boards. Hence, any message can reach instantly at-least one-third of the country through this mechanism. These cooperatives have a membership strength of about 15 million, of which 5 million are women members.
- (vii) Similarly there are cooperatives and institutions for fisheries, beekeeping, etc., each of which can serve as an important information and knowledge dissemination platform.

It is expected that regular manpower helped by qualitative training will cater to the required continuous, uninterrupted and need based extension support to the farmers and facilitate them to realise higher incomes. It is also suggested, that at least 50 per cent of these regular positions may be filled up with women extension functionaries at district and block levels and well qualified agricultural science graduates are available across the country.

Market-led Extension plays an important role in doubling farmers' income. Extension services related to markets such as, inflow and outflow of commodities in markets, location, contact details of buyers, prices, market intelligence, storage facilities, logistics, processing facilities, export formalities, value addition technologies, developmental programmes supporting, marketing activities of farmers etc. can significantly influence the farmers in deciding appropriate time and place of sale of their commodities and the income thereof. Hence, dedicated manpower with marketing department for providing market led extension services to farmers in time is required. However, the structure and function of marketing department at

present is not fully equipped to provide such farmer friendly services. One of the important bottlenecks is inadequate manpower. Hence, in a district, out of the total extension manpower available (with ATMA and Agriculture department), 25 per cent of the manpower should be deputed to the Department/Directorate of Agricultural Marketing for the latter to deliver focussed market extension services to the farmers. This would supplement the extension services offered by functionaries who will continue to be part of their existing departments and cater to both production & marketing extension services.

At the state level, an institutional mechanism is necessary to recruit and fill up all vacancies, that may arise from time to time on a regular basis. To make the process easy, a list of empanelled resources can be maintained, which will be valid for the succeeding 2 to 3 years, through a onetime selection process.

Services of energetic retired extension professionals could be used as and when required. On the lines of ICAR's scheme of Scientist Emeritus for retired teachers and scientists, an Extension Emeritus scheme could be introduced.

Alternatively, it can be on the lines of campus recruitment at SAU & CAU centres when the academic year is about to close. Under both systems, the placement options of the candidates may be maintained and, whenever vacancies arise, placement orders may be issued from the maintained list. Involvement of SAUs and CAUs will also bring them closer to state extension system and enable them to use the feedback for necessary changes in their academic content.

Commercial agriculture is attracting the attention of all categories of farmers seeking specialized extension services on commercial crops, export oriented crops, storage, processing, packaging and marketing. Therefore, engaging specialized qualified functionaries and training them to provide niche extension services needs due focus. These high value production systems would warrant a more favourable extension functionary to farmer ratio, which may be as low as appropriate to the production system. Further, appropriate ICT based extension platforms should be encouraged to attract investments and expand business opportunities for farmer collectives to enhance their incomes.

4.3.1. States to strengthen ATMA manpower

It is observed, that with the change in the funding pattern between centre & state to 60:40, for ATMA, as is the case with other centrally sponsored schemes, the vacancies in the manpower in some States has increased. While some states having recognised the importance of extension, have been taking care to retain the manpower, some others are found wanting on this score. It is therefore, suggested that the states may be motivated to fill up all vacant ATMA positions, incentivising them in different ways. Funding for allied works may be linked to extension capacity and made conditional, that regular extension staff are not deployed for any activity other than agricultural services.

4.3.2. Incentivising for effective extension delivery

Extension functionaries largely comprise those engaged under ATMA scheme and those serving on state government rolls in regular capacities. Incentivising these functionaries can enthuse them to serve the farmers by personal involvement and not just in the manner of a ritualised task.

Short term contract based manpower recruitment in ATMA has created several functional, administrative and legal issues. It has also created uncertainty in their minds and has compromised the functioning of ATMA concept. In order to overcome this serious problem, the following revised manpower strategy for ATMA is proposed:

- (i) The manpower be recruited on long term contract basis for a period of five years.
- (ii) Induction training be provided to all the newly recruited staff prior to their entry into field.
- (iii) MANAGE may coordinate HRD activities of ATMA manpower including induction of newly recruited extension functionaries. An MOU to this effect between MANAGE and State/UT government will be required.
- (iv) Preference be given to contract employees of ATMA in regular recruitment in the Department, as and when vacancies arise. For this purpose state governments may amend their recruitment rules.
- (v) Preference be given to contract employees of ATMA for AC&ABC training, other self-employment opportunities such as Mudra, Stand-up and Start-up India.
- (vi) Certain percentage of seats be reserved for contract employees of ATMA in higher education i.e., at post graduate and Ph.D levels.
- (vii) Contract employees of ATMA be linked to benefits of flagship programmes.
- (viii) Any benefit, found appropriate and as similar to short service commission in the defence services may be considered for contract employees of ATMA.
- (ix) Preference be given for availing of educational loans.
- (x) Incentives be offered for enhancing their mobility i.e. purchasing vehicle.
- (xi) Introduction of the concept of Agri.-Doctors, by allowing the agricultural professions to pre-fix their names with 'Dr.'
- (xii) Provision of extension kits and ICT handheld devices, which will make extension service more scientific and evidence based.
- (xiii) The SAUs and Deemed Universities can start internship programme for their students under ATMA. These internships may be paid ones and the best performers may be given certificates/awards.

An incentive based on access to higher education can serve as a powerful tool to push young and well qualified agricultural science graduates and post graduates into extension service. If such a system is consolidated, then the young graduates may be willing to take a break from direct entry at their next level of education and voluntarily join the contract system. They may be allowed to apply for higher education after a minimum service of 2 years and with the facility of reservation, they will not suffer any disadvantage. The young graduates will also feel

this a more personally and socially acceptable way to conducting their life's ambition. It is not uncommon these days to see engineering and medical graduates working for a few years and then resuming their higher studies in the domains of their choice.

The vacant positions in the state extension machinery should be filled by the state governments on a 'one time drive' basis and thereafter fill up from time to time, as and when vacancies arise. Agricultural Extension Service should be given a special status, considering it as both an economic and educational activity and no vacancies allowed to linger on.

It is recognised, that majority of the agricultural graduates and post-graduates ultimately spend their life in some form of service in private & public sectors, which is largely extension oriented. The system should promote into domains of research only those who demonstrate excellence in academics and passion for new science. This system will then be able to absorb into higher studies and research, even those, who wish to serve the farmers by being a part of agricultural extension for some years and return to academics. Since large number of agricultural science graduates pass out from the universities annually, they can be encouraged to serve the field extension cadre for a few years on contract and move out into academics or other jobs including opting to join the State Extension System on a permanent basis, as and when formal recruitments happen.

4.3.3. Performance linked incentives for field functionaries

Extension functionaries providing high quality extension services need to be appropriately incentivised to accelerate the momentum. Three following outcome based parameters may broadly define eligibility for incentivising the better performers in extension.

- Firstly, the percentage increase in productivity or farm output in a designated area.
- Secondly, percentage reduction in gap between productivity in lab conditions and productivity in the field.
- Thirdly, the growth in net income generated per unit area or livestock.

The first element will ensure, that extension functionaries pay attention to the farmers who have otherwise lagged behind in a region, possibly due to various socio-economic reasons. The second factor will develop benchmark for flow of technology in their area and strive to make laboratory productivity equal field productivity. The third parameter will drive efforts towards improving produce quality at lowered cost, capturing value from residual output and for market-led extension. The third factor is particularly significant in case of non-food crops as well and can be given a higher weightage.

4.3.4. Concept of One village - One farmer friend

In order to facilitate interaction and extension interface with the farming community, an institution of Farmer Friend is already in place at the rate of one for every two villages. While this institution effectively serves as a platform between the extension functionaries and the

farmers, the present experience shows that due to meagre remunerations (Rs. 500/- per month) and, large area of operations, the interface is not as effective as desired. It is, therefore, suggested that the institution of farmer friend be strengthened with a presence in every village to enhance the intensity of interface. In view of the enhanced role of farmer friend, it is recommended that their remuneration be doubled (to Rs. 1000/- per month per Farmer Friend).

Further, to effectively reach out to women farmers, who contribute significantly to farming system and family income kitty, it is recommended that 50 per cent (3.25 lakh) of the farmer friends across the country are reserved for women. The changed ratio will be in the larger interest of farming, as farm women play a major role in value added activities in agriculture including dairy, poultry, etc.

With presence of one farmer friend in every village, the country will have a vertically integrated and horizontally influencing extension system with last mile connectivity in every village across different production systems, positively impacting farm family incomes. The country will benefit with a strength of about 6.50 lakh Farmer Friend (FF) as village level extension facilitators at the door step of farmers. A local resident chosen through consensus by the local community will be more acceptable and serve as effectively as Aganwadis workers in ICDS and ASHA health functionaries in public health management.

It is very important to have multi-purpose extension functionaries at grass root level. Hence, the role of farmer friend under ATMA and at the proposed primary rural agri-markets (PRAMs) under new market architecture can be blended.

4.4. Annotation

Extension agents have been effective and credible sources of information dissemination to farmers. Due to changing face of agriculture, farmers have to make a number of complex decisions which become easier with face-to-face interface with extension functionaries. However, a situation of manpower deficit in extension exists and extension density is today not optimal.

In order to provide uninterrupted, timely and effective extension services to the farmers in agriculture and other sub-sectors, namely, horticulture, dairy & livestock management, poultry, fishery and farm linked on-farm and off-farm activities, it is essential to have an optimal blend of manpower and ICT, each being deployed to harvest its respective strength.

Filling up of 30 per cent of average existing vacancies; retaining the hired ATMA manpower on long term basis with requisite incentives; and using the potential of untapped resource base of agri-preneurs, input dealers and private sector extension service providers may prove effective in achieving an adequate extension density within the State

The states need to be encouraged to engage manpower in extension services at par with sanctioned strength, to improve upon the delivery of information and knowledge that will

facilitate doubling of farmer's income. The need of the hour is providing market-led extension services to the farmers, for which requisite information, intelligence and manpower support are a must. This support could flow from ATMA by placing the services of at least 25 per cent of the district manpower for marketing extension, with the State Marketing Department.

The institution of Farmer Friend needs to be strengthened with positioning of One Farmer Friend in every village. For effective delivery of this institution, besides increasing the number of farmer friends, it is necessary to reconsider the present remuneration to Farmer Friends, and enhance it to Rs. 1000 per month per Farmer Friend. Furthermore, at least 50 per cent of the farmer friend vacancies can be reserved for women.

There is an urgent need to strengthen the manpower in ATMA. To attract volunteers into short term agricultural extension services, attractive incentives such as reserved slots for advanced education (entry to post-graduation and Ph.D), priority in regular extension jobs with State governments, preference to experience in entrepreneur development schemes, international exchange programs and fellowship programs need to be considered and developed.

Key Extracts

- Conventionally, the density of extension functionary was governed by the Training and Visit system of extension. Based on scope for operational blending of public and private manpower and ICT, the DFI committee has rationalised the extension functionary to farmer ratio i.e. Hilly areas- 1:400, Irrigated areas- 1:750, and in rainfed areas 1:1000
- If only 30 per cent of the current vacancies are filled up, many states would get at par with the desired ratio. Other states would still face manpower shortage and hence need additional to fill the gap.
- The concept of 'One Village-One Farmer Friend' may be strengthened and promoted with 50 per cent of the vacancies reserved for women.
- High attrition rate in extension manpower needs to be checked by introducing performance linked incentives for field extension functionaries.
- Revised manpower strategy where contract employees get several incentives may be introduced to attract talent and maximise on quality contribution.
- Commercial agriculture requires added extension services for which reorientation of existing extension system is required, including incorporating banking and financial institutions, cooperatives, etc. as extension platforms.
- Market-led Extension needs to be promoted with the earmarking of requisite manpower (25 per cent of District manpower in Agriculture and Line departments and ATMA) for this purpose.

Chapter 5

Information & Communication Technology in Extension

Over the last about two decades ICT has intervened in all spheres of human living, especially in information dissemination and the agricultural sectors can be no exception. ICT in Extension can change agrarian situations through improving the access to information & knowledge sharing system, thereby enhancing farmers' incomes.

With the introduction of National e-Governance Plan-Agriculture (NeGPA) during last phase of the 11th plan, twelve clusters of services came to be identified. These includes pesticides, fertilisers & seeds, soil health; information on crops, farm machinery, training and Good Agricultural Practices (GAPs); weather advisories; information on prices, arrivals, procurement points, as also providing interaction platform; electronic certification for exports & import; information on marketing infrastructure; monitoring implementation / evaluation of schemes & program; information on fishery inputs; information on irrigation infrastructure; drought relief and management; livestock management.

5.1. Policy Interventions on ICT in Agricultural Extension

The National Policy for Farmers (2007) indicated that the potential of ICT would be harnessed by establishing *gyan chaupals* (Knowledge Centres) in villages. Further, the Common Service Centres (CSCs) of the Department of Information Technology, Ministry of Communications and Information Technology, Government of India and those set up by the state governments and private initiative programmes will be evolved for inclusive broad-based development. Last mile and last person connectivity would be facilitated with the help of technologies such as broadband internet, community radio or internet-mobile phone synergies (NPF, 2007).

The Document of ICAR Framework for Technology Development and Delivery System in Agriculture (2008) outlined the need for the construction of Agri-India knowledge portal – a single electronic gateway to be developed through a peer review process with the help of 15 content accreditation centres from 15 agro- climatic regions of the country. Each of these accreditation centres can coordinate with other Agricultural Universities and agricultural institutions in their region for development of content in regional language as well as in English. The data may also be validated and may be collected in the central data warehouse integrated in the knowledge portal. The portal may also optimally serve as a platform for facilitation of interaction among researchers and extension personnel in the KVKs through high speed server intranet.

Accordingly, a range of ICT initiatives/schemes aimed at providing information to the farmers on various value adding activities in the agriculture were introduced and are implemented by DAC&FW. These initiatives have been integrated in a manner that farmers are able to get real time information to facilitate their decision making. Such information is intended to be provided to farmers through multiple channels such as through public portals like Farmer Portal, m-Kisan Portal; Kisan Knowledge Management System, Portal on Crop Insurance Scheme, Portal on Soil health Card; and the latest being electronic National Agriculture

Market; Kisan Call Centres, Internet Kiosks, USSD (Unstructured Supplementary Services Data) and SMSs etc.

5.2. Major ICT Interventions of DAC&FW

Various ICT interventions have given a new look extension services, both- in terms of improving the outreach as well as the quality of information and knowledge being imparted to farmers. These interventions are discussed below.

- (i) **Kisan Call Centre Service:** Farmers are empowered to seek information by contacting the Kisan Call Centres (KCCs) currently located at 14 stations in different parts of the country through a Toll free no.1800-180-1551. A study report on decision oriented information system for farmers through KCC and Kisan Knowledge Management System (KKMS), m-kisan portal and farmers portal conducted by Centre for Management in Agriculture (CMA), IIM, Ahmedabad in association with Agro-Economic Research Centre, Directorate of Economics & Statistics submitted in August 2017 has revealed that KCC was the most important source of information to the farmers followed by fellow farmers, input dealers, Kisan melas etc. The most sought for areas of information included weather, plant protection, government schemes, market information, fertilizer use/ availability and that on varietal choice. The study also reveals that majority of the farmers expressed that there is a positive impact of KCC information on their production and income levels.
- (ii) **Crop advisories** in the areas of crop management, weather, market price, nutrient management etc. are being sent to more than 1.9 crore registered farmers throughout the nation. It is the KVKs, and District Agriculture Office of the state governments normally send these advisories every week. However, its customization for each district is in pipeline.
- (iii) **Innovative Technology Dissemination Components** like Pico Projectors, Hand-Held devices etc. have been added as an important part of extension reforms process already being implemented through the Scheme 'Support to State Extension Programmes for Extension Reforms'.

Latest and more effective way forward is use of mobile APPs: The initiatives include Agri market app, Crop insurance app and Bhuvan hailstorm app which have been developed and rolled out. KISAN SUVIDHA is another omnibus app where a farmer using a phone is able to serve himself with extension services supported by back end data from the farmer portal. A farmer is able to navigate by using GUI icons of crops like a leaf, shoot or root and identify the pest, insect or the crop disease. He will get to hear the solution/advisory/or opt to get a text message to read.

Other apps like Pusa Krishi which is to spread awareness about latest technologies and varieties and CCE Agri is to capture details of Crop Cutting experiments conducted under PMFBY.

Thus digital interventions have demonstrated the potential of providing quality extension service and supporting remote Extension-Scientists-Farmer interaction. The take away from these is, that ICT can be further strengthened as a component of agricultural extension and resolve the new challenges.

5.3. Impact of ICT for Agricultural Extension in India

Some impact studies on application of ICTs for agricultural extension have indicated, that the adoption of certain agricultural practices had increased seven-folds with use of ICT over the conventional extension approaches; and Digital Green project showing to be almost ten times more effective per unit of money spent.

Further, 85 per cent of adoption of improved technologies achieved through ICT was 85 per cent as against 11 per cent in case of traditional extension methods.

ICTs can effect a paradigm shift in the agriculture sector if brought into the extension system. Such a scope exists in multiple fields including crop production, crop protection, disaster management, market information, market participation, financial institutes and information, natural resource management, fishery, weather information, e-Governance, land administration, livestock management, food security, forestry, sericulture, input management, input availability etc. Alongside this, ICT is also making the farmers more aware and informed about their rights. It is giving voice to their thoughts and is bringing them together, if not always physically but virtually and enable among them a common goal and synergy of efforts.

5.4. Effectively use of ICT – Where and How?

Technologies like precision agriculture aid farmers in tailored and effective water management, helping in production, improving economic efficiency and minimising waste and environmental impact. Recent progress in Big Data and advanced analytics capabilities; as also agri-robotics such as aerial imagery, sensors, and sophisticated local weather forecasts can truly transform the agri-scape; and these tools hold promise for increasing global agricultural productivity over the next few decades. Based on the types of calls received in **Kisan Call Centre** and database of the queries, Big-data analytics can help in identifying flu/diseases outbreaks that could ruin a potential harvest.

Sensors in fields and on crops can provide granular data points on soil conditions, as well as detailed info on wind, fertilizer requirements, water availability and pest infestations. The use of **granular data and analytical capability** to integrate various sources of information (such as weather, soil, and market prices) can help in increasing crop yield and optimising resource usage thereby lowering cost. Unmanned aerial vehicles, or drones, can patrol fields and alert farmers to crop ripeness or potential problems.

Farming depends on a predictable climate from one year to the next. Climate change impacts on visible parameters like rainfall and temperature have begun to disturb the applectart of agricultural production systems evolved & stabilised over decades and centuries. The degree of

uncertainty in agriculture is increasing, making it more risky. Farmers need accurate **weather forecasts** for making rational decisions. Since, climate change and extreme weather events will demand proactive measures to adapt or develop resiliency, Big Data can bring in the right information to take informed decisions.

In schemes where large quantities of granular data are collected, like in Pradhan Mantri Fasal Bima Yojana, use of Data Analytics can actually help in drawing inferences and making policies. Crop sown area of a state can be juxtaposed with insured area statistics and subjected to analysis to find reasons for below or over insurance. Similar other factors can also be examined by putting more layers like Cadastral Maps on top of sown & insured areas. Since conducting of **crop cutting experiments** is a costly affair and demands lot of resources, major challenge is to reduce/rationalise the number of CCEs so that experiments can be done at selected locations only.

Satellite data and weather data can be utilized to cluster groups of IUs (Insurance Units) by mapping homogeneous IUs expecting similar yield/vegetative index mapping. On basis of vegetative index, crop areas can be categorised in different groups and for each group, defined number of CCEs can be conducted to arrive at yield of areas. Currently to make sure that CCEs are actually happening, one has to go through each and every picture. Some kind of **Artificial Intelligence** techniques can be used so that images can be recognized and odd one outs can be straight away removed from the lot.

Commodity Price forecasting is another area where Big Data Analytics can help in big way. The prices of the commodities fluctuates significantly in the semi-arid farming zones. The **price forecasting** information can help the farmer to know the price in advance that helps to take appropriate decision whether to sow that particular crop or not. Price Forecasting will also help Government in taking decisions on the changes needed to the minimum support price (MSP), import duty structure & policy etc.

The market prices also vary across the spot markets, and are also subject to fluctuations. It would, therefore, the farmers to take informed and rational decision on production, if price & demand forecast information is offered to the farmers before the cultivation season begins.

Rapid proliferation of mobile technologies in rural areas can allow farmers improve productivity based on the information received based on Big Data Analysis. Burgeoning data corpus offers unprecedented opportunities to understand preferences of farmers, and to deliver customized services to them thereby increasing production with timely and accurate information.

5.4.1. Harnessing big data analytics to increase productivity

The agriculture production system can only be expected to experience increasing pressure emanating from higher demands on it linked to continued population growth upto the year 2050. Further, with growing urbanisation, less of the population ratio would be directly linked

to agricultural production, while every individual would continue to remain intrinsically linked to agricultural output as a consumer. This manifested as demand, will feed agricultural growth. However, growth in demand can also lead to unplanned or prejudiced production which can stress the ecology and in turn lead to less food and water. Hence, the need will be for planned approach to production, to ensure sustainability in coming decades.

Agricultural system needs to feed the population and domestic animals including aquaculture while remaining ecologically friendly and resource efficient. To address this challenge, it is critical to provide new, digitally-enabled agro-services to farmers that will help increase yield while conserving resources, for example, through precision farming. To be successful in this endeavour, or be smart in agriculture, it will be critical to harness intelligent insights from data.

At the first instance, relevant data needs to be identified, captured and collated, and analysed for next level application. Today, various organizations are accumulating data of high magnitude and diverse in nature. The major challenge is that the data is available in silos and in different formats. There is no uniformity data structure, making analysis difficult. The need of the hour is a comprehensive and standardised approach to juxtapose all related data sets in an inter-operable manner, so that accurate analysis and predictions can be achieved.

The challenges and opportunities from data analytics is immense in a country like India with 654,000 villages and 130 million farmers speaking around 800 languages under 127 agro climatic regions capable of supporting 3,000 different crops and one million varieties.

Technology has the potential to assess and re-shape past trends for the benefit of society. The world is now more inter-connected, spawning massive data and exploration of this data can help to drive decision making that can transform the farm source-to-consumer supply chain. There are several touch points along the agri-value system and each of it holds critical information. Big Data has the potential to add value across each of the touch points starting from selection of right agri-inputs, monitoring the soil moisture, tracking prices of markets, controlling irrigations, finding the right selling point and getting the right price.

5.4.2. Use of ICT in monitoring system

Information and Communication Technology (ICT) is a blend of technology and communication platforms to transfer information through digital systems. It provides a range of tools for tracking the progress of schemes and efficient use of resources. In Agriculture, various flagship schemes have been launched by the Government to help farmers in all possible ways. Due to the federal nature of the Government, success of centrally sponsored schemes depends upon states and ownership level varies from state to state. Real time monitoring helps determine exactly when a scheme is on track and make changes as needed.

Lack of real time information from states often leads to delay in decision making. Thus, it is appropriate to have a Monitoring System in place, which will form the basis for modification of interventions and assessing the quality of activities being conducted. With the rapid spread of mobile phones and network coverage, smart phones that include Global Positioning System

(GPS) functions can be used for data collection. Short Message Service (SMS) through mobile phones can also be used as another affordable option for data collection system. ICT solutions can lead to cost & time saving and improve quality of information.

Dashboard Monitoring System

Monitoring System vis-a-vis the government schemes is an increasingly important phenomenon to track implementation and outputs diligently. Dashboard Monitoring System can enable the tracking of real time progress of various government schemes. The system can capture project related data and information including pictures, videos and textual information through ICT enabled devices. Information can be stored in secure format and transmitted from the field in real time to the central server. Information collected through such systems can be used to accurately and clearly assess the situation in the field for decision-making, planning and budget allocation. Policy-makers and government officials can assess and choose the most appropriate option based on the data reported in such monitoring systems.

In Dashboard Monitoring System, field data originating from the lowest unit can be monitored at all the levels in the hierarchy. Block, Districts, States and National levels. This will enable timely response for a solution, and simultaneously keeping all management functionaries in the loop. Auto alerts in the form of reports, SMSs or emails can be sent to all concerned so as to enable the mid-course corrections and effectiveness of schemes.

Dashboard Monitoring System is a necessary step towards establishing institutionalized mechanisms for achieving transparency and accountability. The adoption of robust and well developed system would certainly improve the implementation and performance of agriculture schemes.

5.5. Standardisation for Effective Inter-operability

In current scenario, many applications and datasets exist in silos. To get a holistic view and a standardised solution, inter-operability is critical, so that information can be exchanged among the systems and seamless integration can happen. Inter-operability addresses the open architecture of technologies and allows the software systems to interact with other systems and technologies.

Lack of data standards disables inter-operability and significantly slow down the adoption of emerging technologies. Standardization is critical to allow the production and export of data needed to support quality assessment, decision support, exchange of data. Developing a way to standardize and harmonize data is necessary, especially when working towards data interoperability among many different systems.

Metadata is identified as one of the methods to manage information by indexing and applying attributes at the "granular" level. An emerging use of metadata is the processing of large amounts of data for analysis and improving quality.

There is need for developing standards that make inter-operability possible by providing the protocols for actual transmission of data from one computer system to another. This will support all applications thereby allowing for to increased capabilities, flexibility and efficiency of operations.

5.6. Suggestions for Promoting ICT in Agricultural Extension

Modern communication technology has proven itself adequately in providing real-time information to farmers on such parameters as weather, market prices, pest and disease status, crop area and production etc. Greater use of ICT systems in extension will make agricultural extension more efficient. Some suggestions in this regards are made as under:

- (i) e-Agriculture Policy of national and state governments. It is necessary to adopt appropriate policy, and explore and outline the possibilities of leveraging ICT for efficient agricultural extension services.
- (ii) Deployment of ICT in extension system will enhance the its out-reach and efficient monitoring.
- (iii) Human Resource Development: Creating awareness on ICT potentials, ICT using skill and capacity development among the extension personnel of the public and private extension systems, and also among farmers and other stakeholders in the extension systems will facilitate efficient usage of ICTs. Hence, a comprehensive national e-Literacy Campaign may be organized covering all the stakeholders.
- (iv) Strengthening ICT Infrastructure: Extension organisations and extension personnel need to be equipped with ICTs for facilitating farm information among the agricultural stakeholders. Management information system be used in ATMA & KVKs.
- (v) Localisation and Customisation of content: Research & educational institutions and extension systems should continuously labour on content localisation and customisation as per the demand of the farmers and other stakeholders.
- (vi) Integration of ICTs with Public-Private Extension System: Appropriate ICTs to be identified and deployed in the extension system to complement ongoing extension efforts of the public and private extension systems.
- (vii) Collaboration among Farm Research and Developmental Institutions: Establish strong working collaboration among the ICT initiatives of the research and developmental institutions (IT solution providers). The leading research and educational institutions in agriculture and information technology solution providers should join together to leverage ICT penetration for agricultural extension.
- (viii) Convergence of Communication Methods & ICTs: For effective agricultural extension service delivery, the convergence of traditional extension communication methods (personal contact methods, print media, radio and TV) and new ICTs need to be blended optimally.

- (ix) ICTs & ICM: Integrating ICTs and Information and Communication Management (ICM) in agricultural extension will accelerate the pace and intensity of knowledge absorption among various stakeholders including farmers.
- (x) Social Networks & Open Source Material: Promotion of appropriate use of social networks and open source material to disseminate information among agricultural stakeholders needs emphasis.
- (xi) Promote Leadership and Find Champions: ICT interventions need leadership. The champions are needed to push projects forward and make them visible and interesting to the agricultural stakeholders. These leaders must operate from local to national level
- (xii) Provide adequate infrastructure such as, LCD Projector/ Pico Projectors, Tablets, Computers, Internet, Video conferencing facility etc to various extension functionaries operating at different levels.

Areas that are recommended for immediate ICT intervention are as follows:

- Setting up of an Integrated Portal on Agricultural Marketing by integrating websites of: e-NAM, AGMARKNET, APEDA, APMCs, CWC, SWCs, CACP, CCI, DMI, FCI, JCI, KVKs, MPEDA, NAFED, TRIFED, NCDC, NDDB, NHB, SAMBs etc.
- Establishment of AGMARKNET nodes at KVKs and Panchayats using BharatNet connectivity.
- Strengthening of FMC's efforts in disseminating AGMARKNET information through Electronic Display System in Public Places.
- Introduction of technologies for scientific grading of agricultural commodities and electronic records at Village level / Panchayat level.
- Digital access to timely agricultural credits facilities for small and marginal farmers, at reasonable rate of Interest by financial institutions.
- Operationalisation of ICT enabled market-led Extension at farm level.
- ICT enabled Life Long Learning of Farmers (L3F) for their Livelihood.
- Establishment of e-National Bank for Agricultural Technology (e-NBAT) at MANAGE, e-State Bank of Agricultural Technology (e-SBAT) at SAMETIs level and e-District Bank for Agricultural Technology (e-DBAT) at ATMAs level to converge and disseminate appropriate technologies to farmers
- Connecting and facilitating FPOs, SHGs and other farmers' collectives with ICT enabled platforms for e-marketing.
- Enhancing digital competencies of farmers and extension personnel.

5.7. Annotation

Information Communication Technologies (ICTs) refer to technologies that facilitate the creation, processing and transfer of information across space and time. Agricultural Extension

is the application of scientific research and new knowledge to agricultural practices through farmer education, and therefore, is central to agricultural growth.

The paradigms of agricultural extension, *ipso-facto*, include:

- (a) Technology Transfer
- (b) Advisory Work
- (c) Human Resource Development
- (d) Facilitation for Empowerment.

There are various case studies that demonstrate and corroborate that use of modern ICT tools has brought gainful information, knowledge and interaction among the farming community. In fact, in many cases, the facility also allows farmers to directly share among each other or direct others in need to available information.

The validation of available information in a centralised ICT linked repository is reiterated. Backstopping all ICT interactions would require a national level library and knowledge management systems, preferably through an e-platform at MANAGE (e-NBAT), and at State level in SAMETI and at District level in ATMA.

Kisan Call Centres have emerged as a premier and reliable source of information to the farmers. Every week more than 1.9 crore Crop Advisories reach farmers. Mobile apps, social media like facebook, whatsapp and others are popular and effective among e-friendly farmers. Other sources preferred by farmers is fellow farmers, input dealers, kisan melas, etc.

Both farmers and extension workers are increasingly seen to be utilising ICT tools, transforming the way they work. This deserves to be encouraged and provided greater momentum. It is now required to provide access Access to appropriate location specific and need based contents and advisory, in languages understandable by farmers. The information demanded, is increasingly farm-size neutral and the phenomena is one of demand for information that, is more specific to site, crop and market.

Digital technologies have the potential of creating a virtual extension functionary available to a farmer - any time anywhere - for quick transfer of information. With mobile phone penetration in rural India expanding rapidly, ICT mode of agricultural extension can bring scale, and efficiency to extension delivery, which was elusive till now.

ICT can suitably help in the management and diffusion of information, making the outreach more expansive and assured and mitigate concerns of duplication in efforts of manpower, shortfall in manpower and provide audio-visual flow of scientific and market information to the agricultural sector.

Key Extracts

- Need for the construction of a knowledge portal is reiterated – a single electronic gateway needs to be developed through a peer review process.
- Policy and budgetary support is required to bring in relevant ICT tools for use of extension functionaries. The e-Agricultural Policy of the National and State Governments should outline the scope of leveraging ICT for the agricultural extension services.
- Extension organisations and extension personnel need to be equipped with ICTs for facilitating farm information among the agricultural stakeholders.
- Content will be key and the establishment for e-National Bank for Agricultural Technology (e-NBAT) at MANAGE, e-State Bank of Agricultural Technology (e-SBAT) at SAMETIs and e-District Bank for Agricultural Technology (e-DBAT) at ATMAs to converge and disseminate appropriate technologies to farmers.
- Market intelligence and demand and price forecasting should encompass the full range of agricultural output. This information for local and at national level will help in planning of production at the farmers' level.
- ICT enabled information on post-production aggregation, warehousing and transportation also needs to be developed for enabling extension functionaries and farmers to suitably use the information.

Chapter 6

Empowering Women for Income Enhancement

Women are the backbone of the rural economy and women are the invisible farmers, often ignored in discussion, while they remain involved in both farming and marketing activities, often directly. Yet, they receive a fraction of the land credit, inputs, agricultural training and information compared to men. Not empowering them implies neglecting 50 per cent of the population and workforce, bringing an adverse impact on the agricultural sector.

6.1. The context

Rural women form the most productive work force in the economy of a majority of the nations, including India. Agricultural sector is the single largest production endeavour in India contributing 16 per cent of the GVA and is increasingly seeing women come to the forefront. Agriculture including various sub-sectors employs 80 per cent of all economically active women; they comprise 33 per cent of the agricultural labour force and 48 per cent of self-employed farmers. About 18 per cent of the farm families in India, according to National Sample Survey Organisation (NSSO) Reports, are headed by women. Beyond the conventional market-oriented narrower definition of 'productive workers', almost all women in rural India can be considered as 'farmers' in some sense, working as agricultural labourers, unpaid workers in the family farm enterprises or combination of the two.

The direct contribution by women across all the sub-sectors of Agriculture is often under-reported and inadequately reflected in macro-level data system. Several micro-level studies point to the fact, that women's participation in agriculture in India is anywhere between 60-75 per cent in most of the farm related activities, such as seed preparation for sowing, raising nurseries for seedlings, thinning, sowing, transplanting, weeding, preparation of fertilizers as well as application of fertilizer, in gap filling, winnowing, grading, shifting produce to threshing floor, cleaning and processing the grain etc. Some micro-level studies have even reported, that in selected activities such as cutting, picking, cleaning and drying of grains; and storage and processing, women's participation is almost 100 per cent. Several activities, such as weeding performed primarily by women, are recurrent daily activities lasting from time the seed is planted until it is harvested. This cascades into several hours of work investment by the women folk.

Even in respect of other sub-sectors of agriculture, like animal husbandry, fisheries and vegetable cultivation, women are involved in the core activities including in the marketing of the produce. In the dairy sector, almost 5 million women are active members of the milk cooperatives and as of 2016 there were 32,092 'women only' dairy cooperative societies.

Evidences from the nationally representative surveys, as well as various empirical studies, point to an overwhelming majority of women being involved in the agriculture sector, both as cultivators and agricultural labourers across rural India. The Census 2011 data on 'Cultivators and Agricultural Labourers' shows, that around 65.1 per cent of women workers depend on agriculture, either as cultivators or agricultural labourers, as opposed to 49.8 per cent of male

workers. It is also highlighted by NSSO, that 63 per cent of all female 'workers' and 75 per cent of 'rural female workers' are engaged in agricultural sector.

6.2. Women Ownership in Agriculture

Despite significant presence of women in agriculture, figures from various data sources present, that their ownership of land in rural households ranges just between 6-11 per cent. Data from the latest Agricultural Census of 2010 indicates, that women's holdings account for 12.79 per cent of all holdings, representing about 10.36 per cent of the total operated area.

Rural women are mainly engaged in agricultural activities in three different ways depending on the socio-economic status of their family and regional factors. They work as:

- (i) Cultivators doing labour on their own land.
- (ii) Managers of certain aspects of agricultural production by way of labour supervision and participation in post-harvest operations.
- (iii) Paid Labourers on others' farms.

National Sample Survey (NSS) data shows, that there has been steady decline of men in agriculture over the last three decades with their engagement coming down from 81 per cent to 63 per cent as compared to women, in whose case it has come down only marginally from 88 per cent to 79 per cent. This trend can be conveniently termed as "*Feminization of Indian Agriculture*" As more and more men have moved to non-farm work in the industrial and service sectors, women have remained in agriculture in substantive manner.

Women's contribution on farm and even in home is, however, not computed in monetary terms, thereby by-passing them to a large extent, in planning schemes & programmes, and also in developing strategies to successfully implement them. This paradigm assumes greater significance due to lack of gender dis-aggregated information and data. This is perhaps one of the key reasons for women's limited access to productive resources such as capital and credit; facilities and support services; land & markets; research and technology development etc.

Though the number of women cultivators and labourers has been increasing, the rate of increase as agriculture labourers is relatively higher among them as seen in the rise from 20.8 million in 1981 to 59.1 million in 2011. In India, the typical work of the woman agricultural labourer or cultivator is limited to less skilled /repetitive and drudgery filled jobs, such as sowing, transplanting, weeding and harvesting. Many women also participate in agricultural work as unpaid subsistence labour. According to United Nations Human Development (UNDP) Report, only 32.8 per cent of Indian women formally participate in labour force, a rate that has remained steady since the 2009 statistics. By comparison, men constitute 81.1 per cent. This data does not reflect the ground truth.

"Gender Mainstreaming' is one of the important pillars of the National Policy for Farmers

(NFP) formulated in 2007. In line with the Policy directives, it is mandated to take appropriate structural, functional & institutional measures to empower women in agriculture and allied sectors. As per the NPF, the status of 'Farmers' is to be granted to anyone who tills the land, while in reality the current practice of identifying a farmer is linked to land ownership. The sharecroppers, salt farmers and pastoralists who are engaged in agriculture and allied activities in several ways do not have ready access to government schemes, support services, compensations and insurance facilities, deprived thereby of various government developmental programmes and welfare activities.

6.3. Women in Agriculture - Constraints in their Contribution

Gender Bias: Women suffer from a statistical *purdah* as a result of which, their contribution is not recognized. They often have heavier workloads than men and bear virtually sole responsibility for family welfare and household management. However, they have either no or at best limited control over productive resources. This is also rooted in gender biases in labour markets and wage rates and has even resulted in their inadequate access to information about rights, opportunities, and support programmes etc. Increasing feminization of agriculture and the agricultural workforce, with little recognition of their role in land and livestock management, has meant that women have largely remained invisible to the government in terms of agricultural policies, schemes, programmes and budgets as well as formal support system such as credit, extension, insurance and marketing services.

Gender discrimination, rooted in law and custom, is pervasive and impedes socio-economic development. Rural women are much more over-burdened than men owing to their multiple involvements. Researchers on women in agriculture have revealed, that on an average, women work for 15-16 hours a day. Studies further reflect that farm activities, which are time and labour intensive, monotonous, respective and more drudgery prone, are generally delegated to women. Since these operations are done manually, they cause considerable physical and mental fatigue and health problems.

Development Bias: Despite the contribution of women in the production process, persistent bias of development planners in treating them primarily as consumers of social services rather than producers, kept them away from the development programmes in agriculture and allied sectors. Some of the new agricultural technologies are reported to have affected farm women adversely. Green revolution had led to the dispossession of small women land-holders, forcing them to join the ranks of wage earners. Wherever the new agricultural technology has led to multiple cropping, the work load of women has increased too. While a number of tasks performed by men have been mechanized, the tasks usually allotted to women continue to be manual and suffer from drudgery. Even where improved techniques have been found for the women's activities, there is not sufficient access to training in such techniques.

Limited Access to Resources: Many of the constraints that rural women are confronted with are similar to those that all resource-poor farmers confront, such as lack of access to land, credit, training, extension and marketing facilities. But, for social and economic reasons,

women's constraints are more pronounced and, in general, development interventions that seek to remove constraints for poor farmers do not reach women. Consequently, the development of technologies specifically tailored to women-centric occupations and the involvement of women in technology development and transfer have received inadequate attention from both scientific and administrative departments of governments.

Women's lack of access to land or insecure tenure continues to be a major obstacle in increasing their contributions and benefits. When women have access to land, they often do not have secure tenancy and tend to have smaller and less productive plots in comparison to men. While land access is increasingly problematic for poor men and women, women's access faces further restriction by inheritance laws and customs. Rural women-headed households are especially affected by land constraints.

Women generally face budgetary constraints as well as credit risks. Presently, despite mainstreaming directives, the funds within the schemes and programmes are hardly allocated for them. The utilization is also not reported separately for women. Current budgetary allocations for women in agriculture need to be critically reviewed from a gender perspective, as well as the rationale for enhancing allocations and strengthening of its planning, implementation and monitoring, across various schemes needs to be delved deep and argued against the biased context. With regard to women's access to credit, in places where women are legally entitled to access to financial institutions, they face problems getting loans because they often belong to the poorest section of the rural population. Rural financial institutions are also often hesitant to accept women clients because they are unable to meet collateral requirements and are inexperienced borrowers.

Inadequate access to Markets: Women engaged in agriculture, forestry and fishery tend to produce small quantities and have poor access to organised marketing and cooperatives. Therefore, women sell mainly to private traders and have low bargaining power. Institutions which promote women's group access to market need to be strengthened. Successful examples are of SEWA, Gramin Bank, SHG Federations etc.

Lack of technology refinement for women: Women only benefit from agricultural support programmes if the information, technology and methods imparted are relevant to their production activities. However, agricultural research is generally much less oriented towards adapting technologies to women's physical status or towards addressing their tasks. Women's low productivity stems mainly from lack of appropriate technologies suited to their work.

Inadequate Extension Support: Women farmers also suffer from inadequacy of efforts in terms of content appropriateness and reach. The need for innovative changes in extension programmes for women farmers is felt. The experience of implementing central sector scheme "Women in Agriculture" and various externally aided programmes by the Department of Agriculture, Cooperation & Farmers' Welfare and Mahila Kisan Sashaktikaran Pariyojna of Ministry of Rural Development, has been encouraging as seen from the results and warrants

up-scaling of these efforts and strategies. The need for capacity building and skill up-gradation of farm women has now begun receiving the priority it deserves. Special extension and technology dissemination programmes for women are being implemented. However, the span of attention and pace of execution need to be consistently intense, to catch up with the lagging status of women.

6.4. Policy and Programme Environment for Women in Agriculture:

Women farmers face increasing barriers of access to entitlements and support for agriculture. These days, both the central and state government agriculture departments require farmers to do an online registration on various portals to access support and benefits from various schemes, with the exception of farmer registration for SMS information services. Farmers cannot register themselves unless they have land records in their name which effectively ignores the reality of skewed land ownership picture of the country and systematically excludes the women farmers. The Direct Benefit Transfer will effectively deny access to agricultural inputs and extension services for women farmers working on their own family lands, as sharecroppers and women's collaboratives, who lease land.

Hence, the recognition of a farmer has to be de-linked from land ownership and alternate “**Know Your Farmer**” (KYF) norms are suggested to recognize, as also grant the status of a farmer to the farm women, even when they do not own land, and therefore, not barred from consequent entitlements.

According to reports by FAO, if women farmers in developing countries have equal access to productive resources as men, their productivity can be enhanced by 20-30 per cent and agriculture production could be raised by 2.5-4.0 per cent. Hence, there is a need to create *an alternative systems for farmers' registration* based on notified norms at panchayat and village level, that certifies individuals engaged in agriculture as farmers irrespective of gender and land ownership. This would be an important source of income growth from the farms.

It brooks no delay in introducing various policy measures that will empower women in farming & allied areas. These include a more equitable approach to land ownership such as ‘joint pattas’ for both homestead and agricultural land; credit access through speedy issue of Kisan Credit Cards; creating multiple livelihood opportunities through crop-livestock farming systems, agro-processing, etc. This egalitarian mechanism is not only necessary to improve the lot of the women farmers, but also is in the interest of farm productivity and incomes. With increasing instances of out migration of men to urban & industrial centres in search of jobs, the women left behind to manage agriculture will be able to do so better, if ownership right is bestowed upon them.

6.5. Approaches to Mainstreaming Gender Concerns

An egalitarian approach to gender based concerns in development of agriculture is necessary. Some of these matters are being addressed by (i) earmarking 30 per cent of funds for women under various major schemes/programmes and development interventions; (ii) introducing

'pro-women initiatives' to help women derive the benefits of all beneficiary-oriented components of different programmes/ schemes and missions; and (iii) focussing on formation of women Self Help Groups (SHGs), Women Federations and Farm Women Producer Organisations /Companies; capacity building interventions; linking them to micro credit; enhancing their access to information and ensuring their representation in decision making bodies at various levels.

As part of mainstreaming gender concerns in agriculture, the Department of Agriculture, Cooperation & Farmers' Welfare (DAC&FW), has initiated steps to earmark a certain percentage of budgetary allocations for women farmers in of its beneficiary oriented schemes. Under the DAC&FW, Seeds, Crop, Cooperation, Horticulture, Extension, Marketing, Farm Machinery and Tools etc., are some of the key subject matter Divisions that promote schemes aimed at women farmers, with some having earmarked 30 per cent of budgetary allocations for women. This is a good initiative and needs closer supervision and monitoring to ensure, that it is the farm women who are really benefiting. An MIS based monitoring is necessary to ensure, that the intention behind such a budgetary reservation is actually acted upon.

Various 'Pro-Women Initiatives' taken by the government include-Support for Farm Women's Food Security Groups at the rate of 2 (two) per Block with financial assistance to the tune of Rs. 10,000 per group under ATMA Scheme; inclusion of one '*Gender Coordinator*' in every State in the team of committed extension functionaries again being supported under ATMA Scheme; involvement of women in various decision making bodies at various levels viz. State, District and Block levels to the extent possible and elicit their say in planning and implementation of Block and District level training and extension activities; development and regular delivery of Gender Sensitization Module, namely, 'Capsule Module on Gender Learning' & its delivery through all ongoing training programmes organized by National (MANAGE), Regional (Extension Education Institutes) and State (SAMETIs), level institutions; revision of reporting formats of all beneficiary oriented schemes to ensure flow of gender dis-aggregated data and giving preference to involvement of more women as 'Farmer Friends' under the extension delivery mechanism below the block level. It is proposed that the current system of 1 (one) farmer friend per 2 (two) villages be revised to 1 (one) per village and efforts must be made to induct only women in this process. This will establish that almost 50 per cent of farmer friends are women.

The Government is also providing additional assistance to women through higher rates of subsidy. Such schemes include Agri-Clinics & Agri Business Centre Scheme, where the rate of subsidy is 44 per cent for women as compared to 36 per cent for men; Integrated Scheme for Agriculture Marketing where it is 33.33 per cent for women in comparison to 25 per cent for others; SMPP (on total cost of equipments) for opening mass production unit for Bio-Control Agents, where it is 50 per cent for women organisations, SC, ST as against 35 per cent for general category. Similarly, additional financial assistance of 10 per cent is available for women under sub-mission on Agriculture Mechanisation for procurement of agriculture machinery/equipment including post-harvest (PH) equipment. This is however not enough in view of women's involvement in all seven growth engines as identified in DFI Report Vol. IV

6.5.1. Budgetary allocations for Women in Agriculture

As elaborated above the DAC&FW has been earmarking allocations to an extent of at least 30 per cent for women under its flagship schemes such as sub-mission on Agricultural Extension (SMAE), National Food Security Mission (NFSM), National Mission on Oil Seed and Oil Palm (NMOOP), National Mission on Sustainable Agriculture (NMSA), Sub-Mission for Seed & Planning Material (SMSPM), Sub-Mission on Agricultural Mechanisation (SMAM), Mission for Integrated Development of Horticulture (MIDH) and Pradhan Mantri Krishi Sinchai Yojana.

However, evidence from various empirical studies suggests that this is not enough.

- Firstly, the growing presence of women in the agriculture sector over the years, has not been matched with equally substantial increase in the allocations for women farmers. The allocations in some of the beneficiary oriented schemes have been pegged at around 30 per cent without any specific rationale or basis to substantiate the same; these are not in proportion to the number of women involved in the particular sectors. This is only a good beginning and now needs to be refined and allocations made in consonance with the women's share under each scheme.
- Secondly, a look at various schemes of the DAC&FW shows, that as on date out of 55 odd schemes (subsumed now broadly under 7 missions), only around 14 schemes have specifically earmarked allocations for women. Significantly, there are no special schemes under the department that are either meant for women farmers exclusively or those which seek to address the special challenges of women farmers in difficult conditions (e.g., rainfed agriculture) across the country.

As per the budgetary allocations reflected in the Gender Budget Statement (Statement 20) of the Ministry of Agriculture & Farmers' Welfare (MoAFW) for the financial year 2017-18, it is seen that out of the total budget size of Rs. 51,026 crore, Gender Budget allocation for various schemes together works out to just 4,388 crore or little more than 8.6 per cent of the total budget. Further, these allocations and the actual expenditure incurred on women may not finally match at the end of the year. The amendments that aim to correct social-inequalities normally begin more with a welfare motive, while they should be more driven like hard-nosed programmes. Hence, in case of farm women, the allocations and expenditure, as also quality of implementation must be proportionate to the size of farm women, if gender mainstreaming has to be quick and real.

More importantly, the women farmers need to be enabled to benefit from these allocations by imparting them the right to do so. This will primarily emanate from conferring on them the land title, besides promoting institutions like Joint Liability Groups (JLGs), legalising land lease etc.

6.6. Women oriented Mass Media and ICT Support

All spheres of human lives including the process of information dissemination in agriculture sector have come to be influenced substantively of ICT. While, the ICT led extension systems are capable of changing farmers' lives by improving access to information and sharing knowledge through click of a button, they are far more important and essential for women farmers who are overburdened and hard pressed for time.

Affirmative action is called for to duly recognize women farmers, challenge their stereotypical symbolisation in mass media coverage, scheme related extension material and their representation on State website home pages.

Women have never been acknowledged as farmers even though making substantive contribution and women farmers have rarely found adequate and appropriate representation in State owned sponsored mass media, be it Print, TV and Radio programs. The same has continued in the virtual world too. The 'Farmers' Portal' displays adverse implications of such policy choices for the gender inclusion agenda, as detailed below.

The Farmers' Portal of the DAC&FW commits to provide all informational needs related to agriculture and its allied sectors to farmers and other stakeholders. The vast data covers all aspects related to farming including insurance, storage, extension activities, seeds, pesticides, farm machineries, fertilizers, market prices, package and practices, programmes, welfare schemes, soil fertility, training, etc. and is available in an interactive map. It brings together various websites of different departments and organizations related to agriculture and allied sectors from the state and central government and 'Links' have been provided to relevant external websites such as the Kisan Knowledge Management System and Kisan Call Centres; and the pan-India AgMARKNET.

One of the key issues with the Farmers' Portal, when viewed from women's perspective, is that it assumes that a land owning, male person is alone a farmer. This needs to be corrected to project a more inclusive picture. It is also closely linked to the demands of women farmer groups for broadening the operational definition of farmers in agricultural policy and programme frameworks that would lead to recognition of women as farmers. By this underlying assumption, it structurally excludes vast majority of farmers who happen to be women. At the time of online registration, "Women" is added in the applicant category of farmers along with large, small, marginal, and other farmers. It ignores that women too can be large, small or marginal category farmers. Therefore, the options need to be placed accordingly. This is an illustration to suggest a paradigm change at policy formulation and implementation levels, with a view to recognizing the status of farm women.

The format ignores other vulnerable identities like physically challenged farmers or identity of single women, while seeking information during online registration. The online registration form gender cell drop down menu has only two options – either Male and Female and it does not acknowledge third gender identity. The only exception to this is NIPHM website which

provides space to share such identity details as transgender and physically challenged while registering for training. It may however be noted, that NIPHM registration is primarily used by professionals and not farmers.

Information generation and knowledge creation are conceptualized as an expert-driven process with the farmer's role being reduced to that of a seeker rather than an active co-creator. The extensive traditional knowledge of women in dry land farming, seed preservation and selection, collecting and foraging nutritious tubers etc. finds no place on this portal.

Further, the high rates of illiteracy amongst women, especially amongst small and marginal women farmers combined with limited access to ICT aggravates the situation. The portal as is, cannot be accessed by vast majority of such women farmers.

The portal does not leverage the knowledge generated by the community resource persons/women farmer leaders, who have provided extensive extension education services through farmer field schools /farm schools in State wide programmes such as CMSA in Andhra Pradesh or MKSP of MORD across the country. Additionally, women farmers are not duly acknowledged on the home page pictures of various links. On one hand, it is heartening to find faces of women farmers on few of the sites, a big majority of the related websites do not adequately represent women farmers in the same way as they include male farmers in their home pages or at times completely miss out on women's role and identity as farmers.

Farmers can get information as of now by contacting the Kisan Call Centres (KCCs) located at 14 stations all over the country through a Toll free no. 1800-180-1551. The services of KCC are to be refined by earmarking specific hours for answering farm women's queries and redressing their problems. In determining the vulnerability of the farmers, other factors linked to physical constraints and single status of women may also be given due weightage, in addition to parameters like land holding and social class.

Peer learning is the most effective form of learning for farmers and particularly for women farmers. Forms of peer learning such as farmer field schools/farm schools, oral learning methods and tools should also form the content creation by women farmers themselves for the portal. Literacy also is a barrier to learning and can be addressed by combining use of the portal with physical interface collective spaces at the level of women's collectives. Dedicated space and programmes for learning and sharing between women farmers needs to be created at every Krishi Vigyan Kendra and State Agricultural Universities to participate meaningfully in the portals.

Various other public portals like m-Kisan Portal, Kisan Knowledge Management System, Portal on Crop Insurance Scheme, Portal on Soil Health Card and the latest in series the National Agriculture Market portal may have separate women's corner under which the State specific gender interventions, technology refinements in favour of women, success stories of women and best practices for gender addressal in agriculture could be given.

Innovative technology dissemination components like Pico projectors, Hand-held devices etc. have been identified as effective extension tools and are supported under ATMA programme. The provision of such tools to Women Farmer Friend/ women extension functionaries would help women farmers to get benefits of such ICT interventions. Moreover, on the pattern of Digital Green, videos on key technologies and practices may be got developed and shown during trainings.

With mobile phone (both feature and smart) penetration in rural India expanding rapidly (from 1.4 units per 100 people in 1995 to 51 units, or one phone per 2 persons currently), Digital Agriculture as a mode of extension can bring scale, and efficiency to Extension, which was elusive earlier. Some good models of ICT in Agriculture include - NEGP-A, Digital agriculture; TN –FCMS, Bhoo Chetna, Maitrikatha; Private players-RML Ag Tech; Mkisan etc. These can be further improved upon to meet farm women's requirement.

The eligibility criteria required to access government schemes and services, circumscribed by land ownership and possession of the land title is not representative of the field situation as brought out earlier. The larger issue of 'who is a farmer' is critical from the perspective of doubling farmers' income. Hence, this definitional issue has been addressed in DFI Volume XIII under 'Governance Framework'.

6.7. Women and Research

Along with an in-depth understanding of women's involvement in agriculture all along its value system, suitability of available technological options for them is an equally important issue. In order to reduce drudgery of work and improve work efficiency of women in agriculture, the technology designing and agronomics have to keep their specific issues in mind. As such, research on gender issues in agriculture and allied sectors including technology refinement in favour of women has to be an ongoing and gender sensitive activity.

The Central Institute for Women in Agriculture (CIWA), Bhubaneswar is the only centre mandated to push research agenda for women by way of participatory action research in different technology based thematic areas involving rural women. The Centre has been assessing suitability of available technologies for them and suggesting measures to make them women friendly. It also works to catalyse and facilitate R&D institutions to bring in farm women's perspective in their programmes. Besides, an All India Coordinated Research Project (AICRP) on Home Science 12 coordinating centres spread across the country as in operation with a view to developing a strong base for research and extension in State Agricultural Universities for improving the quality of life of rural families. This type of project initiated during the VI Five Year Plan Period, was subsequently merged with the then DRWA (Directorate of Research for Women in Agriculture) in XI Five Year Plan Period. The DRWA is now known as CIWA.

The AICRP on Home Science basically integrates all the five components of Home Science

(now Community Science), namely, Foods and Nutrition, Clothing and Textiles, Family Resource Management, Human Development & Family Studies and Home Science Extension Education. Each discipline has a specific thrust area of research that has been interwoven to focus on empowerment of women in agriculture. At present, the AICRP on Home Science is being implemented through its 12 Centres located at different State Agricultural Universities of the country, with their focus currently being on -

- Food & Nutrition security in selected farming system
- Drudgery assessment and mitigation
- Mitigating occupational health hazards
- Capacity building of agrarian families
- Empowerment of women

However, most of the times such research studies are highly location-specific thereby constraining their applicability across nation. Also, for the research work taken up under AICRP through identified 12 Centres, there is no formal mechanism to share the outcome and recommendations with the development agencies for its popularization among women farmers of different States. It is, therefore, essential to take up need based research activities linked in principle to feedback received from development agencies based on its adoption and performance in the field.

One of the recent developments that may prove to be a setback to farm women related education and research is the decision of the ICAR to rename the colleges of Home Science/Rural Home Science, set up under the SAUs as 'College of Community Science'. This will dilute the sharpness of attention that the farm women need, in respect of their multiple associations with rural agricultural society. The rural society in the country today is getting differentiated, with structural changes relating to activities in employment and income generation. Hence, Community Development may not represent farm women in particular, which is what the education in Rural Home Science or its variant name(s) is/are supposed to focus on.

It is, therefore, suggested that ICAR may reconsider restoration of the name and may preferably call it as 'College of Family and Community Science' and offer degree and post-graduation in 'Family and Community Science'.

6.8. Empowering Women - Suggested Actions

The following strategies/initiatives considered important for empowering women in agriculture need to be given a big push:

- i. **Recording women cultivators in cultivation records:** One way of recognition of women farmers' work, and giving them a decision-making voice in the land use/agriculture would be to introduce women's name in the land records as a **cultivator** (in the relevant column in cultivation records (called khata, pani patrak, pahani etc.) separately, wherever they are

farming on their own lands or on tenanted lands. Currently, the practice is to only record the name of land owner unless it is contested. Cultivation by family members (women) is not recorded separately.

Recording the name of women cultivators or those who labour on their own family farms in the cultivation records can form the basis for her becoming eligible for the benefits of credit, inputs, insurance and compensation. This important step will go a long way in helping women farmers gain access to agriculture services, inputs, such as credit, other schemes and subsidies at par with male farmers. With this inclusion, women will also have decision making voice in sale of land or any other transactions done on land as collateral. There may also be a need to examine if there is some other change required within the State Land Revenue Acts; and if this is not necessary, then instructions can be given through a simple Executive/Government order to all frontline Revenue Department offices to record and update the cultivation records in their respective jurisdiction with the name of women cultivators, where woman is also engaged with the other members of the family in land cultivation.

ii. **Enumerate/register various categories of women farmers:** Land Revenue, Agriculture and Rural Development Departments at the state level may work in tandem to identify and enumerate/register various categories of women farmers from the revenue village upwards in a time bound manner backed by suitable guidelines issued for this purpose from the concerned ministries including the Department of Land Resources, Ministry of Rural Development at the central level. The process to be adopted for this enumeration would be broadly like the one followed for registering workers and entitling them to job cards under the MGNREGS being implemented all over the country.

The registration drive must be backed by wide publicity and required budget to enable all categories of women farmers to self-register themselves and avail identity cards as farmers. This could be a concrete step in operationalizing the inclusive definition of farmers as per the Policy Guidelines (National Policy for Farmers, 2007). To begin with, all the farmers' interest groups, members of rural women SHGs promoted by the government under NRLM or any other programme can be enlisted and given farmer's cards.

A norm based approach to 'enlisting a farmer – whether men or women, even when they do not own land, but are actually engaged in farming or allied activities needs to be developed, for the limited purpose of gaining access to agriculture related entitlements. Further, the list can be dynamic, so that inclusions and exclusions can be made on a year to year basis. **The guiding principle should be, that let there be no rightful exclusion and it does not matter if there is a wrongful inclusion. And the available ICT makes this an easily doable thing.**

iii. For ensuring flow of optimum overall support and maximum services to Farm Women in all villages of all States and UTs, the pattern followed under the Scheme '**Assured Maximum Services to Marginal People in All villages of Tamil Nadu**' and '**Mahila Kisan (Farm Women) Sashaktikaran Pariyojana**' of Ministry of Rural Development being implemented in projectised mode for livelihood generation under **National Rural Livelihood Mission (NRLM) needs to be up-scaled and replicated.**

iv. The Cooperatives have for long been seen as a social institution providing partnership, solidarity and resources to women farmers as well as in tackling and fighting gender inequalities. 'Women-only Cooperatives' in areas such as dairy, banks, stores, food vendors, have not only been critical in empowering and educating women, but have also done quite well in providing a whole range of services to their members. Despite this, women's participation in cooperatives is still relatively low.

Some studies reveal that only 7.5 per cent of women participate in the cooperatives as compared to 92.5 per cent of men. Till recently, of India's 450,000 cooperatives with a membership of 204.5 million, there are only 8,171 'women cooperatives' with a total membership of 693,000 women. Organising women SHGs and federating them to form 'All Women Cooperatives' is another need of the hour. These should be used as Extension entry points and platforms for building the capacities of women. There is need for leadership development, entrepreneurship development and digital competencies. Transformational approach may be required to move from 'micro credit' to 'micro-enterprises for enhancing farm families' income.

With a view to involving women in the process of decision-making in local self-governing bodies including cooperatives, at least 33 per cent representation should be instituted in all States/UTs across all boards of directors with women serving on them. Organizations such as the Self-Employed Women's Association (SEWA) have been working very successfully in India with partners to form a membership of 1.24 million women in India. Fifty four (54) per cent of members are agricultural workers. Agricultural Extension System providing input delivery services, production and post-harvest support services needs to emphasise on following a market friendly approach to integrate the individual value- chains, especially those involving women farmers.

It would help adopting and scaling up innovative examples for improving women's access to land by long-term leasing of community wasteland/fallow land to women SHGs for collective farming; land development, grain storage facilities; seed banks, implements & infrastructure support and micro capital assistance. There are examples of long term land leasing of land in the name of women farmers; support in the form of seed banks & grain storage bins, provision of technological & managerial support along with a reasonable amount of revolving fund for empowering women in agriculture sector. These are illustrations that can be scaled up as also replicated in other agriculture related domains.

Independent evaluations of two UNDP supported gender programmes of Andhra Pradesh & Orissa (now Odisha) executed by the Department in the past have demonstrated favourable results, which show that financial support in the form of Micro Capital Assistance, has led to procurement of land on long-term lease basis for cultivation by women group members. This has adequately strengthened food security at household and community levels, thereby breaking the cycles of indebtedness through internal lending of grains etc. among the group members. With focussed interventions under these projects, approximately 50 per cent of the Women Groups were found to have had over Rs. 50,000 - Rs. 100,000 savings in their accounts with the money having been successfully rotated over two to three times. The dependence on money lenders had substantially reduced and the lands that were mortgaged to money lenders were got

released. This calls for replication and up scaling of such successful interventions.

Additionally, the development of women owned individual land holdings in convergence with MGNREGA, watershed development and natural resources management programmes to promote soil and water conservation, fish ponds, horticulture, sericulture etc., with special focus on tribal areas where women farmers have acquired land ownership under the Forest Rights Act may give more impetus to this initiative.

'Agriculture for Nutrition and Health' (A4NH) projects having potential to support women's empowerment and income generation through rearing of backyard poultry, dairy, piggery, goat and sheep rearing etc. need to be conceptualised and implemented. Besides adding to livelihood support, these activities have the potential to enhance the nutritional security of rural households, particularly the Women-led households. If support for such interventions is provided to all farm families (approximately 12 crore), this may not only have tangible results in doubling the income of farmers but may also reduce their expenditure on health related problems by ensuring food and nutritional security. **Women are strong and potential catalysts and ambassadors of change.** Out of the seven pathways, from 'agri. to nutrition' three are related to women empowerment. Women's role is very critical along the entire food system chain. There also needs to be convergence with the Anganwadi network across the country for strengthening agri-nutri linkages. The Health and Food industry can become a potential area for making strategic interventions by pro-actively involving women, and take another step towards doubling of farmers' income.

v. Promoting women SHGs in operationalisation of on-farm and off-farm micro-enterprises such as raising crop nurseries, vermin composting, agri-input dealerships, basket weaving, insect-repellent agarbatti making etc., with proper forward and backward linkages and support for markets can go a long way in enhancing income of farmers. However, for all such efforts considering women as 'farmers' in line with the provisions of National Policy for Farmers (NPF) 2007 is a must.

Besides, training and capacity building of women SHGs in both, the managerial aspects as well as in subject matter areas are very important to help them participate in rural good governance through effective contribution in Gram-Sabha meetings. Women participation would also provide an egalitarian addition to social audit activities, land records modernisation, and in preparation of gram panchayat development plans, village disaster management plans and various other micro-planning initiatives.

vi. Provide direction to the Agriculture Extension System to leverage its knowledge and proximity to farmers for greater empowerment of rural women. This is essential, in view of the absence of a strong panchayat level extension system in the country. The skewed ratio of women extension personnel can be addressed by recruiting more women and building cadre of women para extensionists.

vii. Family farming with multiple approaches based on crop, animal husbandry, agro forestry and mixed integrated farming can boost incomes by facilitating earnings from all

sources like main crop, inter crop, border crop and income from diary animal as well as backyard poultry of desi birds.

viii. Strengthening of National Gender Resource Centre in Agriculture (NGRCA) and intensifying its activities such as providing advisory and advocacy services to States, bringing out literature and print publications like the ones recently brought out by it, titled 'Handbook for Women Farmers' carrying women specific provisions in agriculture sector' in regional languages; compendium of agriculture tools and technologies and undertaking macro and micro level studies and action research in critical thrust areas related to women in agriculture is also very essential in tapping and exploiting the resource base of women farmers in enhancing the income of farmers

ix. Institutionalising the recommendations of NGRCA Study (2015-17) on Schemes for 'Improving Women Farmers' Access to Extension Services & Gender Mainstreaming in Agriculture' which suggested key structural changes in ongoing agriclinics & agribusiness centres (AC&ABC) and ATMA as given below is also important from women's perspective.

AC&ABC:

- Highlighting the success stories of women agri-preneurs through all social media, to popularize the whole concept of agri-preneurship among young women.
- Sensitization of final year girl students at University/Graduation levels by inviting successful women entrepreneurs to share their experiences.
- Connecting aspiring women entrepreneurs to various Technology and Business Incubators (TBIs) and mentoring them as being practised successfully under the Kudumbashree Model of Kerala.
- Introduction of Stream-II of ACBC Programme for Women Non-Agriculture degree holders along with Certified farmers of 'Recognition of Prior Learning (RPL) who have hands on experience (of at least 5 years) in Agriculture.
- Improved access to subsidy/collateral security / Intra-bank transfer of loans to women agri-preneur, her parents/ siblings/ husband/in-laws, etc.
- Modifying the scheme to incorporate a provision for upfront subsidy for women agri-preneurs.
- Inclusion of Mudra Bank and NBFCs (Non Banking Financial Companies) as eligible Financial Institutions for disbursement of bank loan.

A certain percentage of Mudra loans and physical targets may be reserved for agri-preneurship, with a sub-reserved percentage for women agri-preneurs.

ATMA Scheme

- At least one woman farmer friend (WFF) possessing requisite qualification (Senior Secondary/High School) and duly trained be placed in every village to serve as a link

between the women farmers of the village and the extension system required to provide/facilitate provision of support services to the farm women of the village.

- One of the 3 (three) Farm Schools supported in each block under ATMA, should be exclusively dedicated for women farmers and should be operationalised by the woman farmer on her own field.
- Exposure Visits (Intra-district, Intra-State and Inter-State) may be exclusively organised for Farm women as per their strategic needs and in areas of their interest.
- Funds with separate budget head be allocated, utilized and reported for training and extension activities of women farmers including use of ICT.
- Pioneering venture of SEWA (<http://www.sewa.org>) using “Video” as tools for “mobilizing and communicating” their experiences with women in neighbouring villages can be replicated for ATMA and other programmes having gender components.
- For imparting necessary skills to promote agri-entrepreneurship among women, Farm Women Centric Qualification Packs (QPs) for various job roles in critical thrust areas related to Women in agriculture be developed. Allied sectors such as horticulture, dairy, poultry, fishery, apiculture, agro-forestry, water management, post-harvest (Agri-supply cold chain), marketing, processing and mechanisation etc. may be included in this exercise and such Qualification Packs may be developed and promoted by Agricultural Skill Council of India (ASCI), Ministry of Skill Development & Entrepreneurship (MSD&E) in collaboration with SAUs, ICAR Institutes and other related organizations involved in skill development of Farm women.

x. Other initiatives suggested are: all government departments to generate gender disaggregated data; at least 50 per cent reservation for women in local committees/ bodies/ decision making fora; introducing incentives such as lower registration charges for registration of assets/equipments in favour of women and improved representation of women in institution and marginal position wherever applicable within the Scheme/Programmes/Missions of Ministry of Agriculture & Farmers' Welfare. Such support would certainly bring women from peripheries to the centre stage of agriculture and substantially contribute to the family incomes.

xi. Education for Agricultural Management: with a view to providing overarching support to women in agriculture and allied sectors and to suitably empower them to be able to contribute to family income, it is essential to redefine the role of Home Science Extension Education being delivered by the Home Science Colleges of the State Agricultural Universities and make it Farm and Rural Home Extension; and similarly redefine focus of Home Management Units of Home Science colleges to Family Resource Management, aiming at catering to the family resources as a unit.

xii. A dedicated and time bound plan to provide mechanized hand held tools for all laborious tasks done by women largely, such as transplantation of paddy throughout the country is required to be done on campaign mode instead of the pilot approach that has not significantly

altered the reality on the ground.

xiii. Increase budgetary allocation on schemes that will help to reduce drudgery, increase efficiency for women farmers through the promotion of tool banks for small, marginal and subsistence farmers via rural women's collectives at the panchayat or hamlet level etc. The tool banks can also be effective agri-enterprises run by rural women's collectives (such as green army in Kerala) only when they are backed by training, maintenance and operation costs through Krishi Vigyan Kendra's and FPO's/SHG's or any other form of women collectives. Custom Hiring Centres (CHCs) being promoted to increase farm power intensity must take care of farm machinery that women related activities need. The corollary is the need for appropriate technology development.

xiv. Though many schemes like ATMA, NHM etc are clear in respect of allocation and suitable depiction in Guidelines with a view to reach out to women, they however need greater clarity as regards the strategy required to mainstream gender concerns at all levels and all stages of a scheme. What is necessary to improve scheme implementation is bringing clarity on various dimensions including farmer conceptualization/design to planning, implementation, monitoring and evaluation. It is also necessary to take care of qualitative aspects such as farmer's need assessment from women's perspective; organizing tailor made training and extension programme strictly as per women's needs; running exclusive programmes/explore trips/Farm Schools for Women etc.

xv. In terms of monitoring too, there is no mechanism to ensure whether even the 30 per cent allocations across schemes are indeed being spent on or availed of by women farmers as intended. The MIS system for gender budgeting of schemes currently remains focused on reporting and aggregating data around physical and financial targets that have been set or met. For example, 30 per cent participation of women in trainings or exposure visits (under ATMA) is taken to mean that 30 per cent of allocated budgets were indeed spent on women farmers.

xvi. There is no mechanism to capture what percentage of the budget earmarked was actually spent on women or the qualitative impact of any given component of a scheme on women's lives thorough documentation of case studies or narrative reports. This is necessary to understand the gender differentiated impact of schemes and budgets. Therefore, for gender budgeting to be truly effective and meaningful, a reorientation of the monitoring and the MIS system from a gender perspective is necessary.

xvii. For mainstreaming gender concerns in agriculture in real sense, all subject matter divisions of all the three Departments of MOA&FW need to incorporate gender dimensions to their schemes and programmes right from conceiving them to deciding the objectives, strategies, approaches, outcomes and outputs and monitoring and evaluations. To achieve this, NGRCA be made to serve as one of the appraising agencies which may vet the Scheme from Gender Perspective before its consideration and approval by DSC/SFC/EFC/CCEA.

xviii. Lack of a clear training and capacity building process and plan for officials (at the national, state, district levels) appears to be a major issue. For Gender Budgeting to truly

become an effective tool in mainstreaming gender concerns in the agriculture sector, continuous capacity building and gender sensitisation of officials in the sector at all levels is absolutely necessary.

The re-orientation process must focus on building basic gender sensitivity amongst personnel, enabling them to conduct a situation analysis of the agriculture sector for collection and analysis of gender disaggregated data, identifying differential properties and concerns of women and men involved in agriculture across different tasks and land holding sections and then using the above for planning, budgeting, implementation and monitoring of schemes.

xix. It is important to significantly increase overall allocations for women in agriculture, making it to at least 50 per cent (from the current 30 per cent) or more across all and not the select schemes of the Ministry. Equally important is the need to formulate new schemes specifically to suit the needs requirement of women farming in different agro-ecological contexts along with strengthening and expanding existing programmes such as the Mahila Kisan Shashaktikaran Pariyojana (MKSP) under the Ministry of Rural Development (MoRD). There is also an urgent need for meaningful convergence of schemes which have overlapping objectives and budgets.

xx. Remove gender-based discrimination in underlying assumption of default farmer while designing the portals and other knowledge and extension services. It be ensured that the option of male, female and third gender registration is available on all sites and gender segregated information is collected across categories.

xxi. Need based research activities to be promoted based on the feedback of development stream which it obtains while working closely with women during the course of implementation of Central and State Schemes in the real field situation.

6.9. Annotation

Rural women are involved in activities that typically include producing agricultural crops, tending animals, processing and preparing food, working for wages in agricultural or other rural enterprises, engaging in trade and marketing, besides caring for family members and maintaining their homes. Many of these activities by women are unfortunately not accounted for, resulting in depriving them of due recognition vis-à-vis the substantive economic contributions they make to family income.

Women are also more vulnerable to climate and economic disruptions as they continue to bear their responsibilities with exacerbated agricultural situations and workload, while males migrate to other locations for employment. They also have the potential to act as catalysts of change and play an active role in coping and adaptation measures relating to climate change and also in contributing to nutritional security.

Despite being active in the farming economy, the significant contribution of women in food production sectors as farmers, landless agriculture labourers, livestock, managers, fishers,

forest produce gatherers, salt pan farmers, women are not accorded the same rights as a farmer, as only very few women farmers, legally, are land owners. This cries for urgent correction, to not only recognise their real contribution and offer them the dignity they deserve, but also provide them an opportunity to improve their output efficiency, as farmers fully entitled to access various governmental and institutional facilities and support. Special emphasis needs to be given to their capacity-building.

While there is no technological fix to the issue of gender bias, the extension system can be leveraged not only to empower the women as knowledge dissemination functionaries, but also by extension functionaries being provided specific targets regarding support to women farmers.

There is need for a gender sensitive approach in planning, implementation and monitoring with appropriate investments in their capacity building. Women farmers play an effective and significant role in Natural Resources Management, and this may be used to realise optimal returns from the perspective of doubling farmer's income.

The collegiate education relating to farm women must continue to be suitably named as 'College of Farm and Rural Home Science'.

Key Extracts

- As high as 75 per cent of 'rural women workers' are engaged in agricultural sector; but their ownership of land in rural households ranges between a low of 6-11 per cent.
- Various efforts have been made by the Ministry of Agriculture and Farmers' Welfare, by providing special incentives to women farmers to mainstream the gender in Agricultural development. This is however not enough.
- Of the 55 odd schemes (subsumed now broadly under 7 missions), only about 14 schemes have allocations specifically earmarked for women.
- There is need for dedicated or special schemes that target women farmers exclusively, or those which seek to address the special challenges of women farmers in difficult conditions (e.g., rainfed agriculture) across the country.
- Farm women may be recorded as cultivator in revenue records or as farmers in a farmer database making them eligible for all privileges received by farmers.
- Financial support in the form of micro capital assistance, has allowed women groups to take land on long-term lease basis for cultivation. This has not only strengthened food security at community levels, but has also helped to break the cycle of indebtedness through internal lending of grains etc. among the group members. Such efforts need to be accelerated.
- Promoting women SHGs in operationalisation of on-farm and off-farm micro-enterprises with proper forward and backward linkages and support for markets can go a long way in enhancing income of farmers.
- There is need for capacity building of women farmers for their active participation in the context of market-led extension.
- Enhancing the strength of women extension personnel and para extension workers to be given importance.

Chapter 7

Strengthening Technology Backstop Institutions

Communications to share ideas and information form a large part of the job of an Extension Service Provider (ESP). However, communication can be effective only if the content is relevant and farmers, the clientele find it meaningful. Further, for the extension outcome to be the one that is its aim, the ESP has to ensure, that his content is in consonance with changing face of science & technology, as applicable to all the sub-sectors of agriculture. The outcomes of the R&D activities undertaken by various institutions need to be shared with the ESPs on a continuous basis. Hence, the need for strengthening of Technology Backstop Institutions.

Agricultural advisory services are intended to respond meaningfully to farmers, to transfer relevant knowledge and provide advice on diverse demands ranging from on-farm activities to off-farm, finance, business and market related issues. The ideas, advice and information so provided influence the decisions of farmers.

The reality however is that the rural population, especially farm women still have difficulty in accessing crucial information. The challenge is not only to improve the accessibility of information but also to make it available to the fellow women farmers. Modern communication technologies when applied to conditions at grassroots level can help improve communication, participation disseminating of information and sharing of knowledge and skills.

In addition to providing focussed support to farmers through public extension system which is largely man-power intensive, there exists potential to optimise the use of mass media for agricultural extension, which may have to follow the "lab-to-lab; lab-to-land; land-to-land; & land-to-lab modes of network and communication.

7.1. Lab-to-Lab & Lab-to-Land Communication

The process of technology generation and refinement is a continuous process. As detailed in earlier chapters, the National Agricultural Research System (NARS) of India is highly expansive and all-encompassing across all the sub-sectors and crop commodities of the sector of agriculture. It may not however be addressing all components of the agril. value system in a secular manner. It now needs to bring due focus on post-production aspects of the system.

There is a need to ensure parallel flow of information related to technology generation and its pooling at one level before the research outcome is translated into an extension message to be shared with farmers. As indicated in Chapter 3, a system has to be developed where research related outcomes flow parallelly and are pooled at the national level to ensure standardised extension approaches. Similarly, regional & state level research institutions viz. ATARIs and SAUs may have to work in tandem to ensure lab-to-lab flow of information and provide requisite extension support through State Department of Agriculture (SDA) & State Agricultural Management and Extension Training Institutes (SAMETIs).

The source of flow of technical information with requisite refinement and validation at the

district level is Krishi Vigyan Kendra (KVK) which needs to provide technical backstopping to ATMA and other district level staff of agriculture and allied sector departments.

A platform of this nature will also promote multi-directional communication among different laboratories and suggest a concrete partnership on different topics, which may have varying degrees of commonality. This will help in achieving a more comprehensive solution to the field problems, which may be more beneficial to the farmers. It will also bring in optimisation of resource use, namely, men, material and finances, besides saving time. An institutional mechanism for promoting partnership between and among related labs on common farmer related problems would be highly useful, if put in place.

7.2. Land-to-Land & Land-to-Lab Communication

Land-to-land system of information dissemination may include individual Contact Methods – e.g. farm and home visits by ESP; Group Contact Methods – e.g. training, demonstration where a group of farmers are educated; and Mass Contact Methods – e.g. television, radio whereby large number of farmers can be reached.

Mass media involves the channels of communication which can expose large numbers of people to the same information at the same time; these are largely used at awareness and interest stages of adoption. These include media which convey information by sound (radio, audio cassettes); moving pictures (television, film, video); and print (posters, newspapers, leaflets).

The benefit of mass media in case of extension services is the high speed and low cost with which information can be communicated to people over a wide area. Although the cost of producing and transmitting a radio programme may seem high, when this cost is divided among millions of people who may hear the programme, it in fact turns out to be a very cost effective way of providing information. The cost of an hour's radio broadcast per farmer who listens, can be less than one-hundredth of the cost of an hour's direct contact with an extension agent. However, mass media cannot do all the jobs of an extension agent. It cannot offer personalised advice and support, demonstrate to teach practical skills, or answer questions immediately.

Land-to-lab refers to conscious effort to identify field concerns and issues and escalate them to the scientists for research in their laboratories. In particular, problem-solving approach will get immediate attention and bring solutions to farmers' field problems. The laboratories will be engaged in real issues and not 'blue sky' research, which may not always be relevant in applied science.

7.3. Mass Media in Agricultural Extension

The mass media can support agricultural extension in multiple ways and some of them are:

- Spreading awareness of new ideas and creating interest in farming innovations

- Giving timely warnings about possible pest and disease outbreaks, and urgent advice on what action to take
- Multiplying the impact of extension activities - A demonstration will only be attended by a small number of farmers, but the results will reach many more if they are reported in newspapers and on the radio & tele-visions
- Sharing experiences with other individuals and communities - The success of a village in establishing a local tree plantation might stimulate other villages to do the same if it is broadcast/telecast over mass media like radio & TV. Farmers are also often interested in hearing about the challenges/problems of other farmers and how they could overcome them
- Answering questions, and advising on problems common to a large number of farmers
- Reinforcing or repeating information and advice - Information heard at a meeting or passed on by an extension agent can soon be forgotten. It will be remembered more easily if it is reinforced by mass media. Memory gets strengthened through repetition
- Using a variety of sources that are credible to farmers has its advantages too. Instead of hearing advice from the extension agent only, farmers can be brought into contact with successful farmers from other areas, respected political figures and agricultural specialists, when mass media is deployed

For the mass media to become effective as an aid to agricultural extension, the farmers must:

- have access to the medium;
- be exposed to the message – possession of a radio set, for example, may not necessarily mean that the farmers are listening to the farm broadcast; and
- pay attention to the messages - information must be attractively presented, easy to comprehend and relevant to farmers' interests.

Public initiatives for 'Mass Media Support to Agricultural Extension Programme and Focused Publicity Campaigns' are covered under the Sub-Mission on Agricultural Extension (SMAE).

Agriculture related programmes are broadcast/telecast through 180 Narrow Casting Centres, 18 Regional Centres & 1 (one) National Centre of Doordarshan Kendra and 96 FM Station Radio for 30 minutes, five/ six days a week. The audio & video spots and success stories are being aired through All India Radio, Doordarshan and Private Channels operating at national and regional levels. Besides this, the focused publicity campaign being undertaken creates awareness about the assistance available to farmers under various agricultural schemes, through audio & video spots of 30–60 seconds duration. The spots are broadcast / telecast through All India Radio, Doordarshan and Private Channels operating at national and regional

levels during news, serials, and entertainment programmes possessing maximum viewership. The campaigns are being launched through print as well.

7.3.1. TV, Radio, DD Kisan – Backed by Technology Advancement

Farm Telecast continues to be an attractive source of agriculture information to rural population. Thanks to the increase in the number of television channels, agricultural programmes have gone up substantively in number. However, the time share and content delivery need attention. Some of the agricultural programmes telecast by TV Channels (both public and private) are given below:

Table 7.1 Major TV Channels for Farmers

TV Channel	Language	Public/ Private	Duration
DD Kisan (http://www.ddkisan.in)	Hindi	Public	<ul style="list-style-type: none"> • 24-hour television channel – Prasar Bharati Public Sector - launched on 26 May 2015.
	Regional Languages	Public	Various time slots
GreenTV (http://greentvindia.com) Operational since 15th August 2014.	Hindi	Private	<ul style="list-style-type: none"> • 24 Hrs. (Mainly in Hindi but Video Journalists try to speak in local dialect and give them solution in easy vernacular if not in regional language) • Also in the process of setting-up Tamil language feed. • Manages the communication, through email, mobile or landline phone, Facebook, Twitter and WhatsApp which has become an interesting tool for farmers to share Crop pictures for GreenTV Experts to give them solutions.
ETV (Annadata&Jaikisan) Programme	Regional Language (Telugu)	Private	<p style="text-align: center;">Time slots</p> <ul style="list-style-type: none"> • 6:30 am daily in Telugu only
Saam TV	Marathi	Private	Daily

Apart from using the vast network of television channels and radio purely for flow of technical

information, it can also be extensively used to publicize success stories of farmers who have demonstrated profitable agriculture, besides utilizing their services in outreach programmes.

Community Radio Stations (CRSs) provide updated agricultural information which is location specific to a group of villages. The local population can be reached instantly and cost effectively. ATMA provided for establishment of CRS in all the districts by funding infrastructure and content development for two years. However, response has not been encouraging. Only few CRS units have been established. Some of the important reasons are delay in obtaining the license, restrictions on advertisement time and challenges of creating attractive content. One of the ways of improving their viability, is to motivate all the developmental agencies (both public and private) in the jurisdictional area to use CRS to advocate and promote their activities.

7.3.2. Print media – Value addition by high literacy rate

There are about 500 periodicals in India devoted to agriculture including those journals and newsletters supported by Indian Council of Agricultural Research (ICAR). However, there also are a few popular periodicals like Smart Agripost, Agritech India, Floriculture Today, Oils & Fats Today, Agribusiness & Food Industry, Shetkari, Agriculture Today, Krishi Jagaran, and some others, in the private sector. Printed media has its own strength in dissemination of valuable information.

There are several studies on the impact of print media on the farmers and agriculture sector. It is observed that all categories of farmers including large, medium and small farmers have benefited more from the print agricultural communication. Even at district and block levels, it is observed that Government Agricultural Offices distribute handouts, pamphlets among farmers during exhibition and make the farmers aware of schemes and techniques which are highly beneficial to farmers.

Despite the advent of television and instantaneous media (social media), print media has not lost its glory or relevance. It is observed that the print media in agriculture has been growing steadily over time. With its long shelf life, the print media can be read and referred to by the farmers and agripreneurs as and when they want. It is suggested that most popular Agriculture magazines in the specific area could be subscribed to in favour of all the Extension Service Providers with ATMA financial support.

7.4. Farm Journalism - Vehicle for Extension Services and Outreach

Mass communication and Journalism education assume new significance in the age of globalisation and communication. Mass media are an agent of information education, entertainment and motivation. They open up the farmers to accepting agricultural innovations and technology and therefore serve as a vehicle for such transfer.

Agricultural extension is essentially a communication process, and it conveys improved or recommended or alternate practices to farmers with a view to improving their methods of

agricultural production and marketing of their produce.

In broad terms, farm journalism is the science of conceptualising, developing and operationalizing information activities through various media that are supportive of agricultural extension. Farm journalism is an integral part of the agricultural extension system and its growth is directly proportional to the performance of extension processes, coverage & impact/adoption. Access to information and improved communication are a crucial requirement for sustainable agricultural development.

In the era of knowledge, farmers practising intensive agriculture require timely, crop-specific and location-specific information about their farm practices. In India, SAUs such as Anand Agricultural University (AAU) (Gujarat) offer course – M.Sc. in Agricultural Journalism – in distance learning mode. Agricultural Journalism includes:

- Print Journalism
- Online Journalism
- Photo Journalism
- Broadcast Journalism (Radio and Television)
- Agricultural and Developmental Journalism
- Media ethics and Press laws.

However, not many universities/institutes offer agricultural journalism as a specialised programme at university level in India. A candidate with a degree in agricultural sciences or allied field can take up a PG Diploma program in Journalism and become well qualified to start a career in the field. Such a course will expose the students to the concept, history, relevance and approach of journalism in disseminating farm information to the stakeholders. The students can also learn the process of creating TV and radio programmes as also social media inputs. There is a growing market for agricultural journalists and broadcasters/telecasters having formal education in agricultural journalism and agricultural communication skills.

Amongst the communication technologies available for mass outreach, radio is pre-eminent. Its portability, inexpensiveness, accessibility, extensive reach (even in remote areas) and longevity make it a perfect medium. It is especially effective in some rural and remote areas where television and print media may not have made a breakthrough.

While Community Radio holds immense potential, the limitations of its expansion also need to be borne in mind. Commercial FM Radio, is also spreading in India, but its growth is constrained by the difficulty in obtaining licences and financial sustainability. In order to sustain this powerful medium and use it in agricultural extension, innovative content that the farmers can relate to and learn from is required. This will require strengthening the base of agricultural journalism and developing this subject further. Such journalism will require specific focus on local news, information and updates on relevant happenings in relation to

agricultural sectors.

Agricultural Journalism – some suggestions: It can be strengthened and made more effective. Some suggestions in this regard are made as follows:

- Extension Education Institutes to offer Agricultural Journalism Courses at P.G., Degree and Diploma levels
- Continuous capacity building of agricultural extension professionals in Agricultural Journalism, promotion of DD Kisan (public sector) and private sector channels dedicated to agriculture in all regions
- Using Community Radio / Commercial FM Radio for disseminating agricultural extension programmes in Gram Panchayats/villages
- Establish an authoritative platform, which supports on-line viewing, downloading and physical distribution of quality agricultural training videos in local languages
- Location specific & qualitative media content generation and timely delivery, as also enhancement of programme durations
- Continuous capacity building of agricultural extension professionals in “Mass Communication and Journalism Education and Training (MCJE&T)” Courses to strengthen agricultural extension
- Introducing and strengthening of Agricultural Mass Communication and Journalism Education and Training (Agri MCJE&T) courses in various State and Central Agricultural Universities

7.5. Professionalising Agricultural Extension through Agri-preneurs

Agri-Clinics and Agri-Business Centre is another public sector mode of providing extension services to farmers, the difference being, that it is on payment basis. These Centres can be utilized to support agricultural extension. These can become effective paid extension service centres run as enterprises by agricultural science graduates.

The selected trainees can be provided agri-preneurship training for a period of two months by MANAGE through identified Nodal Training Institutions in various states, which will also offer handholding support for one year. NABARD can offer the credit support to Agri-Clinics through Scheduled Banks. Such a provision exists and credit-linked back-ended subsidy at 36 per cent has been approved under the scheme. The subsidy is higher at 44 per cent in respect of candidates belonging to SC and ST, as well as women categories and those from North-eastern and Hill states.

The impact evaluation study has been conducted through Directorate of Economics and Statistics (DES) and its report is expected shortly. The findings and observations can be studied and adopted appropriately. More than 22,000 agri-preneurs have established agri-start-ups in

32 categories of activities in different parts of the country. This initiative will get further scope for growth under revised Guidelines of RKVY, where-under 10 per cent of the allocation is reserved for enterprise and incubation facilities.

As discussed in the preceding chapters, if every village is facilitated by an Agri-clinic & Agri-business centre (AC&ABC) to offer the farmers doorstep service, the spin-off effect is generation of 45,00,000 number of knowledge-centric jobs in the rural areas.

7.6. Agri Start-ups by Farmers: Stream II of AC&ABC

Considering the vast farmer population of the country and the potential that exists in the process for information dissemination through AC&ABCs and in line with the Government's aim of doubling the farmers' income by 2022, it is suggested to enhance the scope of the AC&ABC.

An additional stream can be created, wherein, farmers with hands-on-experience in agriculture and allied areas but without any formal education in agriculture & allied sciences are also provided training under the AC&ABC scheme, and encouraged to start agri-ventures and join the process of information dissemination. This will provide additional momentum to the creation of self-employment opportunities in the agriculture sector.

7.7. Kisan Call Centres – Reaching out to Every Farmer in Every Corner

There exists a wide space for ICT based extension strategies, especially at the awareness & interest creation stages of the adoption process. However, content development and delivery in respect of print and electronic media are crucial. Kisan Call Centre (KCC) with its toll-free number 1800-180-1551 has been gaining increasing popularity over time. However, the pertinent issue relates to increasing its access and reach to the large number of farmers. Mobile applications in extension need to be expanded. Internet access needs to be improved by organizing Farmer Knowledge Groups (FKGs) in the villages for facilitating / improving arrangements for knowledge interpretation and knowledge sharing.

The Ministry of Agriculture, Government of India launched Kisan Call Centres as a personalised service in January 2004, with a view to answering farmers' queries on telephone calls in their own dialect. These call centres are now working at 14 locations covering all the states. A country-wide common eleven digit Toll free number **1800-180-1551** has been allotted for Kisan Call Centre. This number is accessible through all mobile and land line telephone networks including private service providers.

The replies to the farmers' queries are offered in 22 languages and the calls are attended from 6 AM to 10 PM on all seven days of the week, from each of the KCC locations. Farm Tele Advisers (FTAs) who are post-graduates in agriculture and allied subjects, identified as Level-1 resources respond to the farmers' queries instantly.

The queries which cannot be answered at Level-1 are transferred to higher level experts, namely, Level-II (SMSs of the State Department of Agriculture or Scientists of SAUs or ICAR

institutes) in call conferencing mode. There are 4-7 identified experts in every state for answering KCC Calls. Further, if the calls cannot be answered even at Level-II, then the calls are escalated to Level-III, i.e. identified nodal institutions that look after the working of KCC in the concerned State. The access of women farmers to KCC needs to be however improved.

A study report on decision oriented information system for farmers through KCC, Kisan Knowledge Management System (KKMS), m-kisan portal and farmers' portal conducted by the Centre for Management in Agriculture (CMA), IIM, Ahmedabad in association with Agro-Economic Research Centre (AERC), Directorate of Economics & Statistics submitted in August 2017 has revealed, that KCC was the most important source of information to the farmers followed by fellow farmers, input dealers, Kisan melas etc.

The most sought for areas of information related to weather, plant protection, government schemes, market information, fertilizer use/ availability and that on varietal choice. The study also reveals, that majority of the farmers interviewed, expressed that there is a positive impact of KCC information on their production and income levels. This highlights the importance of using KCC platform more robustly by increasing the number of KCC centres across the country from the now existing 14 to 35. This will help in answering more calls and also enabling the Level I & II resources to focus on issues with reference to their limited agro-climatic zones and offer better advice to the farmers.

The technical backstopping of the Farm Tele-Advisors is however an issue of great concern as revealed from the Study. This backstopping is to be provided through KVKs, efficient & effective Kisan Knowledge Management System (KKMS) through use of updated version of state specific package of practices not only in agriculture sector but also in allied sectors.

The identification of Levels II & Level III experts across States has also been a grey area. The States need to provide requisite ownership to this initiative, by identifying and sharing subject matter-wise experts from the respective Departments of Agriculture and allied departments; and Level III experts in concerned discipline from SAUs/ICAR institutions/CAUs, and incentivize them suitably to answer the escalated queries of the farmers, so that the second and third tiers of this initiative are made more effective.

7.8. Media Alternatives to lead Future Extension

Social Media is a powerful communication tool that widens lines of communication, engages a large number of people quickly and has a potential to reach out to farmers/farm women and stakeholders. Face Book and Twitter are two well-known social media sites whose usage in agriculture field would witness radical changes in near future. Social Media Technology will play a leading role in advancing agricultural communication to farmers and other related stakeholders.

Email has risen as a speedy communication channel across the globe. Its use in scientific communications is growing manifold. Young agri-preneurs and farmers have started using

internet for accessing information relating to technologies, credit and marketing. This medium has a great scope in high tech agricultural development.

Farm portals are also available for dissemination of information and distance learning. Information includes crop production & protection technologies, inputs, prices, e-commerce, etc. Portals vary widely in their contents, updates, user friendliness and use of visuals.

7.9. Common Service Centres (CSC) as Extension Delivery Points

There are 157,000 number of Common Service Centres across the country, located at Gram Panchayat (GP) level providing a variety of citizen services to the people. These are operated by rural level entrepreneurs. A CSC is built on minimum IT infrastructure to provide IT enabled services to people on payment basis. It is an expansive national infrastructure available at village level, managed by an entrepreneur and could be used to also offer agricultural extension services. This entails training of CSC-entrepreneur in basics of agricultural practices and extension services. They can then share with the farmers a range of inputs - data and information relating to weather, market prices, input stocks & availability, information on buyers and exporters; as also upload visuals relating to diseases and pests, link farmers to scientists and ESPs; enable skype based interaction with scientists, video-conferencing, screening of agricultural films, filing of complaints, etc. All these services can be offered by the CSC-entrepreneur on nominal payments by farmers.

By virtue of scale, the entrepreneur can earn additional income making his current enterprise financially more viable, while enabling easy and affordable information access to farmers. This approach is expected to benefit large number of farmers as government is planning to add another lakh of CSCs during the next one year. The Farmer Friend can serve as a link for the farmers with agri-CSCs.

An effective and efficient extension system that can support initiatives for enhancing farmers' income will have to be robust enough to receive feedback of farmers and undertake revisions of content and methodologies for land-to-land dissemination of information through various channels of Extension, including the mass media. For this purpose, it is suggested to promote ICT enabled Monitoring, Evaluation and Learning (MEAL) mechanism at various levels i.e. centre, state and district. The MEAL system would need to be adequately supported with participatory social assessments, involving all stakeholders – farmers' advisory committees, civil society groups, representatives of line departments and peer institutions.

7.10. Re-orienting Agriculture Education from the Perspective of Farmers' Income

Agriculture can be made viable and income-centric, only if it is practised as an agri-business. This transformation warrants a revisit of the current agriculture education curriculum to orient it to promote agriculture as a sustainably practised and profit generating enterprise. The curriculum should consider detailed discussion on space available for various stakeholders in relation to first six of the seven sources of growth in agriculture value system, as listed and

discussed in volume II of this Report.

7.11. Rural Agriculture Work Experience (RAWE) Programme

The RAWE programme that is a part of a student's curriculum at the agricultural universities will become more meaningful if it can teach the students interventions which yield enhanced income from farming. The project should be designed to ensure that the students are trained about various sources of growth in agriculture and treat agriculture as a value system in its entirety. In this direction, hands-on-experience and mentorship by successful farmers, farmers' organisations, NGOs, agri-business companies and the like, besides university and government organisations will be useful.

The programme may be revised accordingly to treat agriculture not just as a production activity, but as an enterprise, that should be practised on the principles of profit. The duration of six months, that the final year students of agricultural sciences spend in the villages can become true internship, promoting the spirit of enterprise in them, apart from learning it as an applied agricultural science.

Further, a part of this internship should also include experience at agril. market and agro-industries.

7.12. Technical Backstopping: Extension Research for Problems Solving

There are 77 SAUs and CAUs in the country, that educate annually at least 15,000 students at post-graduation and Ph.D. levels. This is in addition to much larger number of graduates they educate in different agricultural sciences.

The DFI Committee observed, that there is a huge gap between field level problems and research areas selected by the students at the P.G and Ph.D. levels. As a result, the research theses are more academic oriented with lesser than desired level of relevance to the practical problems in the field. There is scope to enrich the experiences of both the teaching faculty and the students and render them more sensitive to field level problems. This will strengthen the quality of university education on one hand and improve the quality of graduates emerging on the other side, when seen from the perspective of farmers. The students will be more 'field-ready' and therefore more confident as an employee/entrepreneur.

In order to make research relevant to field level problems, various stakeholders in the field may be requested to share the list of field problems identified by them which can then form the basis for delineating their research problems for students' thesis work. The research outcomes will become relevant and also enhance the students' scope for employment/enterprise.

The ICAR and SAUs/CAUs may also introduce a system of evaluating the student thesis recommendation on the anvil of their practical utility and offer suitable awards, on the line of Jawaharlal Nehru Merit Award in practice today, which examines the thesis more from an academic perspective.

7.13. Students & Youth in agriculture and improving the Farmers - Scientists Interface

Various ongoing initiatives of ICAR have good scope to attract youth and students to agriculture with potential for employment and income generation. These initiatives include the following:

- **Mera Gaon Mera Guarav (MGMG) Programme** has been initiated to effectively promote direct interface of scientists of ICAR Institutes and State Agricultural Universities with the farmers to hasten the lab to land process. A group of four scientists adopts 5 (five) villages each. The project is intended to connect with 25,000 villages. The agricultural scientists have started providing information on newer technologies to the farmers in over 10,000 villages by now.
- **The Farmer FIRST initiative aims at enriching:** farmers – scientist interface, technology assemblage, application and feedback, partnership and institution building and content mobilization. It provides a platform to farmers and scientists for creating linkages, capacity building, technology adaptation and application, on-site input management, feedback and institution building. The scientists from about 100 ICAR Institutes/ Universities are expected to work with 100,000 farmers directly thereby helping them to resolve their issues and realise higher productivity and production.
- **Attracting and Retaining Youth in Agriculture (ARYA):** This is an initiative to empower the youth in rural areas to take up various agri-enterprises across the multiple sub-sectors of Agriculture. The purpose is to manage the enterprises professionally by adopting the principles of profit and output both jobs and incomes on a sustainable basis. The project is now operational in 25 districts across 25 states through the KVKs.

All these three, are creditable initiatives. In order to stabilise them Key Performance Indicators (KPIs) for each of them may be identified through a national consultation and monitored effectively. The success will depend upon convergence of various schemes of government already underway and providing some fund as a flexi-fund. Training and orientation will also play an important role. A robust MIS may be rolled out so that an appropriate system of monitoring & evaluation is also adopted.

7.14. Evoking Individual Social Responsibility (ISR)

More than 250,000 agriculture science professionals are working in various public and private research, academic and developmental organisations across the country. Many of these professionals do entertain a desire to contribute to farmers' welfare in the form of individual social responsibility. An appropriate policy support and institutional mechanism can help in channelizing this productivity in a systematic and professional manner and offer farmers an additional service window.

There is need for developing appropriate Operational Guidelines for implementing Individual Social Responsibility (ISR) initiatives for all those working in both public and private institutions. The Guidelines may highlight policy support and incentivise them by offering leave provision, transport allowance and nominal expenses required for implementing individually committed ISR activities.

The ISR activities to begin with may be by free volition of the individuals. Based on learnings from the initial pilots, an element of mandatoriness can be considered. Thus, even small initiatives such as adoption of individual farmer family or a village, large number of professionals will be mentoring the farmers to become more professional and entrepreneurial. These initiatives may be of limited nature, more profitably linked to transfer of knowledge, skills, attitudinal change etc.

Specific ISR activities can be identified for students and such service may be given preferred weightage in case of candidates applying for jobs through Central and State Public Service Commission and UPSC. Such students can become an agent of change by helping their adopted farmers to accept new technology & farm management practices. Even students joining the Agricultural University may be encouraged to adopt a few farm families, during the first year itself and guide them throughout their annual academic progress at the college. Both, the adopted farmers and the adopting students can be evaluated at the end of their graduation programme. The evaluation can be made against the baseline data generated at the initial stage of adoption. Based on performance and demonstration of social commitment, the students can be awarded & recognized. More importantly, the colleges and universities will be supporting the students to grow up as socially conscientious citizens of the country.

7.15. Annotation

There is a need to ensure parallel flow of information related to technology generation and its pooling at one level, before the research outcome is translated into an extension message to be shared with the farmers. An institutional mechanism for promoting partnership between and among related labs on common farmer related problems needs to be put in place.

Mass media is a time and cost effective tool to reach large number of farmers in quick time without any communication distortion. However, time share needs to be substantially increased and quality of content delivery addressed.

Agri-Clinics and Agri-Business Centres (AC&ABC) managed by Agri-preneurs provide value added information to the door step of farmers. These units are professionalizing extension services in rural areas. If every village is facilitated by an AC&ABC, the spin-off effect is generation of 45 lakh jobs in rural areas. There is also strong need for transformation of 157,000 number of Common Service Centres in to Agricultural Extension Delivery Points so that without additional cost, available ICT platform can be utilised in extension.

The initiatives of ICAR to promote interface between scientists and farmers are creditable, and

success of them can be made by adopting a professional approach to their implementation and monitoring of progress.

There exists scope for promoting Individuals Social Responsibility (ISR) initiative for the agricultural professionals serving in different organisation (both public & private), as also students joining the Agricultural Universities.

Key Extracts

- Technology backstopping can be strengthened by establishing a four-way mode of communication, between labs, from land to lab and lab to land, and between farms.
- Despite the advent of television and new media, print media remains relevant and extension functionaries will benefit from being supported to subscribe to printed information.
- If every village is facilitated by an AC&ABC to offer the farmers doorstep service, the spin off effect is generation of 45,00,000 number of skills and knowledge intensive jobs in the rural areas.
- Enhance the scope of the AC&ABC, by creating an additional stream, wherein, farmers who have hands-on-experience in agriculture and allied areas but are without any formal education in agriculture & allied sciences are provided training under the AC&ABC scheme and encouraged to start agri-ventures and join the process of information dissemination.
- Kisan Call Centre (KCC) is the most important source of information to the farmers followed by fellow farmers, input dealers, Kisan melas etc. as per the GoI study, 2017. The technical backstopping of the Farm Tele-Advisors needs strengthening and number of KCC can be increased.
- There is a growing market for agricultural journalists and broadcasters/telecasters having formal education in agricultural journalism and agricultural communication academic disciplines. Continuous capacity building of agricultural extension professionals in Agricultural Journalism deserves priority attention.
- Common Service Centres numbering 157,000 lakhs may be utilised to also serve as 'Extension Delivery Points'..
- The RAWE programme will become more meaningful if it can teach the students interventions which yield enhanced income from farming.
- There is need for developing operational guidelines for implementing Individual Social Responsibility initiatives for all those working in public and private institutions.
- KVKs be strengthened to focus on income enhancing technologies in PPP mode (value addition, post-harvest, agri-business enterprises)
- Innovative Initiatives of ICAR like *Mera Gaon*, *Mera Gourav*; *Farmers First* and *ARYA* need to be up scaled and strengthened. This necessitates bringing professional management to their implementation and monitoring of progress.

Chapter 8

Recommendations

There are various recommendations that relate to agricultural extension, including reforms in the Extension support system, the Extension architecture, and for bringing in a value system approach with participation from the private sector. The active involvement of State governments will be a key to reach all the farmers in all corners of the country.

8.1. Redefining Agriculture Extension

The scope of agricultural extension has expanded well beyond its traditional role in pushing the frontiers of production and productivity in pursuit of the nation's food security. While this theme held relevance for decades till the goal was realised, it falls short of the new challenges that have emerged over the last decade. The income security of the farmer is as important as the nation's food security. This is important also from the perspective of imparting viability to farming and strengthening the interest of the farmer in agriculture. Income security is both a challenge and an opportunity. Hence, the need to redefine agricultural extension as not merely a techno-social system of supporting farmers to grow more, but also achieving increases in incomes from farm, off-farm and non-farm activities.

The DFI Committee in defining the mandate of Indian Agriculture, describes Agricultural Extension as:

“a system of empowering farmers with information, knowledge, technology, skills, risk and farm management practices, across agricultural sub-sectors and along all aspects of the agricultural supply chain, so as to enable the farmers to realise higher net income from their enterprise on a sustainable basis”.

The above definition sets the strategic direction that agricultural extension should be taking, in the coming years to double the farmers' income by 2022. The definition highlights the role of extension in empowering farmers to help themselves better through transfer of technologies as well as farm management practices, with focus on judicious use of farm resources and the ability to manage risk during pre-production, production and post-production processes. The new definition covers not only the cropping systems, but also other sub-systems such as horticulture, animal husbandry, fisheries etc., thus emphasizing the farming system approach. Most importantly, value chain integration approach is inherent to make the farmer a legitimate and active stakeholder at every stage of value addition, envisaging two principal outcomes from the extension process - higher income to farmer and sustaining the same.

8.2. Key Recommendations

For doubling farmers' income, the focused areas that demand strengthening of existing extension system are: delivery of real-time market information; integrating farmers with agri-value system platforms; promoting use of warehouses including pledge loan facility and e-NWR trade; connecting with agri-logistics, as also retail and primary wholesale markets,

besides using electronic trade platforms; promotion of contract farming; scaling up farmer producer organisations (FPOs); farm mechanisation; extension of water use efficiency, effective pest management, production and marketing of organic products; primary processing; scientific storage; entrepreneurial skills for farmers to manage small scale agri-business; introduction of new on-farm, off-farm and non-farm income generating activities; intensification and diversification strategies; providing psychological counselling to farmers to manage distresses; developing managerial competencies of farmers and extension personnel and effective use of ICT by farmers. Highlighted recommendations in this context are:

i. Co-opting and converging the multiplicity of public, private and not-for-profit Extension Services: DFI Committee recommends that a beginning be made to co-opt the private sector and the 'not for profit' development organisations into agricultural extension by developing a comprehensive database on number of extension functionaries available with them at various levels and documenting the extension approaches adopted by them across diverse product supply chains and value added activities, in various agro-climatic settings.

ii. It would also be necessary to formulate situation-specific and region-specific protocols for building more transparency and trust into the partnership with private extension services known for their aggressive marketing strategies vis-a-vis the public extension, to avoid conflicts of interest. Such partnerships and protocols should focus on blending the strengths of the production led public extension system (PES) with the more market oriented private extension services, with a view to ending the exploitation of farmers by middle men, whether in sourcing inputs for production or in realising prices by marketing their farm produce. It is also recommended that all the public and private agriculture research and development (R&D) institutions be provided a common national platform by creating e-National Bank for Agricultural Technologies (e-NBAT) at the national level for sharing their technologies on a real time basis, and thereby, increasing the usage of valuable R&D output across the nation's similar production environment. The National Institute of Agricultural Extension Management (MANAGE) is recommended as a suitable institute to host and manage such a national platform. Similar platforms at State and District levels, hosted by similar and appropriate institutes are recommended.

iii. Rejuvenating the ATMA: The Agriculture Technology Management Agency (ATMA) was conceived as a multi-agency platform for addressing short-comings of agricultural extension including convergence of agriculture and allied sectoral services; gender equity; and linking farmers to markets. A bottom up system of participatory planning involving the block and district level farmer advisory committees shaping the Strategic Research Extension Plan (SREP) coupled with the autonomy and decentralised decision making structures as originally envisaged for the ATMA needs to be implemented. This Committee considers ATMA to be a case of a good programme whose implementation has been ineffective, and hence recommends retention of the scheme with reforms and a stronger monitoring mechanism to ensure adequate compliance with implementation procedures. It calls for well oriented and trained leadership and use of ICT for ease of management.

iv. **Reinventing Agricultural Extension:** In expanding upon the co-operative model of collectivisation, farmers all over the country are also keen to organise into producer groups and farmer producer organisation including companies. Besides influencing the farming strategies through intensification, diversification and input management, extension needs to develop greater market orientation and to facilitate thought leadership among farmers themselves. Understanding agricultural reforms such as eNAM, Model APLM Act 2017, Contract Farming Act, 2018, Warehousing Act, etc. and informing farmers of the benefits from is needed from extension functionaries, so that changed concepts are also extended to farmers.

v. **Capacity building of extension functionaries:** It is recommended that a comprehensive programme of capacity building be designed for extension functionaries across the country to hone their skills in mobilisation and formation of producer groups, linking the groups to post-production activities that allow small farmers to link directly with terminal wholesale; and to capture greater value. The MANAGE, EEIs and SAMETIs should assume responsibility for re-skilling and capacitating the extension personnel at all levels. The focus of capacity re-building recommended above should be on the principles of agri-business extension, in contrast to the production-centric extension practised hitherto.

vi. **Agri-business oriented extension system:** Extension service can organise more buyer-seller meets to expand scope for direct selling by farmers, and to explore contract farming where possible, besides farmer producer organisations and village producer organisations.

vii. **Networking of institutions and knowledge base:** MANAGE should take the lead in developing a platform for knowledge convergence and serve as the nucleus of this network. For this to happen, this Committee recommends that all extension approaches and technologies reach MANAGE for categorisation before transferring the same to EEIs and SAMETIs for further dissemination to mainstream extension i.e. State Agriculture and line departments. This arrangement, to be labelled as the e-NBAT, will bring in sectoral convergence in a given micro-production system.

viii. **The Subject Matter Specialists (SMS) based in the KVKs** must be oriented to integrate their research agenda and front line extension plans with the Block Action Plans (BAPs) developed by the ATMAs. The above recommended platform for convergence of technologies would also help achieve the much needed co-ordination between the KVKs and ATMAs all over the country.

ix. **Public Private Partnership (PPP) mode through KVKs:** Each KVK is in possession of about 50 acres of land which provides ample opportunity for developing agri-business enterprises, since the guiding principles of ATMAs also provide for promotion of PPPs in Agricultural Extension Delivery, with 10 per cent of the funds to be allocated for such initiatives.

x. **National Level Ranking Frame Work (NLRFW) for Extension Service Providers** (Public and Private) be put in place jointly by MANAGE and the Extension Division of the ICAR to facilitate formation of healthy and functional PPPs at the operational levels of KVKs

and ATMAs.

xi. With the SAMETIs increasingly expected to function as extension arms of MANAGE in the States, the Regional EEIs cannot afford to continue with their 'me too' role. They should differentiate themselves as institutions of higher value addition by developing a niche set of competencies not currently available in the national extension system. The EEIs should be developed into Centres of Excellence, each specializing in areas relevant to their locational priorities and agro-climatic conditions.

xii. Downstream Institutional Linkages: India has a very expansive network of scientific institutions and extension organisations, it is important to have organic linkages among MANAGE, Regional level EEIs and State level SAMETIs through both governance and financial obligations. Effectively, MANAGE should assume the role of a mentor to the EEIs and SAMETIS, and the Director General, MANAGE can co-chair the governing boards of the regional and state level institutions.

xiii. The Committee also recommends strengthening the role of the Directorate of Extension (DoE) in the GoI for it to play a more pro-active role in providing technical backstopping to the Department's Extension Division in execution of various extension initiatives. A Committee may be appointed to study and recommend restructuring and a suitable role for OoE in this regard.

xiv. It is recommended that a one-time need based Catch-Up Grant of about Rs.200 crore be provided to about 2000 training institutions (KVKs, ATMAs, SAMETIs, AUs (State and Central) and their constituent and affiliated Colleges, EEIs, ICAR Institutes, Private Organizations etc.), for up-gradation of their training infrastructure. The returns on such an investment are expected to be substantive.

xv. It is recommended that various district level plans that have been prepared, such as SREP of ATMA, C-DAP of RKVY, PLP of NABARD, NICRA of ICAR, District Irrigation Plan (DIP) of Ministry of Water Resources (MoWR) and DAC&FW should all have a common objective of contributing to the doubling of farmers' income by 2022-23. The targets should accordingly reflect such outcomes.

xvi. The status of manpower strength in Agricultural Extension System is showing a downward trend. The ATMA Guidelines provide for a staffing pattern at District level and at Block level, which translates into about 33 Technical Resources for ATMA in a district with an average of 10 Blocks. As of April, 2017, less than 50 per cent were filled leaving 14,265 vacancies. The Committee observed, that around 30 per cent vacancies also exist on an average in the extension system of the States. It is recommended that all vacancies in the centrally sponsored projects as well as states must be filled up on priority. It is also suggested that at least 50 per cent of these regular positions may be filled up with women extension functionaries at District and Block levels. In view of the urgency and time constraint, it is recommended that ATMA recruitments may be done by an appropriate agency identified by the States, who may set up a recruitment body or identify one of the many bodies already existing and undertaking

recruitments.

xvii. The Committee also finds that appointment of personnel on short term contract with consolidated salaries that are sub-par in comparison with those in regular employment has been a serious cause for concern. The Committee recommends that the contract be made more attractive with a more rational salary structure and stable contract period. Further incentivisation through strategies suggested in chapter 4 may be implemented to attract manpower and mitigate attrition.

xviii. The institution of Farmer Friend is already in place at the rate of one for every two villages, and this serves as a grass-root platform between the extension functionaries and the farmers. It is recommended that the remuneration of farmer friends be made at least Rs. 1000 per month and the institution be strengthened with the presence of one in every village. Further, at least fifty per cent of the farmer friends (approximately 3.25 lakh) across the country should be women.

xix. ICT based Extension Services need to be promoted. Leveraging ICT to reach out to farmers will streamline information flow, reduce load on manpower and provide for real time information, among other advantages. Accordingly, a range of ICT initiatives/schemes aimed at providing information to the farmers on various value added activities in agricultural practices were introduced and are implemented by the DAC&FW. It is recommended that National and State e-Agriculture policies be formulated to explore and outline possibilities of leveraging ICT for agricultural extension.

xx. Gender concerns about women in farming can be addressed by enrolling women as farmer friends and by developing schemes that are women-centric. The Committee recommends that policy measures be initiated by the stakeholder institutions to empower women with joint *pattas* (ownership) for both homestead and agricultural land, speedy issue of Kisan Credit Cards, creating multiple livelihood opportunities through crop-livestock farming systems, agro-processing support and other gender friendly measures, providing them an enabling environment for contributing to the family's income. In addition, adopt more initiatives that give impetus to gender equity. These include development of women owned individual land holdings in convergence with MGNREGA, watershed development and natural resources management programmes to promote soil and water conservation, fishponds, horticulture, sericulture etc., with special focus on tribal areas, where women-farmers have acquired land ownership under the Forest Rights Act.

xxi. Revisiting Curriculum in Agriculture Universities: Re-inventing agriculture extension with an agri-business orientation is a process of change that should begin with curricular changes in agriculture education. There is a need to revisit the agriculture education curriculum to orient students towards enhancement of farmers' income. The curriculum should consider detailed discussion on space available for various stakeholders along all the seven sources of growth discussed in this report. To achieve desired results in terms of enhancement of farmers' income, revision of curriculum has to be handled by a set of professionals from within and

outside the agriculture universities, in a consultative manner. The DFI Committee recommends the constitution of a Central Board of Studies at the national level to review and regulate changes in curriculum across all the 77 agriculture universities of the country, so that the standards and content of education in agriculture address the field level problems of farmers. The guidelines issued by the proposed body should be reflected in the curricular reviews carried out at the level of individual universities who may further identify location specific problems of the farmers to further guide the research priorities of post graduate and doctoral scholars.

8.2.1. Other recommendations

a) Develop an institutional mechanism to bring all the institutions together on one platform regularly to strengthen collaboration and achieve complementarities for effective technology sharing and adoption.

b) Agricultural extension activities to cover “off-farm and non-farm” income generating activities which are critical for doubling farmers’ income. Special efforts may be initiated to build the capacity of extension functionaries in these areas.

c) To achieve inclusive economic growth, there is a need for renewed emphasis on promoting new generation farmer collectives such as, Commodity Interest Groups (CIGs), Village Produce Organizations (VPOs), Farmers Producers Organizations (FPOs) and Farmer Producer Companies (FPCs).

d) The following seven sources of growth need to be integrated in job chart of extension functionary, delivery mechanism of extension system and extension policy frame work.

- (i) Improvement in crop productivity.
- (ii) Improvement in livestock productivity.
- (iii) Resource use efficiency or saving in cost of production.
- (iv) Increase in cropping intensity.
- (v) Diversification towards high value crops.
- (vi) Improvement in real prices received by farmers.
- (vii) Shift from farm to non-farm occupations.

However, in respect of seventh source of growth, the extension functionary’s role would be limited to enabling those shifting out of agriculture to do so with least discomfort. The engagement may relate to the migrant’s agricultural family staying back in the village to continue with farming.

e) Synergising public and private extension systems through win-win PPP models, aligned with state and district plans may be aggressively promoted through outcome linked incentives.

f) MANAGE can take the lead to serve as the nucleus of public and private extension systems and converging platform for State, Central, NGO and Private sector programs in Extension by establishing an intuitional mechanism. For this purpose it may use SAMETIs and EEIs as also suitable state institutions.

g) KVKs may open land and infrastructure available for PPP activities with Agripreneurs, by adapting suitable PPP models. ATMA should aggressively and proactively promote PPP for which KVK and ATMA may be given functional freedom.

h) An Expert Committee may be setup to redefine the role of Directorate of Extension (DoE) to address challenges in extension.

i) Twenty five per cent of the total manpower available at district level with ATMA, Agriculture and Allied Departments be made available to the District level Agricultural Marketing department, to strengthen extension relating to agricultural marketing.

j) Reintroduce fortnightly training schedule of Extension functionaries by Subject Matter Specialists (SMSs) as was practised in the T&V System. Continuous capacity building of agricultural extension professionals in Agricultural Journalism needs attention.

k) Common Service Centres numbering 157,000 lakhs may be utilised to also serve as Delivery Points, in addition to the already mandated services.

l) Banks also have potential as extension providers for Agricultural Credit Extension Services, including for provision of family loans for farmers. Involvement of Banks in close coordination with ATMA and Agri-business Companies, Farmer Producer Organisations and CSCs in Agricultural Credit Extension Services, needs to be promoted and strengthened.

m) The extension system should promote and support the agricultural value system by guiding the farmers appropriately. It is time that all small and marginal farmers in particular, become members of FPOs and the Agri-Value System Platform (DFI Volume IV). The extension functionaries need to be oriented accordingly.

n) Farm women may be recorded as cultivator in revenue records making them eligible for all privileges received by farmers.

o) Bring greater focus on women-farmers and their participation through the promotion of tool banks for small, marginal and subsistence farmers by setting up rural women's collectives at the panchayat or hamlet level. This will reduce also drudgery and increase efficiency.

p) ATMAs need to promote Agri-startups; use Common Service Centres (CSC) in dissemination; and increase farmers' friend strength to one per village. Women may be inducted as farmer friends so that they comprise 50 per cent of this institution.

q) In the opinion of the DFI Committee, needed ratios between extension functionary to farmer are: Hilly areas-1:400, Irrigated areas-1:750, Rainfed areas 1:1000. This ratio, which is based on optimal blending of manpower and ICT, is advised for adoption for extension services to be effective.

r) Performance linked incentives may be introduced for field extension functionaries. Revised manpower strategy where contract employees get several incentives may be introduced to maximise their quality contribution.

s) Need for the construction of Agri - India knowledge portal – A single electronic gateway to be developed through a peer review process with the help of 15 content accreditation centres from 15 agro-climatic regions of the country.

t) The delivery competence of extension organisations and extension personnel be supplemented with ICT tools. The acceptance and extensive use of ICT need internal champions to give a big push to ICT projects.

u) It is also important to revisit the Ministry's portals and websites already in use, and make them more gender-sensitive to cater to women farmers.

v) National and State Governments e-Agriculture Policy: formulate National and State e-Agriculture policies, which should explore and outline all possibilities of leveraging ICT in agricultural extension services, with a view to achieving efficiency and effectiveness of delivery, besides cost rationalisation..

w) It is important to make mandatory execution of several extension activities and transactions on ICT platform so that, extension system gets ICT friendly.

x) Large scale national e-Literacy Campaign be organized to educate farmers and extension functionaries in usage of ICT tools in extension.

y) An institutional mechanism for promoting partnership between and among related labs on common farmer related problems to be put in place.

z) Enhance the scope of the AC&ABC. An additional stream be created, wherein, farmers who have hands-on experience in agriculture and allied areas but are without any formal education in agriculture & allied sciences are also provided training under the AC&ABC scheme, and encouraged to start agri-ventures and join the process of information dissemination. The programme should include learning experience on farms, at agril. markets and on shop floors of agro-industries.

aa) The RAWE programme may be made more meaningful by training the students, in interventions which yield enhanced income from farming.

bb) Post-graduate research in agricultural sciences can be rationalised to be solution centric of the existing field level problems received from different stakeholders.

cc) There is scope for developing operational guidelines for implementing Individual Social Responsibility (ISR) initiatives for professionals serving in various public and private sector organisations on the lines of Corporate Social Responsibility (CSR) in case of industries. There are as many as 220,000 agricultural professionals serving in different capacities across the country, many of whom may be waiting to be part of the transformation process of agriculture in their individual capacity.

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Abbreviations

A4NH	Agriculture for Nutrition and Health	CIMMYT	International Maize and Wheat Improvement Center
AADs	Agricultural Associated Diseases	CIRDAP	Centre on Integrated Rural Development for Asia and the Pacific
AARDO	African-Asian Rural Development Organization	CM	Convergence Matrix
AAU	Anand Agricultural University	CoopNet	Networking of Cooperative Societies
AC&ABC	Agri-Clinic and Agri-Business Centre	CSC	Common Service Centres
ACCNet	Agricultural Credit and Cooperation Network	DAAPs	District Agriculture Action Plans
ADB	Asian Development Bank	DAC&FW	Department of Agriculture, Cooperation and Farmers Welfare
AE&AS	Agricultural Extension and Advisory Services	DAD&F	Department of Animal husbandry, Dairying and Fisheries
AFC	Agricultural Finance Corporation	DAESI	Diploma in Agricultural Extension Services for Input Dealers
AMMA	Assured Maximum Services to Marginal people in All villages	DAP	District Action Plan
AMMP	Agricultural Mission Mode Project	DAVP	Directorate of Audio Visual Publicity
APEDA	Agricultural & Processed Food Products Export Development Authority	DCB	District Cooperative Banks
ASCI	Agricultural Skill Council of India	DEEs	Directorates of Extension Education
ASEAN	Association of Southeast Asian Nations (ASEAN)	DIP	District Irrigation Plan
ATARIs	Agricultural Technology Application Research Institutes	DLBC	District Level Bankers Committee
ATIC	Agricultural Technological Information Centres	DMI	Directorate of Marketing and Inspection
ATM	Assistant Technology Manager	EAS	Extension and Advisory Service
ATMA	Agricultural Technology Management Agency	EAs	Extension Agents
BAMETI	Bihar Agricultural Management & Extension Training Institute	EEl	Extension Education Institutes
BAPs	Block Action Plans	EEl	Entrepreneurship Extension Institute
BATs	Block Action Teams	ESPs	Extension Service Providers
BAR	Brackish water Aquaculture Resource	ETCs	Extension Training Centres
BFACs	Block Farmer Advisory Committees	EWRMS	Electronic Warehousing Receipt Management System
BMP	Better management Practices	FACs	Farmer Advisory Committees
BNNRC	Bangladesh NGOs Network for Radio and Communication	FAO	Food and Agriculture Organization
BPL	Below Poverty Line	FF	Farmer Friend
BTTs	Block Technology Teams	FFDAs	Fish-Farmers Development Agencies
CAUs	Central Agricultural Universities	FFF	Female Farmer Friend
CDAP	Comprehensive District Agricultural Development Plan	FIGs	Farmer Interest Groups
CDB	Coconut Development Board	FFSs	Farmer Field Schools (Farm Schools)
CFTRI	Central Food Technological Research Institute	FISHNET	Fisheries Information System Network
CGIAR	Consultative Group on International Agricultural Research	FKGs	Farmer Knowledge Groups
CIBA	Central Institute of Brackishwater Aquaculture	FLDs	Frontline Demonstrations
CIGs	Commodity Interest Groups	FMTTI	Farm Machinery Testing and Training Institutes
		FNGs	Farmer Knowledge Groups
		FPCs	Farmer Producer Companies
		FPOs	Farmer Producers Organizations
		FTAs	Farm Tele Advisers
		FTCs	Farmer Training Centres
		GAP	Good Agricultural Practice

GIS	Geographical Information System	MFIs	Micro Financial Institutions
HRD	Human Resource Development	MGNREGA	Mahatma Gandhi National Rural Employment Guarantee Act
IAAP	Intensive Agricultural Area Programme	MIDH	Mission for Integrated Development of Horticulture
IADP	Intensive Agricultural District Programme	MPEDA	Marine Products Export Development Authority
ICARDA	International Center for Agricultural Research in the Dry Areas	MSD&E	Ministry of Skill Development & Entrepreneurship
ICM	Institutes of Cooperative Management	NABARD	National Bank for Agriculture and Rural Development
ICMR	Indian Council of Medical Research	NADRS	Networking National Animal Disease Reporting System
ICRISAT	International Crops Research Institute for the Semi-arid Tropics	NAEP	National Agricultural Extension Project
ICTs	Information and Communication Technologies	NARP	National Agricultural Research Project
IDRC	International Development Research Centre	NATP	National Agricultural Technology Project
IDWG	Inter Departmental Working Group	NCCD	National Centre for Cold-chain Development
IFFCO	Indian Farmers Fertilizer Cooperative	NCCT	National Council for Cooperative Training
IGNOU	Indira Gandhi National Open University	NCIP	National Crop Insurance Programme
IGSI	Indian Grain Storage Institute	NCUI	National Cooperative Union of India
IIFPT	Indian Institute of Food Processing Technology	NDDB	National Dairy Development Board
ILRI	International Livestock Research Institute	NDP	National Dairy Plan
IMAGE	Institute on Management of Agricultural Extension	NeGP	National e-Governance Plan
ISAM	Integrated Scheme on Agriculture Marketing	NES	National Extension Service
ISRO	Indian Space Research Organization	NFAES	National Fisheries and Aquaculture Extension Service
IVLP	Institute Village Linkage Programme	NFDB	National Fisheries Development Board
IWMI	International Water Management Institute	NFSM	National Food Security Mission
JICA	Japan International Cooperation Agency	NGOs	Non-Governmental Organizations
KCC	Kisan Call Centre	NGRCA	National Gender Resource Centre in Agriculture
KCCs	Kisan Credit Card	NHB	National Horticulture Board
KKMS	Kisan Knowledge Management System	NIAM	National Institute of Agricultural Marketing
KRIBHCO	Krishak Bharati Cooperative	NIC	National Informatics Centre
KVK	Krishi Vigyan Kendra	NIH	National Institute of Horticulture
MANAGE	National Institute of Agricultural Extension Management	NIMSME	National Institute for Micro, Small and Medium Enterprises
MBDE	Multi-Billion Dollar Enterprise	NIN	National Institute of Nutrition
MCJE&T	Mass Communication and Journalism Education and Training	NIPHM	National Institute of Plant Health Management
MCS	Monitoring, Control and Surveillance	NIRD&PR	National Institute of Rural Development and Panchayat Raj
ME&IT	Ministry of Electronics & Information Technology	NLRFW	National Level Ranking Frame Work
MEAL	Monitoring, Evaluation and Learning	NMAET	National Mission on Agricultural

Extension and Technology	SCARDBs	State Cooperative Agricultural and Rural development Banks
NMOOP National Mission on Oilseeds & Oil Palm	SCB	State Cooperative Banks
NMSA National Mission for Sustainable Agriculture	SEWA	Self Employed Women's Association
NRAA National Rainfed Area Authority	SEWPs	State Extension Work Plans
NRLM National Rural Livelihoods Mission	SFDA	Small and Marginal Farmers Development Agencies
NRSC National Remote Sensing Agency	SHGs	Self Help Groups
PA&RDBs Primary Agricultural and Rural Development Banks	SLDB	State Land Development Banks
PACs Primary Agricultural Cooperative Societies	SMAM	Sub Mission on Agricultural Mechanization
PDS Public Distribution System	SMPP	Sub Mission on Plant Protection and Plant Quarantine
DCP District Credit Plan	SMS	Subject Matter Specialist
PMGDISHA Pradhan Mantri Gramin Digital Saksharta Abhiyaan	SMSP	Sub Mission on Seed and Planting material
PPV&FRA Protection of Plant Varieties and Farmers Rights Authority	SNC	State Nodal Cell
QPs Qualification Packs	SPV	Special Purpose Vehicle
RFE Research-Farmer-Extension	SREP	Strategic Research and Extension Plan
RKVY Rashtriya Krishi Vikas Yojana	ST	Scheduled Tribes
RPL Recognition of Prior Learning	T&V	Training and Visit
RRBs Regional Rural Banks	TBIs	Technology and Business Incubators
SAME Sub Mission on Agricultural Extension	ToT	Transfer of Technology
SAMETI State Agriculture Management & Extension Training Institute	UAS	University of Agricultural Sciences
SAUs State Agricultural Universities	WALMI	Water and Land Management Institute
SC Scheduled Castes	WSSV	White Spot Syndrome Virus

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Annexures

Annexure I

**Case Study on Doubling Farmers' Income through Effective
Agricultural Extension – the DATES Project**

DATES (Dynamic Agricultural Tablet Based Extension Services) project was tested in Karnataka for a period of two years by University of Agricultural Sciences (UAS), Raichur. This project has by following the rigour of research methodology and statistical analysis has overcome the challenges of quantifying the impact of agricultural extension, as will be revealed in the sections that follow.

The objectives of DATES project were to:

- i. Establish the impact of agricultural extension; and
- ii. Measure the extent of impact

The study under DATES project was carried out in Siruguppa Taluk of Bellary district, Karnataka. Siruguppa falls under northern dry agricultural zone. Most of the lands in Siruguppa are irrigated by the Tungabhadra canal project in the region. Siruguppa has shallow to deep black clays; agriculture is actively practiced in Rabi season as well (apart from Kharif) and the major crop is paddy, followed by cotton. Agriculture is commercially oriented in Siruguppa as manifest by the number of crops, the farmers take in a year and the investments they make in crop production (in terms of inputs like fertilizers and pesticides).

The focus crops that the project studied were: paddy, cotton, sunflower, and bengal gram. Of these two most prominent crops are paddy and cotton and the results of those two are presented here.

Agricultural Information Availability in the Region before the Intervention

5.1. The main centers for information established by Karnataka Government are Ryot Samparka Kendra (RSK) and Krishi Vigyan Kendra (KVK). Initial survey of farmers showed that:

- majority of the respondents did not obtain any training on modern agricultural practices and they did not have any idea on the source of such information;
- in case of many farmers, crop yield was lower than that in field experiments; and
- majority of the interviewed farmers were willing to pay if a reliable source could provide agriculture related information to them.

5.2. Mode of Treatment

As per the treatment design, one extension agent would visit the selected farmers in treatment villages with e-SAP tablet and provide information as appropriate. e-SAP (*Electronic Solutions*

Against Agricultural Pests) refers to a unique IT-enabled handheld device, that had been developed by the scientists of UAS, Raichur with the purpose of providing the farmers real time information on pest-related problems. In addition to relevant information on pest management, the project loaded more data onto the tablet, so that it held modules on nutrient management (information on crop nutrition and soil nutrition); plant and animal protection; crop agronomy (information on crop rotation, plant variety, irrigation & drainage, meteorology, and weed control; markets information on prices for farmer's produce in nearby markets; and government schemes on agricultural loan and insurance, as also procedure to apply for them.

Apropos the project design, each extension agent was in charge of three Gram Panchayats (GPs) catering to 150 farmers. The agent interacting with the farmer about his crops, and on finding a problem would first try to diagnose it with the help of material in the tablet and then suggest remedial actions. And, if he was not confident about the problem, he would take three (3) photographs of the affected crop parts and field condition and submit the same to the online server. The UAS scientist sitting at the back-end would study the issue and upload the solution in the server, for being communicated to the farmer. Apart from diagnosing problems generally related to pests and diseases, the agents also advised farmers on using seeds for better yields and complementary inputs that would go with newer seeds; on appropriate time of sowing, depending upon weather forecasts; on rational and correct use of chemical inputs besides encouraging them to increase use of organic manure; and advising them on matters of land preparation & maintenance (regular weeding etc). When making any suggestions, the extension agents ensured that the inputs being recommended were easily and locally available.

Trust is said to play an important role in ensuring that farmer adopts information given. The extension agents succeeded in gaining the trust of the farmers they worked with by ensuring: regular visits to farmer's land; being constantly available on mobile phones; always talking to farmers in local language and explaining the concepts in easy to understand ways; and being familiar with the farming techniques and practices.

Other project interventions included:

- a) Collected information on various agricultural credit schemes from the most prominent banks in the region and put them together in pamphlets in local language and distributed the same among treatment farmers.
- b) Collected information on relevant insurance schemes and informed farmers about them.
- c) Collected samples for soil tests, got them tested, shared the test results with farmers and advised them on nutrients that they should be using.
- d) Got treatment farmers registered for receiving price information service provided by APMC (Agricultural Produce Market Committee). On registration via a web-

based system by using his/her mobile number, the farmers received daily SMS containing price of selected crops from upto ten selected APMC markets. None of the treatment farmers were benefitted from such initiative when the project was launched.

- e) Trainings were conducted by a pool of resources comprising scientists from Agricultural Research Stations, local veterinary doctor, and government officers who imparted knowledge on best management practices in agriculture and about different government schemes.
- f) Made farmers aware of the prevailing helpline numbers, namely, Sahaya Vaani (Farmers helpline) – 1800 425 3553 and the Kissan Call Centre - 1800 180 1553 and encouraged them to call up and seek solution on their problems.

While the project made extensive use of ICT in its intervention by way of using tablets with pre-loaded data, it was ensured that it combined optimally with manpower based extension. The pre-loaded data included farmer profiles (including GIS service for field identification) and scope for taking snaps of affected crop if extension agent was not able to identify the disease; linking farmers to various helplines (provided both message based and voice based services) and encouraging them to contact extension agents through cell phones. It has now been recognised, that ICT should not be used as a stand alone technique in work of agricultural extension and there are major benefits of face-to-face communication that must figure in the project design (FAO). The DATES project thus tried and maintained a healthy mix of conventional extension techniques like farm visits and ICT for greater efficiency.

5.2. Results

The project researchers analysed the data and evaluated the impact of the treatment on area under cultivation, pest/disease attack by number of crops and total area affected; crop losses reported by farmers; and also change in yield, costs and returns, for all the three crops, namely, cotton, Kharif paddy and Rabi paddy.

In case of all the three crops, the study showed, that the yield increased with time as also paid-out costs and gross returns. Yield increase, across the board, was partly attributed to reduction in pest incidences and crop losses. Higher yields translated into higher gross returns, as the latter was measured in terms of the money received by the farmer from sale of his/her produce. However, the study also showed, that there was an increase in paid-out costs which had an implication on the net returns obtained by the farmers.

Effect of treatment was found to be positive. The impact of treatment in respect of yields and gross returns was as follows:

- i) It doubled in case of cotton;
- ii) It increased by 17 per cent in case of Kharif paddy

- iii) It increased by more than double in case of Rabi paddy.

The cost of cultivation also showed decline in case of cotton and Kharif crops.

As per the study, there was significant increase in net returns obtained by the treatment farmers from the treatment received by them. The highest increase was seen in case of cotton at the level of Rs.33,000 per acre, followed by increase of Rs.16,000 per acre for Rabi paddy and more than Rs.15,000 per acre in case of Kharif paddy. When measured against constant term, net returns of farmers in treatment group increased by 67 per cent for farmers growing Kharif paddy, by 76 per cent for Rabi paddy farmers and by 331 per cent for cotton farmers. **It is thus clear, that effective treatment through an efficient agriculture extension system can result in high net returns to the farmers.**

5.2.1. Effect of Other Independent Variables

The researchers saw limited impact of other farmer specific observables on change in values of dependent variables. Irrigation status of farmer has significant impact of farmer's outcomes from cotton crop. Farmers with irrigation facilities got higher yields and gross returns from their cotton crop but also incurred higher costs on the crop. Similar results were observed for kharif paddy crop for the variable that captured farmer's education levels. In case of more educated farmers growing kharif paddy, yields, gross returns and costs were seen to have increased. Surprisingly, land ownership, measured in acres, seems to have a very limited impact. Costs incurred in growing kharif paddy and rabi paddy reduce as the size of land ownership increases, though the magnitude of reduction is very small.

5.2.3. Change in net returns with enhanced prices

The study had not focused much on improving market linkages and, therefore, did not see substantial change in the prices received by the farmers on their produce. In order to estimate the net returns, if farmers received better prices, the researchers worked out the impact of market linkages on the net returns by assuming 10 per cent increase in the price received and plotted net return for farmers with new prices and old paid-out costs. The returns based on this showed that:

- Kharif paddy farmers would have received net return of Rs.37,500 per acre showing an increase of over 93 per cent compared to the baseline net returns (nearing doubling of the farm income).
- Corresponding increases for two other crops are:
 - 139 per cent for Rabi paddy farmers
 - 397 per cent for cotton farmers

The study brought out clearly that there is a close link between the net returns and the higher price realisation. With the hypothetical 10 per cent increase in prices, treatment farmers got additional return of 66 per cent for cotton, 26 per cent for Kharif paddy and 63 per cent for Rabi paddy as compared to net returns gained without increase in prices. **Thus, a small increase in prices of the final produce has a disproportionately large impact on the**

returns received by the farmers and demonstrates the need for improved marketing efficiency.

6.0. Understanding change in costs from the perspective of ecological sustainability of agriculture

While the increases in the net returns clearly brought out, that by providing timely and quality information to the farmers it improves their financial sustainability, its impact on ecological sustainability also needed to be examined. Hence, the project studied the expenses incurred by the farmers on fertilizers and pesticides. The impact of the project on the change in fertilizers and insecticides used as captured by time into variable treatment was evident except for expense on insecticides in case of rabi paddy. The treatment farmers realized reduced expenses on fertilizers and insecticides in case of cotton and kharif paddy crops.

7.0. Outcome and Recommendation of the DATES Project

The study concluded practically, that robust agricultural extension can enable to double the net income of the farmers in 3-4 years, by using current outcomes of research and supported by facilities like irrigation. The study also argued that doubling of the net income would happen faster if the farmers realized higher prices on their produce. In addition to this, personalized agricultural information delivery can also mitigate some of the concerns relating to ecological impact on agriculture arising from improper use of insecticides and fertilizers. Hence, investments in proper institutional support, if provided, for appropriate mechanism to deliver farm advisory services can help in enhancing farmers' income, even by using existing technologies & knowledge generated by agricultural research system of the country.

Annexure- II**Public and Private Extension Service Providers – An Overview****Public Extension Service Providers**

Ministry of Agriculture and Farmers Welfare, GoI

- **Department of Agriculture, Cooperation and Farmers Welfare (DAC&FW)**
 - ❖ Directorate of Extension
 - ❖ National Institute of Agricultural Extension Management (MANAGE)
 - ❖ National Institute of Agricultural Marketing (NIAM)
 - ❖ National Institute of Plant Health Management (NIPHM)
 - ❖ National Council for Cooperative Training (NCCT)/ National Cooperative Union of India (NCUI)
 - ❖ Vaikunth Mehta National Institute of Cooperative Management (VAMNICOM)
 - ❖ Institutes of Cooperative Management (ICM)
 - ❖ Extension Education Institutes (EEIs)
 - ❖ Coconut Development Board (CDB)
 - ❖ National Horticulture Board (NHB)
 - ❖ Small Farmers Agri-Business Consortium (SFAC)
 - ❖ Agriculture Skill Council of India (ASCI)
 - ❖ Farm Machinery Testing and Training Institutes (FMTTI)
 - ❖ Commodity Directorates
 - ❖ National Cooperatives - IFFCO, KRIBHCO
 - ❖ National Centre for Organic Farming
 - ❖ National Bureau of Soil Survey of Land Use Planning
 - ❖ National Institute of Horticulture (NIH)
 - ❖ Directorate of Marketing and Inspection (DMI)
 - ❖ National Rainfed Area Authority (NRAA)
 - ❖ Protection of Plant Varieties and Farmers Rights Authority (PPV&FRA)
 - ❖ National Seed Corporation (NSC) and other PSUs supplying Agri Inputs
- **Department of Animal Husbandry, Dairy and Fisheries (DAH, D & F)**
 - ❖ National Fisheries Development Board (NFDB)
 - ❖ National Fisheries Cooperative
 - ❖ National Dairy Development Board (NDDB)

- ❖ Poultry Directorates
- **Department of Agriculture Research and Education (DARE)**
 - ❖ ICAR Institutions
 - ❖ Agricultural Technology Application Research Institute (ATARI)
 - ❖ Krishi Vigyan Kendras (KVKs)
 - ❖ Central Agricultural Universities (CAUs)
- **Ministry of Water Resources**
 - ❖ National Academy of Water Resources / WALMI
- **Ministry of Food, Consumer Affairs and Civil supplies**
 - ❖ National Nutrition Board (NIB)
 - ❖ Indian Grain Storage Institute (IGSI)
- **Ministry of Commerce and Industries**
 - ❖ Coffee Board
 - ❖ Tea Board
 - ❖ Rubber Board
 - ❖ Spices Board
 - ❖ Coir Board
 - ❖ Tobacco Board
 - ❖ Agricultural & Processed Food Products Export Development Authority (APEDA)
 - ❖ Marine Products Export Development Authority (MPEDA)
- **Ministry of Information and Broad Casting**
 - ❖ Doordarshan – DD Kisan, Narrow Casting Centres
 - ❖ All India Radio, Community Radio
 - ❖ Directorate of Audio Visual Publicity (DAVP)
- **Ministry of Textiles**
 - ❖ Central Silk Board
- **Ministry of Food Processing**
 - ❖ National Institute of Food Processing Technology Engineering and Management (NIFTEM)
 - ❖ Indian Institute of Food Processing Technology (IIFPT)

- **Ministry of Rural Development**
 - ❖ National Institute of Rural Development and Panchayat Raj (NIRD&PR)
 - ❖ State Institutes of Rural Development (SIRD)/ Extension Training Centres (ETCs)

- **Ministry of Micro, Small and Medium Enterprises**
 - ❖ National Institute for Micro, Small and Medium Enterprises (NIMSME)
 - ❖ Khadi and Village Industries Commission / Khadi Boards
 - ❖ National Institute of Entrepreneurship and Small Business Development (NIESBUD)
 - ❖ Entrepreneurship Extension Institute (EEI), Guwahati

- **Ministry of Science & Technology**
 - ❖ Indian Space Research Organisation (ISRO)
 - ❖ National Remote Sensing Agency (NRSC)
 - ❖ Central Food Technological Research Institute (CFTRI)

- **Indian Council of Medical Research (ICMR)**
 - ❖ National Institute of Nutrition (NIN)

- ***Indira Gandhi National Open University (IGNOU)***

- State Agricultural Universities (SAUs)
- State Agricultural Management Extension Training Institute (SAMETIs)
- Farmer Training Centres (FTCs)
- Rural Self-Employment Training Institutes (RSETIS)
- Agricultural Technology Management Agency (ATMA)

- **Ministry of Finance**
 - ❖ National Bank for Agriculture and Rural Development (NABARD)
 - ❖ Public Sector Banks
 - ❖ Regional Rural Banks (RRBs)

- **State Government**
 - ❖ State Cooperative Banks (SCB)

- ❖ District Cooperative Banks (DCB)
- ❖ Primary Agricultural Cooperative Societies (PACs)

- **Inter-Governmental Institutions**

- ❖ ICRISAT
- ❖ IRRI
- ❖ IFPRI
- ❖ ILRI
- ❖ ICARDA
- ❖ IWMI
- ❖ IFAD
- ❖ SAARC
- ❖ CIRDAP
- ❖ ASIAN
- ❖ ADB
- ❖ CIMMYT
- ❖ World Bank
- ❖ FAO
- ❖ UNDP
- ❖ IDRC
- ❖ USAID
- ❖ GIZ
- ❖ DFID
- ❖ AARDO
- ❖ European Union
- ❖ JICA etc.

Private Extension Service providers

- ❖ Agripreneurs / Agri-Clinics and Agri-Business Centres (AC&ABC)
- ❖ CIGs, FIGs, FSGs, SHGs,
- ❖ Farmers Producer Companies
- ❖ Farmers Cooperatives
- ❖ Farmers Organisations
- ❖ Input Dealers
- ❖ Agri-business Companies

- ❖ Private Banks- Yes Bank, ICICI Bank, Axis Bank etc.
- ❖ NGOs
- ❖ Donor Agencies – National, International
- ❖ ICT Service Providers – Mobiles, Internet
- ❖ Mass Media – Television, Radio, Print Media
- ❖ Agriculture Traders
- ❖ Millers
- ❖ Agriculture Insurance Service Providers
- ❖ Logistic Service Providers - Transport, Cold Storage, Godown,

Annexure- III**Brief note on Salient Achievements of KVK Scheme during 12th Plan**

So far, the Indian Council of Agricultural Research (ICAR) has established a network of 683 Krishi Vigyan Kendras (KVKs) in the country (669 KVKs were set up till 12th Plan) with mandate of Technology Assessment and Demonstration for its Application and Capacity Development for Farmer-centric growth in agriculture and allied sectors through application of appropriate technologies in specific agro-ecosystem perspective. The salient achievements of KVK scheme during 12th Plan are as follows:

- **Assessment of Technologies:** During the 12th Plan, the KVKs assessed and refined 16681 technology interventions across 25009 locations by laying out more than 1.60 lakh trials in farmers' field on various crops under different thematic areas, viz. varietal evaluation for cereals, pulses, oilseeds, fruits, vegetable crops and commercial crops; cropping systems; disease management; drudgery reduction; farm machineries; integrated crop management; integrated disease management; integrated nutrient management; IPM; integrated weed management; evaluation of breed; feed and fodder management; IFS; production and management; processing and value addition; energy conservation; small scale income generation; and storage techniques; mushroom; Vermi-compost production; nutritional gardens; processing of fruits and vegetables; etc. The successful technological interventions tested under On- Farm-Trials were subsequently also demonstrated as part of technology package for frontline demonstrations.
- **Demonstration of Technologies:** In order to demonstrate the production potential of agricultural technologies as many as 6.23 lakh frontline demonstrations (FLD) were conducted with the participation of farmers on various crops and enterprises. Under FLDs, focussed and specialized programmes were started for demonstrating the production potential of Pulses and Oilseeds through cluster frontline demonstrations by 549 KVKs in Pulses and 517 KVKs in Oilseeds. As many as 111157 FLDs showing an increase on yield of 33.44 to 69.96 per cent in various pulses and 78003 FLDs showing an increase on yield of 23 to 147 per cent in various oilseeds were conducted during last two years of the 12th Plan.
- **Establishment of Pulses Seed hubs:** Seed hubs have been set-up at 97 KVKs for production of quality seeds of major pulse crops. During the year 2016-17, a total of 20479.30 qtl seeds of pigeon pea, black gram, green gram, lentil, chick pea, field pea and lathyrus was produced for availability to farmers. Different models of integrated farming systems have been set-up in more than 462 KVKs.
- **Production of technological products:** KVKs produced large quantity of technological products like seeds and planting materials of improved varieties and hybrids, bio-products and elite species of livestock, poultry and fish which benefited 31.29 lakh farmers in the country.

- **Seeds:** During 12th Plan, 1.21 lakh tonne seeds of improved varieties of cereals, oilseeds, pulses, commercial crops, vegetables, flowers, fruits, spices, fodder, forest species, medicinal plants and fibre crops were produced and provided to farmers.
- **Planting materials:** In all, 16.26 crore quality planting materials of elite species of commercial crops, vegetables, fruits, ornamental, medicinal and aromatic crops, plantation crops, spices, tuber crops, fodder and forest species were produced and provided to farmers.
- **Livestock, poultry and fish fingerlings:** As many as 11.29 crore fingerlings and other livestock strains and improved breeds of cow, sheep, goat, buffalo and breeding bull were produced and supplied to farmers.
- **Awareness on Improved Technologies and Government Schemes:** In order to create awareness among farmers on improved agricultural technologies developed by NARS, the KVKs conducted large number of extension activities with the participation of 665.11 lakh farmers. In addition, special awareness creation extension programmes were conducted by KVKs sensitizing and benefitting 4.57 lakh farmers and other stakeholders for taking advantage of provisions of Pradhan Mantri Fasal Bima Yojana and other Government schemes. As many as 555 Public Representatives including Union Ministers, Chief Ministers, State Ministers, Members of Parliament and Legislative Assemblies, other Public Representatives and Senior Govt. Officers had participated in such programmes.
- **Mobile Advisory to Farmers:** Kisan mobile advisory (KMA), an initiative by the KVKs is providing timely and need based information to farming community. KVKs provided service through various service providers and using the mKisan portal. Information on weather, market, various farm operations, outbreak of pest and disease incidence and their control measures are given to farmers through Short Message Service (SMS). During the 12th Plan, short text and Voice messages were sent to benefit 422.86 lakh farmers on various aspects of agriculture, horticulture and animal husbandry, weather forecast, and pest and disease control by KVKs.
- **Skill Development Training Programmes:** In view of the priority of Government of India to develop skilled manpower in different sectors, special 200 skills oriented programmes were initiated during 2016-17 by 100 KVKs. During 2017-18, 254 KVKs, 38 Agricultural Universities and 10 Agricultural Colleges, 42 ICAR Institutes with 7 Regional Stations of 29 states are conducting skill training programmes based on National Skills Qualifications Framework aligned job roles.
- **Soil Testing for Sustainable Agriculture:** In the light of the initiatives of Govt. of India for Soil Health Management as a part of Natural Resource Management in the country, the KVKs are implementing Soil Health Card Scheme every year for the farmers. As per focus of the Govt. all KVKs have been provided soil testing kits (1330). As many as 8.90 lakh Soil health cards have been provided to farmers with the advice to apply soil test based nutrients to their crops.
- **For Attracting and Retaining Youth in Agriculture (ARYA):** The ARYA project is being implemented in 25 states through KVKs, one district from each state with technical

partners from ICAR Institutes and Agricultural Universities. In one district, 200-300 rural youths are identified for their skill development in entrepreneurial activities and establishment of related micro-enterprise units. The trained youth groups are functioning as role model for other youths and demonstrate the potentiality of the agri-based enterprises and also give training to other farmers. As many as, 4400 youths have been involved in the project for developing their entrepreneurial skills in various agri-enterprises.

- **Farmer FIRST Programme:** A new Farmer FIRST programme has been started at Agricultural Universities and ICAR Institutes which aims at enriching Farmers –Scientist interface, technology assemblage, application and feedback, partnership and institutional building and content mobilisation and providing a platform to 45000 farmers and scientists for creating linkages, capacity development, technology adaptation and application, on-site input management, feedback and institution building.
- **Some other notable achievements of KVK scheme during 12th Plan are as follows:**
 - Refined the technology package of control of Orobanche or broom-rape (*Orobanchaegyptiaca*) by KVK Bhiwani, Haryana.
 - Propagation of oyster mushroom cultivation technology, storage, marketing etc. by KVK Chirang, Assam.
 - Black Polyethylene Mulch to prevent soil erosion in Pineapple (*Ananascomosus*) Cultivation in Dimapur, Nagaland.
 - Intercropping in Sugarcane [mustard, garlic, onion, green pea, black gram, green gram and cucumber] by KVK Saharanpur of Uttar Pradesh. The KVK also initiated participatory rice and wheat seed production programme.
 - Improved Jasmine cultivation model and collective marketing for higher income (KVK Kosbad Hill).
 - Adaptability of Pigeon pea in Moisture Stress Conditions by KVKs in Nalgonda, Mahbubnagar and Ranga Reddy districts.
 - Promoted Micro irrigation system, drip and sprinkler by Banaskantha KVK, Gujarat. As many as 1.66 lakh farmers have adopted MIS covering 2.59 lakh ha area, which is about 35 per cent of total cultivated area of the district.
 - Promotion of Improved method of sowing particularly Ridge and furrow/Broad Bed Furrow/Furrow Irrigated Raised Bed/Raised Bed in soybean, chickpea, etc. by the KVKs of Madhya Pradesh resulted in procurement of more than 50,000 seed drills, equipped with ridge-furrow attachments are now used in sowing operation. Soybean is being sown in Madhya Pradesh through ridge-furrow method in more than 3.2 million ha area.
 - Rearing of Kadaknath breed in Madhya Pradesh, Chhattisgarh, Uttar Pradesh, Andhra Pradesh, Rajasthan, Gujarat, Kerala, Maharashtra and Delhi (with the help of Jhabua KVK and 15 KVKs of the said states).
 - Effectiveness of System of Rice Intensification (SRI) through FLD demonstrations increased the area manifold under SRI in rice dominated regions of Madhya Pradesh, Chhattisgarh and Odisha.
 - Diffusion of Direct Seeding of Rice by KVK Raichur, Karnataka has resulted in spreading of DS R technology in more than 26000 ha in Raichur district.

- KVK, Ranchi demonstrated and promoted scientific lac cultivation among 500 farmers belonging to 22 tribal villages. Lac cultivators are now able to produce their own brood lac by utilizing their own trees and have become model for other lac cultivators. The KVK has formed a brood lac (lac seed) bank with farmers as members.
- KVK Baramati, Pune popularized in-situ moisture conservation technology through farmer's campaign. For this activity 42 rainfed villages were selected and demonstrations were conducted for farmers by involving farmers' clubs and State Department of Agriculture. As a result, about 256 ha was brought under this technique.
- With the technological support and demonstration of Vanaraja there is upto 100 per cent productivity enhancement by KVK Pulwama. Now , Vanaraja poultry strain is ruling backyards in Kashmir Valley.
- KVK Ahmednagar demonstrated Pomegranate orchard management under deficit water condition with the use of water absorbent polymer in pomegranate orchard showing the net saving of 14 lakh liters of water per hectare. The area under pomegranate has increased from 225 ha to over 630 ha (64 per cent) and number of farmers has also increased six-fold, i.e. from 200 to 1200.
- Hot arid region turns hot spot for Shankhpushi and Mulethi (Medicinal Plants) with the technological interventions of KVK Barmer by forming a group of 100 farmers and linking it with a private company for marketing.
- Rice bowl in Kerala develop has been developed as a mushroom belt with the advice of the KVK Pathanamthitta to 3471 farmers for adopting Mushroom cultivation through 161 training courses on mushroom cultivation, spawn production and value addition. A group of 250 farmers have started the enterprise by obtaining 6010 Kg of spawn from the KVK. As a result the mushroom cultivation is gaining momentum in the district.
- Entrepreneurial development of farm women for production and marketing of Jeera Phool Rice by KVK Balrampur (MP) by forming a Farmers Interest Group (FIG) and providing it a bag sealing machine, a mini rice mill and marketing support. The FIG earned about 60,000 after the investment of 36,000 only, in just one season selling about 12 q of Jeera phool rice @ ₹ 250/packet of 5 kg. There is a huge demand for this organic rice from many consumers across the state and traders as well.
- The innovative extension approach adopted by KVK Dhalai i.e. *Krishi Prajukti Rath* with financial support from ATMA has brought a greater level of enthusiasm and confidence amongst the farmers of the district for adopting improved technology of Rice , groundnut and maize crops. For increasing production and productivity of different crops during the *Kharif season of 2014-15*, the KVK provided 4,700 kg HYV (Gomati, MTU1010 and Ranjit) of paddy seeds, 2,000 kg of groundnut (var. TG-37-A) seeds, and maize seeds to the farmers of Dhalai district.
- KVK, Bengaluru Rural, implemented FLD on 'Preparation of Jackfruit products including branding and market linkage' among the members of two SHGs. Weighing balance, sealing machine, foil sealer, labeling and packing materials were made available to the group. The SHGs were sensitized on nutrient composition of jack fruit, cost economics, importance of hygiene and sanitation in production unit, marketing channels, Food Safety and Standards Authority of India (FSSAI) licensing and registration. With this intervention the SHG members are selling the branded products.
- Under the technical guidance of KVK Kullu for Empowering dairy farm women the identified 18 SHGs each comprising farm women interested in dairy farming. Farm

women was facilitated to get loan of Rs 1.00 lakh to purchase high yielding animals and construction of semi *pucca* animal sheds. The intervention showed positive trends leading to increased income of the dairy farm women, besides reduced calf mortality (decreased from 15-20 to 5-7 per cent), age of puberty (reduced from 24.8 months to 16.42 months), age at first conception (reduced from 26.86 months to 18.28 months), calving interval (reduced from 2.89 years to 1.23 years) and increased milk yield per lactation (from 1,500-2,000 litres to 2,200-3,000 litres).

- For Improving the vegetable farming in barren land through drip irrigation, KVK, Seoni, provided technical guidance to farmers for growing nursery management, planting, fertigation schedule and insect pest management for improved hybrids of vegetables (tomato, chilli and capsicum) coupled with introduction of drip irrigation system in more than 150 ha. Identified area was linked with subsidy (70 per cent) from Horticulture Department, Seoni. Due to KVK interventions, there was increase in area up to 4,798 ha for growing improved variety/hybrids resulting in enhanced productivity to 179 q/ha and increased income of ` 40,000-45,000/annum.

Annexure-IV
Extension strategies for addressing emerging challenges

SN	Extension Approach	Possible Impact
1.	General extension approach	<ul style="list-style-type: none"> • This approach assumes that the Technology & Knowledge are available for local people but not being used by them; • As a result, the Government involves the NGOs & Voluntary Organisations; • Success is measured in the adoption rate of recommendations which increase the socio-economic condition of farmers;
2.	Commodity Specialized Approach	<ul style="list-style-type: none"> • To function for increased production through extension, research, input supply, marketing intelligence and prices under single command; • Fairly Centralized and oriented towards one commodity or crop and the Agent has many functions;
3.	ToT approach	<ul style="list-style-type: none"> • Fairly centralized approach and based on a rigorously planning where the technology / recommendation is transferred through different extension teaching methods to farmers, training to agents and subject matter specialists; • Close links are maintained between research and extension; • Agents are only involved in technology transfer; • Success is related to increases in the production of particular crops or commodities;
4.	Participatory approach	<ul style="list-style-type: none"> • Often focuses on the expressed needs of farmers' groups with the goal to increase production and uplifted rural life; • Implementation is often decentralized and flexible; • Success is measured by the number of farmers actively participating and the sustainability of local extension organisations;
5.	ICT approach	<ul style="list-style-type: none"> • focuses on subjective communication, distance education, rendering agriculture information, inputs and services through cyber linkages;
6.	Project approach	<ul style="list-style-type: none"> • Harness the efforts on a particular location, for a specific time period, often with scarce resources; • Part of its purpose is often to demonstrate the techniques and methods that can be extended and sustained after the project period; • Short term changes are often a measure of success.
7.	Farming systems approach	<ul style="list-style-type: none"> • Systems or holistic approach at the local level; • Close ties with research are required and technology for local needs is developed through an iterative process involving local people; • Success is measured by the extent to which local people adopt and continue to use technologies developed;
8.	Cost-sharing approach	<ul style="list-style-type: none"> • Assumes that the cost-sharing with farmers will promote the activities that is more likely to meet local needs and where extension agents are more accountable to local interests.;

SN	Extension Approach	Possible Impact
		<ul style="list-style-type: none"> • Their role is to give advice and service to facilitate farmers' development; • Success is measured by the willingness to pay.
9.	Institutional approach	<ul style="list-style-type: none"> • Uses educational institutions which have technical knowledge and researches to support extension services for rural people; • Implementation & planning are often governed by the determinants of formal education; • Emphasis is often on the Transfer of Technical Knowledge;
10.	Market led extension approach	<ul style="list-style-type: none"> • Focuses of the extension functionaries need to be extended after harvesting; • Promotes end-to-end solution (beginning from package of practices for production to selling of produce); • Aims at farmers getting remunerative prices of their produces;
11.	ITK approach	<ul style="list-style-type: none"> • Focuses on the indigenous knowledge developed by the farmers through their ingenuity, which are viable & sustainable for the solution of many agricultural & allied problems faced by them without neglecting the nature and culture;
12.	HRD/HRM approach	<ul style="list-style-type: none"> • Focuses on development & management aspects of available human resources of organisation & in the field; • Stakeholders are Extension Machinery & Farmers; • Concentrates on Capacity Building which results in work efficiency of an individual;

#Source: The Gujarat Journal of Extension Education [Vol. 25 (1), 2014]