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Agri- Allied Sector Extension: Present Status and Way Forward

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About the Publication:

Extension Digest is a publication from the National Institute of Agricultural Extension Management (MANAGE). The purpose is to disseminate information on extension systems and practices, research on extension methods, efficient organization of technology transfer, current concerns and new developments in the area of agriculture and allied sector.

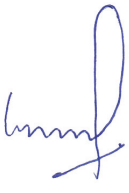
Disclaimer: This issue of the Extension Digest is a compilation of information, on the status of agri-allied sector, sourced from various reports and websites and is based on discussions and information received from organizations. For latest information and updates, respective links may please be seen.

Foreword

Agri-allied sectors are considered to be the mainstay of the Indian economy because of their high share in employment and livelihood creation. National Sample Survey Office's (NSSO) 70th round survey showed that more than one-fifth (23 per cent) of agricultural households with very small land size (less than 0.01 hectare) reported livestock as their principal source of income. Farming households with some cattle head are better able to withstand distress due to extreme weather conditions. It is also an important source of raw material and demand for many industrial products. The major agri-allied sectors are livestock, horticulture, fisheries and sericulture sector.

Presently, the agri-allied sector is facing several challenges, among which extension services are seen generally as weak and neglected aspects. Extension as a rural support service is needed to meet the challenges in agri-allied sector due to changes in the global food and agriculture system including the rise of supermarkets and the growing importance of standards and labels; growth in non-farm rural employment and agribusiness; constraints imposed by health challenges that affect rural livelihoods; and the deterioration of the natural resource base and climate change. The delivery of extension services is emerging as an important priority area for enhancing and optimizing production and value addition. Services include transfer of technology and strengthening of various infrastructure and support services, while building the capabilities of the stakeholders.

This issue of the Extension Digest looks into challenges in agri-allied sector, extension approaches, constraints and strategies for strengthening extension delivery mechanism in the agri-allied sector with more emphasis on Animal Husbandry. I am sure that this Extension Digest issue will be helpful for all actors in the agriculture and allied sectors and agricultural extension professionals.



Smt. V. Usha Rani, ***IAS***
Director General, MANAGE

Content

1. Status of Agri-Allied Sectors in Indian Economy

Agriculture plays a vital role in India's economy. Nearly 54.6% of the population is engaged in agriculture and allied activities (Census 2011) and the sector contributed 17.4% to the country's Gross Value Added for the year 2016-17 (at current prices). (Annual Report 2016-17, DAC & FW). The contribution of agri-allied sectors viz., livestock (including dairy, sheep, goat, poultry and piggery), fisheries (marine, inland and aqua farming), horticulture (including fruits, vegetables, flowers, spices, aromatic and medicinal plants) and sericulture sector has been significant and growing over the years. Globally, India accounts for the highest milk production, second highest fish production and second highest production of fruits and vegetables.

Livestock Sector

Livestock sector is an important sub-sector of agriculture which provides nutrient-rich food products, draught power, organic manure and domestic fuel, hides and skin and is a regular source of cash income for rural households. Over the last two decades, livestock sector has grown significantly. According to estimates of the Central Statistics Office (CSO), the value of output of livestock sector at current prices during 2015-16 was about 28.6% of the value of output from agricultural and allied sector. (28% at constant prices) (Annual Report 2016-17, DAC & FW).

Currently, India accounts for 18.5% of world milk production. In 2016-17, with annual growth rate of 6.37%, milk production reached 165.4 million tonnes. The per capita milk availability is 355 gm per day per person, considerably higher than recommended by ICMR i.e. 280 gm per day per person. (Annual Report, DAHD&F, 2017-18)

Uttar Pradesh, Rajasthan and Madhya Pradesh are the highest milk producing states contributing 37.8% of total milk production.

The Indian dairy cooperative network consists of 1,77,314 primary milk cooperative societies at village level covering 16,282 producer members and procures 42.8 million kg milk per day. (Annual Report, NDDB, 2016-17). Approximately, 34% of the milk is sold in the unorganized market while 46% is consumed locally. This is in contrast to most of the developed nations where almost 90% of the surplus milk passes through the organized sector. As per the Department of Animal Husbandry, Dairying and Fisheries, organized milk handling is expected to grow from 20% at present to 50% by 2022-23. (Annual Report, DAHD&F, 2017-18)

Presently, the co-operatives and private dairies have access to only 20% of the milk produced. However, it is estimated that, by 2020, private corporate dairies will overtake cooperatives in handling of milk volumes, which is projected to reach 28.93 million tonnes, ahead of the 23.67 million tonnes of cooperatives. (National Action Plan for Dairy Development: Vision 2022).

The total meat production in the year 2016-17 reached 7.4 million tonnes among which the major contribution is from poultry 47.05% followed by buffalo 19.80%, goat 14.25%, sheep 7.68%, pig 6.50 and cattle 4.72% (Annual Report, DAHD&F, 2017-18).

The per capita availability of meat is around 5kg. per person per year, which is nearly half the recommended level i.e. 11kg per person per year by ICMR.

Uttar Pradesh, Maharashtra and West Bengal are the highest meat producing states contributing nearly forty percent (39.23) of total meat production.

Tamil Nadu, Andhra Pradesh and Telangana ranked the largest egg producing states, contributing more than half (50.3%) of the total egg production.

India ranks third in egg production in the world after China and the USA and is the fourth-largest producer of chicken in the world after China, Brazil and the USA. In 2016-17, egg production reached 88.14 billion with annual growth rate of 6.3%. The per capita availability of eggs is around 69 eggs per person per year, which is far below the recommended level i.e. 180 per person per year by ICMR.

The total value of poultry sector is about Rs.80,000 crore (2015-16) broadly divided into two sub-sectors – a highly organized commercial sector with about 80% of the total market share and the unorganized with about 20% of the total market share. (Annual Report, DAHD&F, 2017-18).

Fisheries and Aquaculture sector

Andhra Pradesh, West Bengal and Tamil Nadu are the top three fish producing states.

The fisheries and aquaculture sector is recognized as the sunshine sector in Indian agriculture providing nutritional security to the food basket, contributing to agricultural exports and engaging about 14 million people in different activities. There have been continuous and sustained increments in fish production in India since independence. Constituting about 6.3% of the global fish production, India stand 2nd in total fish production as well as freshwater fish production. The total fish production in 2016-17 was 11.4 million metric tonnes (3.6 million metric tonnes from marine fisheries and 7.8 million metric tonnes from inland fisheries). The per capita availability of fish is 9 kg per person per year, which is quite low as compared to other developing nations. The sector contributes 1.1% of the national GDP and 5.15% of the agricultural GDP. (Annual Report, DAHD&F, 2017-18).

In order to utilize the large untapped potential in fisheries and aquaculture in the country, the Government of India started Blue Revolution creating an enabling environment for integrated development of the full potential of fisheries in the country, along with substantial improvement in the income status of fishers and fish farmers keeping in view sustainability, bio-security and environmental concerns.

Horticulture Sector

India has maintained leadership in the production of many commodities like mango, banana, acid lime, coconut, arecanut, cashew, ginger, turmeric and black pepper. Presently, it is the second largest producer of fruits and vegetables in the world. India is next only to China in area and production of vegetables and occupies the prime position in the production of cauliflower, second in onions and third in cabbage in the world. India has also made noticeable advancement in the production of flowers. Further, it is the largest producer, consumer and exporter of spices. India is home to a wide variety of spices like black pepper, cardamom (small and large), ginger, garlic, turmeric, chilli and a large variety of tree and seed spices. The major spice producing States are Andhra Pradesh, Tamil Nadu, Odisha and Madhya Pradesh. The North Eastern region and Andaman and Nicobar Islands also have potential areas for spices, particularly cultivated organically.

The percentage share of horticulture output in Agriculture is 30%. Over the last decade, the area under horticulture grew by about 3% per annum and annual production increased by 5.4%. During 2016-17, the production of horticulture crops was about 295.2 million tonnes from an area of 24.9 million hectares. Among the horticulture crops, vegetable crops account nearly 60%, followed by fruits (31.5%), Plantation (5.7%), Spices (2.4%) and flowers and aromatic plants. During 2016-17, the area under vegetables in India is estimated at 10.3 million hectares with a production of 175 million tonnes. India produces nearly 11% of all the world's vegetables and 15% of all fruits. Uttar Pradesh, West Bengal and Madhya Pradesh are the leading states in vegetable production for the year 2016-17. (Horticulture Statistics at a Glance, 2017)

Andhra Pradesh, Maharashtra and Uttar Pradesh are the leading states in fruit production for 2016-17.

Sericulture Sector

Sericulture is a major sub-sector comprising the textiles sector. Sericulture emerged as an important economic activity, becoming popular in several parts of the country, because of its short gestation period and quick recycling of resources. It suits all types of farmers and exceptionally marginal and small land holders as it offers rich opportunities for enhancement of income and creates family employment round the year.

India is the second largest producer of silk in the world and has the distinction of being the only country producing all five kinds of silk namely Mulberry, Eri, Muga, Tropical Tasar and Temperate Tasar. Karnataka, Andhra Pradesh and Assam were the top three raw silk producing states in 2016-17. In 2016-17 total raw silk production reached 30,348 metric tonnes with an annual growth of 6.4%. However, the demand for silk is more than the production. In 2016-17 a total of 3795 metric tonnes of raw silk worth Rs.1092.26 crore was imported mainly from China, to supplement the domestic production for meeting the increasing demand. (CSO, Annual Report 2016-17). India holds the monopoly in producing Muga silk. It is the only cash crop in the agriculture sector that gives returns within 30 days.

2. Agri-Allied Sectors: Major challenges and issues

Extension services are needed to meet the challenges in agri-allied sector due to changes in the global food and agricultural system including the rise of supermarkets and the growing importance of standards and labels; growth in non-farm rural employment and agribusiness; constraints imposed by health challenges that affect rural livelihoods; and the deterioration of the natural resource base and climate change.

The delivery of extension services is emerging as an important priority area for enhancing and optimizing production and value addition. Services include transfer of technology and strengthening of various infrastructure and support services, while building the capabilities of the stakeholders.

The Agri-Allied sectors face certain challenges and issues which are listed here.

Livestock sector

1. **Low productivity:** there is need to enhance the levels through genetic improvement along with practices such as; improving feed utilization efficiency, adopting better reproductive strategies and improving health coverage based on newer generation biotechnological vaccines and drugs.
2. **Shortage of feed and fodder:** Crop residue is used as animal feed but a large portion is burnt in the field to clear the field after harvest. Area under fodder cultivation is only about 4% of the cropping area and it has remained static over last four decades
3. **Unorganized:** Livestock sector particularly small ruminants; sheep, goat, piggery are highly unorganized.
4. **Inadequate infrastructure for marketing, processing and value addition:** Marketing of livestock and livestock products remains largely unorganized, traditional, and fragmented, with a few exceptions.
5. **Livestock and environment:** Climate change aggravates heat stress in dairy animals, adversely affecting their productive and reproductive performance. The estimated annual loss at present due to heat stress at the all-India level is 1.8 million tones. Livestock are itself a large source of methane emission contributing about 18% of total enteric methane budget.
6. **Knowledge gap.** As per National Sample Survey Organization (NSSO) survey conducted in 2003, only 5.1% of the farmer households in India were able to access any information on animal husbandry as against 40.4% on crop farming. (Chander M. et al, 2010). 60% of farmers had not accessed any source of information on modern technology to assist in their farming practices.

Extension Services:

There is increased demand for various services like animal breeding, health care, feed and fodder production, marketing, livestock extension etc. which are provided by multifarious agencies in India. Among all the services, livestock extension services play an important role in empowering farmers with appropriate technological knowledge and skills through various extension education and training programs.

However, there is lack of a livestock extension policy and dedicated administrative structure for livestock extension at center and state level-leading to unorganized, sporadic and ineffective delivery of extension services to livestock farmers. The focus of the State Department of Animal Husbandry (SDAH) is on healthcare and breeding aspects of livestock than production. Further the Livestock extension services in India are characterized by five biases that result in neglecting poor rural livestock-keepers, viz., top-down 'transfer of technology' approach; more focus on cattle and buffaloes, excluding other species; primary focus on milk production, neglecting other roles of livestock; concentration of services in high potential areas and; livestock extension is generally provided by men for men, despite key roles that women play in livestock farming.

There is also a lack of institutional shift from extension to entrepreneurship in livestock extension activities (Ramkumar, 2014). There is also need to move from Conventional dairy extension (with focus on improving production) vis-à-vis Commercial dairy extension (with focus on marketing, market rates, value addition, project formulation, licensing, climate change, pollution control, budgeting, sources of funds, insurance, mechanization etc.).

In view of the above challenges, livestock extension professionals need to have or acquire core competencies in extension as well as technical subject matter for effective service delivery. Moreover, the shortage in the number of Veterinary Assistant Surgeons (VASs), who are the middle level livestock extension professionals (Sasidhar P.V.K. and Murari Suvedi , 2016) and inadequate competencies among these extension professionals lead to further deterioration of livestock extension service delivery.

Poor participation of private sector and inadequate budget for livestock extension activities resulted in a weak extension component. The SDAH-as the major stakeholders for delivery of extension services spend only 1-3% of their budget on extension activities. (Chander M. et al, 2010).

Fisheries and Aquaculture sector

Challenges for fisheries development in India include the following:

1. Inland fishery not treated at par with agriculture in the context of taxes, electricity tariff etc. and therefore fishery sector remained largely un-organized and traditional in most parts of the country with little proliferation of technological improvements
2. Absence of inland fishery policy at national level
3. Non-coverage of fish farming under insurance
4. Lack of a reliable database relating to aquatic and fisheries resources
5. Non-availability of suitable fish yield models for multi-species fisheries for open inland waters and marine resources
6. Weak multi-disciplinary approach in fisheries and aquaculture
7. Inadequate attention to environmental, economical, social and gender issues in fisheries and aquaculture
8. Inadequate human resource development and specialized manpower in different disciplines

9. Weak linkages between research and development machinery
10. Weak and unorganized marketing
11. Poor extension services to the fisher communities for promotion of fish seed and feed production, fish farming and fish based enterprises
12. Poor technology transfer and anthropogenic interventions, resulting in loss of biodiversity
13. Decline in fish catch, depletion of natural resources due to over-exploitation of coastal fisheries
14. Pollution of water bodies with industrial and domestic effluents
15. Clandestine introduction and spread of exotic fish species
16. Unscientific management of fisheries and aquaculture activities
17. Contamination of indigenous fish germplasm resources
18. Poor yield optimization, problems in harvest and post-harvest operations, landing and berthing facilities for fishing vessels and issues in welfare of fishermen.
19. Lack of value addition for enhancing profit margin
20. Lack of location specific improved technology
21. Lack of timely availability of inputs nearby

(Mishra N. 2012,)

Extension Services:

It can be seen that extension services provided by the Government agencies are inadequate (Kumaran et al., 2004 and 2007; Kumar, 1996). The focus of aquaculture extension needs to shift from mere technology dissemination to areas like value addition, quality control, market demand and consumer demand. The most limiting factor with department of fishery is inadequate staff support complemented with inappropriate extension infrastructure, unequal distribution of physical and financial resources during budget allocation and lack of technical content because of the feeble linkages presently existing between the state department of fisheries and research institutions (Kumar and Ananthan, 2009; Kumar, 1996).

Presently, there is no platform or institutional initiative to assure periodic discussion between researchers and farmer extension agencies as in agriculture (Krishna, 2000). Inputs and service provision rests mostly with private companies or individuals (Kumaran et al., 2012). The Coastal Aquaculture Authority Act (2006) specifies that extension services shall be effectively intensified in such a way that the actors involved viz., extension personnel, fish farmers and other related personnel can improve their technical expertise and skills, thus facilitating sustainable aquaculture. Absence of formalized extension policies in developing countries is the main challenge in extension as most of the developing countries prefer policies that are provisional or ad hoc (Van den Ban and Hawkins, 1996). Extension efforts aimed towards fish farmers for transfer of technology is found to be limited only to the area where Fish Farmers Development Agency (FFDA) is functioning (Dehadrai, 1986).

Horticulture sector

Challenges for horticulture development in India include the following:

1. Lack of quality inputs
2. Lack of market support
3. Paucity of post-harvest management, packing and storage, specialized transport and storage arrangements to maintain the chain from farm to fork
4. Increasing cost of production; most growers do not get reasonable returns for their produce
5. Distress sales
6. Inadequate infrastructure like transportation, cold storage, warehouses etc.
7. Price fluctuation
8. Lack of market intelligence
9. Lack of knowledge of post-harvest handling
10. Wastage and spoilage loss
11. Lack of mechanization due to small land holding

Extension Services:

Horticulture extension has been an integral part of agricultural extension services. During the last few years there has been diversification of agriculture towards high value commodities such as fruits and vegetables. Considering the evolving challenges, producers currently need a wider range of support - organizational, marketing, technological, financial and entrepreneurial.

Deterioration of quality of agricultural extension services in general and horticulture extension services in particular is observed, with experts and extension workers finding themselves lacking in capacity to recommend technology solutions to the producers. Therefore there is need to strengthen the technology support system.

Most of the extension personnel perform multiple roles. Their visits to the field are irregular as the service is pre-occupied with the implementation of government schemes linked to subsidies and subsidized inputs.

In the State Directorates of Horticulture, administrative functions are generally assumed by the extension functionaries positioned at higher levels along the hierarchy line and extension work is left to the lower level / lowest functionaries. Most of these functionaries have academic qualifications of agriculture / horticulture but do not have direct exposure to farming; as a result they lack confidence in addressing field level problems faced by farmers. (Report of Planning Commission Working Group on Horticulture and Plantation Crops for XIIth Plan-2011)

ICAR Institutions and SAUs basically concentrate on research and education; extension service is very limited, confined to organization of exhibitions, training programs and demonstrations etc.

Extension Services by Input Suppliers: A number of private seed companies, pesticide and insecticide companies provide extension services and transfer production and post-harvest management technologies to producer farmers. However, due to lack of technical knowledge of products this may result in indiscriminate use of farm chemicals.

Extension Services by Contract Buyers: buyers who enter into contract production program of horticulture crops for exports, processing or domestic marketing do supply seed and planting materials, other farm inputs and relevant technologies. They may also provide cold chain and packaging solutions for long distance transport of produce.

This group is very effective in transfer of technology in respect of certain specific horticulture crops.

Sericulture sector

The Indian sericulture industry, is currently facing several problems which have restricted full utilization of its potential.

1. Indian silk yarn is of poor quality, which not only affects our competitiveness in the world market, but has also resulted in a preference for imported yarn in the domestic market. The problem arises due to lack of:
    - Sufficient thrust on the adoption of improved technologies;
    - Strict disease control measures;
    - Quality leaf due to insufficient inputs to mulberry garden;
    - Grading system for cocoons and
    - Quality-based pricing system as well as use of young age silkworms
2. Decline in area under silk food plants: This can be addressed by initiating area-specific research to improve soil fertility which will ultimately enhance soil productivity, increase mulberry and non-mulberry host plant leaf and silkworm cocoon production as well as arrest decline in area under silk food plants.
3. Insufficient production of bivoltine silk: Bivoltine yarn is sturdier and is used by the power loom industry. But only 5% of the silk produced in India is bivoltine because its production requires more attention and resources. It also yields just two crops in a year, as against the yield of four to six crops by multi-voltine silk. Even the farmers do not have any incentive to switch to bivoltine silk yarn production because the difference between the selling price of bivoltine and multivoltine silk is not much. (CSO, Annual Report 2016-17).
4. The other factors responsible for it are;
    a) Insufficient adoption and proliferation of technology packages developed through research and development efforts
    b) Fragmented and ad hoc approach

c) Non-involvement of private partners in a big way in seed production

d) Non-penetration of the schemes

e) Improper forward and backward linkages

f) Dumping of cheap Chinese raw silk and fabric

Extension Services:

In Sericulture sector, only few states like Karnataka, Himachal Pradesh are doing effective extension activities. Apart from the State Department, Central Silk Board, a strong Capacity Building & Training organization, has covered a total of 16,690 industry stake-holders and CSB's in house participants covering all the sub-sectors (mulberry, tasar, eri & muga) and activities on the silk value-chain. In addition, a total of 2275 college students and school children were exposed to sericulture.

With a view to facilitate farmer–to-farmer contact for information sharing and technology demonstration 11 Sericulture Resource Centers (SRCs) were established in different Seri-Clusters including North-eastern region. (CSO, Annual Report 2016-17).

3. Strengthening Extension Services in Agri-allied sector – MANAGE initiatives

MANAGE has established a dedicated center namely "Extension in Agri-Allied Sector" (EAAS) for organizing various activities to strengthen extension component in agri-allied sector. These activities include;

1. Capacity building of extension functionaries in agri-allied sector:

The center has been actively involved in the capacity building of extension functionaries of state departments of Animal Husbandry, Horticulture, Fishery and Sericulture department by organizing Induction, Refresher and technical training programs.

Themes focused are:

- Promotion of Entrepreneurship Development in Livestock Sector
- Extension Approaches for Sustainable Livestock Development
- New Dimensions in Extension Management
- Organic Animal Husbandry
- Breakthrough Technologies for Productivity Enhancement in Livestock Sector.
- Extension Management Approaches for Fisheries Development, etc.

2. Research Study: Analysis of Extension Approaches in the Agri-allied Sector Departments

MANAGE conducted a study during 2014-16 on different extension approaches followed by the agri-allied sector departments, KVKs, NGOs and Cooperatives in four Indian states viz. Karnataka, Odisha, Maharashtra and Uttar Pradesh. Two districts from each state were selected and from each district 30 line department officials/extension service providers in the Agri-allied sectors of Animal Husbandry, Horticulture, Fisheries and Sericulture were interviewed. Similarly, 30 end users from the above mentioned Agri-allied sectors were selected purposively from each district; thus a sample of 60 respondents were selected from each district thus, making a total sample size of 480 for the study.

The extension approaches considered for the study are; General Extension Approach, Extension Reforms Approach, Participatory Approach, Farming Systems Approach, ICT Approach, Commodity Approach and Project Approach. The study also assessed the level of knowledge of agri-allied department officials about various extension approaches, farmers' perception towards the delivery of extension services by the agri-allied sector departments, constraints in adoption of extension approaches by the agri-allied sector departments and suggested strategies for strengthening extension delivery mechanism in the agri-allied sector departments.

The findings are expected to help the Government find out new opportunities in strengthening the agri-allied sector staff as well as to design their strategies in relation to national economic planning. (MANAGE, 2017)

Findings of the Study

I. **Knowledge level of Agri-allied department officials about extension approaches**

A. General Extension Approach: *The approach is centralized and government-controlled. Success is measured in the adoption rate of recommendations and increase in national production.*

The present study shows that, more than 65% officers of agri-allied department in all four states, knew about the departmental schemes and were implementing different central and state level schemes. It is also seen that in all the four states, farmers participate in implementation of the schemes not in planning of schemes.

On the issue of selection of beneficiaries for the various schemes, the officers in all four states, did not find any difficulty /external/political pressure in selection of the beneficiaries except in case of Horticulture in Maharashtra, Odisha and Karnataka; Animal Husbandry in Odisha, Karnataka and Uttar Pradesh; Sericulture in Karnataka and Fishery in Odisha and Uttar Pradesh.

General Extension approach in Karnataka in Sericulture *The government is keen on injecting fresh reforms in the sericulture sector in Karnataka. The state is the largest producer of silk in the country and accounts for nearly 30 per cent of the country's exports. What prompted the government to act is the steady decline in the area under mulberry cultivation over the past two decades, although total silk production (8,500 tonnes) has more or less been constant, given the increase in productivity and the new reeling techniques.*

A recent review revealed that the area under mulberry has reduced from 1.12 lakh hectares in 2000-01 to around 80,000 acres in 2013-14, and proportionately the number of sericulturists has also reduced from 2.56 lakh to around 1.3 lakh. The primary reasons attributed are the reduction in labor availability, rapid urbanization, with people migrating to better paying vocations. The Central Silk Board is expected to extend support to the exercise in stepping up area under sericulture. The Commissioner for Sericulture G. Satish said subsidy would be extended to all farmers seeking to newly engage in mulberry cultivation. For those wanting to start a mulberry nursery, the subsidy of Rs. 1.7 lakh per hectare is being given and for cultivation it will be Rs. 30,000 per hectare. The primary focus will be on bivoltine cocoon production in preference to multivoltine, since the yield under the former is far higher.

Mulberry is an important cash crop in the districts of Mandya, Ramanagaram, Chickballapur, Bangalore, Tumkur and Kolar. The proposal is to extend area under its cultivation by another 15,000 acres, of which 10,000 acres will be in the traditional sericulture regions and the remaining in the adjoining districts of Mysore, Bellary and Chitradurga.

http://www.thehindu.com/news/national/karnataka/new-plans-for-states-sericulture-sector/article6492121.ece

B. Extension Reforms Approach: *Extension Reforms focuses on operationalizing agricultural reforms across the country through new institutional arrangements with restructured autonomous bodies in the form of Agriculture Technology Management Agency (ATMA) at the District level, Block Technology Team (BTT) at Block level, which are flexible, bottom-up, farmer-driven and promote public-private partnership.*

The study shows that, more than 65% officers of agri-allied departments in all four states had heard about ATMA but less than 50% of them had knowledge about ATMA functions and had not attended ATMA meetings except for the officers of Department of Horticulture in Maharashtra and Fishery officers in Odisha.

Figure 1: Awareness about Extension Reforms Approach among the officers of Department of Animal Husbandry

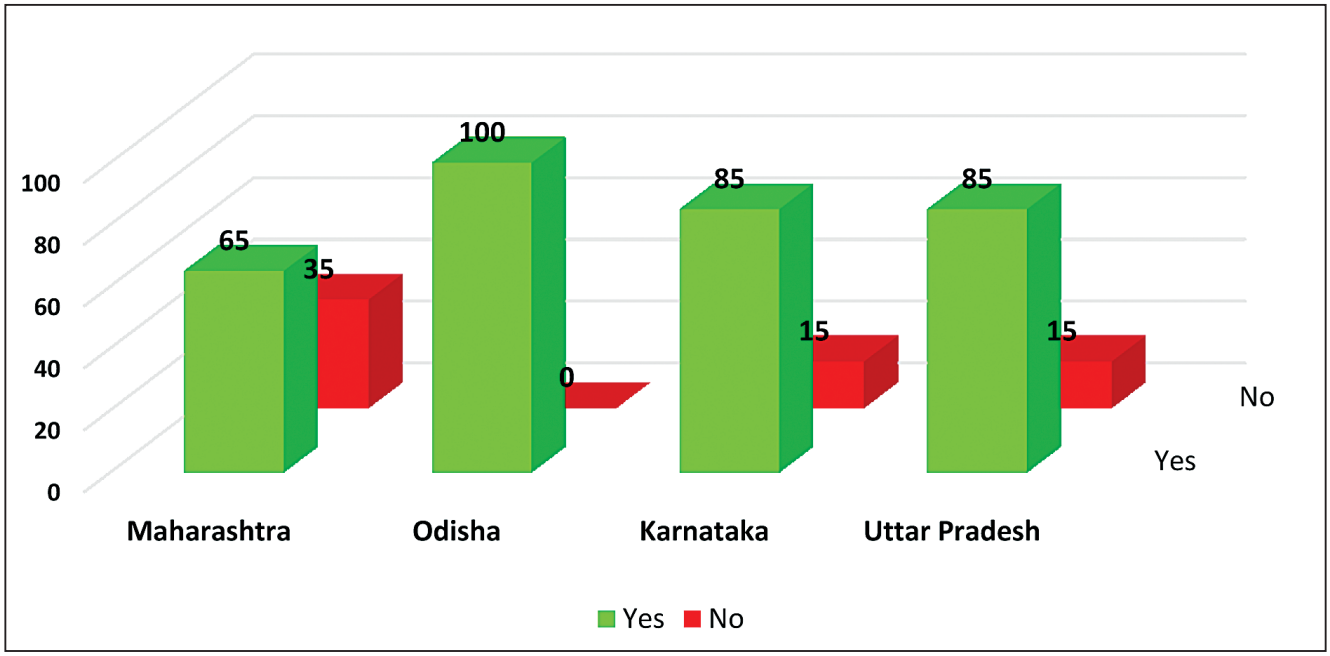


Table 1 reveals that, fishery officers in Odisha and Karnataka and horticulture officers in Maharashtra and Odisha are following extension reforms approach to some extent.

Table: 1. Extension Reforms Approach adopted by agri-allied department in four states

Sr	Items	Sericulture Officers (n=10)				Fisheries Officers (n=10)				Animal Husbandry Officers (n=20)				Horticulture Officers (n=20)			
		MS (%)	OD (%)	KA (%)	UP (%)	MS (%)	OD (%)	KA (%)	UP (%)	MS (%)	OD (%)	KA (%)	UP (%)	MS (%)	OD (%)	KA (%)	UP (%)
1.	Awareness about ATMA	80	80	70	100	70	90	70	10	65	100	85	85	100	95	90	80
2.	Key functions of ATMA	10	40	30	40	40	50	50	30	20	65	35	35	95	35	35	20
3.	Attending ATMA meetings	50	40	30	60	40	80	60	60	20	55	35	45	100	65	20	10
4.	Convergence with other line departments helps in carrying out your own department works	50	40	30	40	10	80	60	30	10	25	5	30	90	50	35	10
5.	Involved in preparation of block action plan	10	20	20	30	0	50	20	40	10	20	0	20	55	25	5	5
6.	Involved in preparation of district action plan	0	10	0	10	10	20	10	10	5	5	5	10	0	10	0	10
7.	Prepared the action plan, by taking the Farmer's advice	10	30	10	40	10	70	30	50	10	25	5	30	55	35	5	15

Sr	Items	Sericulture Officers (n=10)				Fisheries Officers (n=10)				Animal Husbandry Officers (n=20)				Horticulture Officers (n=20)			
		MS (%)	OD (%)	KA (%)	UP (%)	MS (%)	OD (%)	KA (%)	UP (%)	MS (%)	OD (%)	KA (%)	UP (%)	MS (%)	OD (%)	KA (%)	UP (%)
8.	Feel extra burden working in ATMA or convergent mode	10	0	10	40	0	10	20	40	0	20	5	30	15	0	0	10
9.	Refer the Strategic Research Extension Plan (SREP) prepared for the district to prepare the actions plans	0	10	0	0	10	50	20	0	15	25	0	0	50	25	5	0
10.	Get the funds as proposed in the BAP/DAP from ATMA	30	80	30	0	0	90	10	10	5	100	0	0	5	95	0	0

MS: Maharashtra; OD: Odisha; KA: Karnataka, UP: Uttar Pradesh

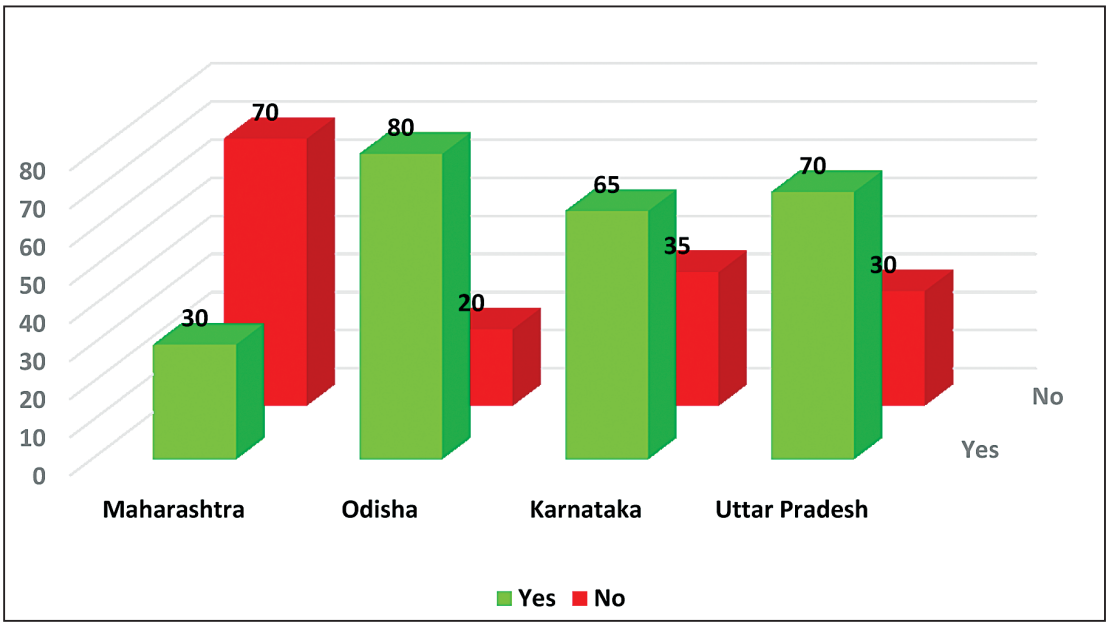
C. Farming Systems Approach (FSA): *A key characteristic of the Farming Systems development approach is its systems or holistic approach at the local level. Close ties with research are required and technology for local needs is developed locally through a process involving local people. Success is measured by the extent to which local people adopt and continue to use technologies developed by the program.*

It was found that, on an average more than 40% of the officers of agri-allied departments in all four states were aware of Farming System Approach (FSA) and its key features, however, only few of them recommended to the farmers to take up a combination of two or three enterprises. None of the officers of agri-allied sector in all four states had worked out the economic viability of the individual enterprises and the total system. These officers also stated that, extension services are not system based and not converged with the other line departments.

Therefore, convergence and orientation to farming system approach is needed as a policy implication. Extension officers working in agri-allied departments need to be trained in FSA, so that they can disseminate FSA to the end users and thereby help in reducing yield losses.

Only 30% officers of Department of Animal Husbandry in Maharashtra were aware about FSA. (Fig-2)

Figure 2: Awareness about Farming Systems Approach (FSA) among the officers of Department of Animal Husbandry



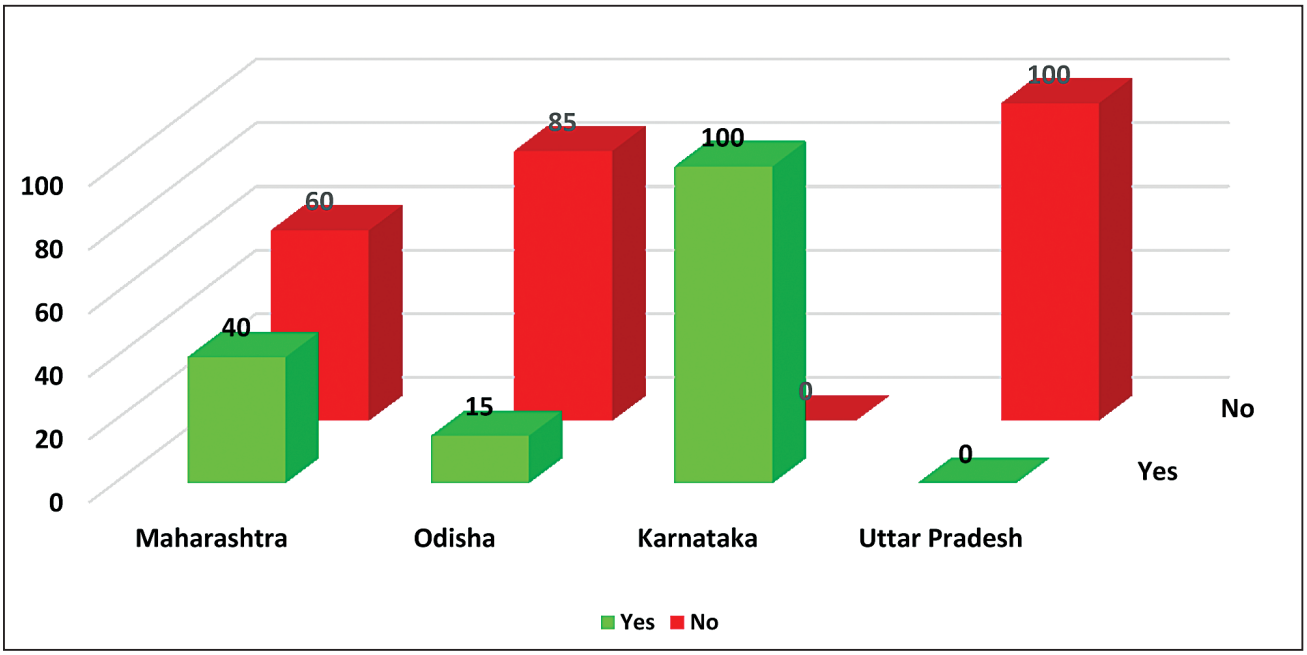
D. Participatory Approach: *The Participatory Approach focuses on the expressed needs of farmers' groups to achieve increased production and improved quality of rural life. Implementation is often decentralized and flexible. Success is measured by the number of farmers actively participating and the sustainability of local extension organizations.*

It was found that, Participatory Approach was well adopted by the Department of Animal Husbandry (61%) in Karnataka, as there was a notification by the State Government that, the veterinary officers at the village level must prepare village maps to better tackle the vaccination of livestock and therefore they were involved in the preparation of village maps. Similarly, it is also seen that, this approach was followed to some extent (16%) by the department of Animal Husbandry in Maharashtra and department of Horticulture in Karnataka.

In Odisha, only 15% officers of agri-allied sector were aware of PRA techniques, social map and resource map. As such PRA approach is not practiced by the agri-allied departments in Odisha.

None of the agri-allied department officers in Uttar Pradesh were aware of the PRA techniques, had no knowledge of PRA tools, village map, and none used participatory tools.

Figure 3: Awareness about Participatory Approach among the officers of Department of Animal Husbandry



E. ICT Approach: *This approach encourages the use of Information and Communication Technology in extension.*

The study revealed that, all the officers working in agri-allied departments in all four states were aware of ICT tools and were using telephonic calls routinely for the advisory services. The use of mobile message was found more popular in department of Fishery in Karnataka, department of Animal Husbandry in Uttar Pradesh and department of Horticulture in Maharashtra. It was also seen that, ICT tools like Internet (Email)/use of tablets, Video calling, Radio talk and Television shows were not so popular for dissemination of advisory services. Majority of the agri-allied officers in all four states had not heard of community radio stations, moreover none of the officers participated in any of the radio/television shows.

TATA Consultancy Services – empowering farmers with mobile technology

In 2007, Tata Consultancy Services (TCS) set up a research team and conducted intensive interviews to understand how technology could help tackle the challenges faced by farmers in India. The team discovered that most farmers do have mobile phones, which became the medium for TCS to deliver services. In 2008, TCS created mKrishi, a customizable Mobile Agro Advisory System, to enable farmers to send queries specific to their crop and receive personalised replies from agricultural experts; to build a consortium of partners to provide integrated services to farmers that generate fee-based revenues for the company. Since 2008, more than 20,000 farmers in 400 villages have subscribed to the mKrishi service. As the platform uses local language interfaces, including a voice messaging system, mKrishi makes it possible for illiterate farmers to get access to agricultural information and advice. The access to real-time local market prices enables farmers to negotiate more effectively with food traders and agents. The mKrishi platform also benefits a broader group of stakeholders in the agricultural value chain. It saves costs for companies servicing farmers, helping them access real-time information of the supply and demand of farmers which increases the efficiency of the entire value chain. The access to field micro-data can help enhance the accuracy of agricultural research and planning. Several organisations have approached TCS with an interest in joining the consortium of partners, offering services through the mKrishi platform to farmers.

https://www.oxfamindia.org/blog/1179/tata-consultancy-services-%E2%80%93-empowering-farmers-mobile-technology

F. Project Approach: *The project approach concentrates efforts on a particular location, for a specific time period, often with outside resources. Part of its purpose is often to demonstrate techniques and methods that could be extended and sustained after the project period. Change in the short term is often a measure of success.*

The findings of the study show that, very few officers (15%) of department of sericulture in all three states except Uttar Pradesh and department of Horticulture in Maharashtra were aware and had knowledge about the project approach. However, none of the officers of agri-allied departments in all four states have undertaken any Project Approach while working in the departments.

G. Commodity Approach: *The commodity specialized approach groups all the functions for increased production - extension, research, input supply, marketing and prices - under one administration. Extension is fairly centralized and is oriented towards one commodity or crop and the agent has many functions.*

It was found that, none of the agri-allied departments in Uttar Pradesh; Department of Fisheries in Odisha; Department of Sericulture, Fisheries and Animal Husbandry in Maharashtra were aware about this approach. Only few officers of the Department of Horticulture in Maharashtra; Sericulture, Animal Husbandry and Horticulture in Odisha; and all agri-allied departments in Karnataka except Department of Animal Husbandry were aware about Commodity Approach. However, the Agri-allied department officers in all four states have not implemented any commodity based program and also not linked commodity groups to markets.

Commodity Approach- Success Story of Sericulture Development in Himachal Pradesh:

As many on 8,055 families are practicing sericulture in Himachal Pradesh. About 5 lakh mandays are generated under the sericulture activity and 4.93 lakh kgs of green silk cocoon are produced in the State. The State has sold 6.24 MT of raw silk in the market. Most of the families practicing sericulture are poor and even living below the poverty line. The State is making efforts to increase the income and the number of households involved in this activity. More and more rearing centers, mulberry farms, nurseries and silk seed production centers are being set up in the hill state now. Silk worms are being supplied at subsidized rates, mulberry gardens are developed with distribution of mulberry saplings and disinfectant materials. Good tools and equipment with incentives for setting up reeling units are being given. The State is providing an assistance of 50 percent in constructing the rearing sheds. About 2270 such sheds have been made so far. Centrally sponsored projects worth Rs. 27 crore are being implemented in the State for the development of sericulture trade.

http://www.thehindu.com/todays-paper/tp-national/tp-otherstates/Sericulture-expansion-plan-in-H.P./article15616192.ece

II. Extension Services and Methods adopted by other Extension Service Providers

The extension methods adopted by other extension service providers such as; *Krishi Vigyan Kendras*, Cooperatives and Non- Government Organizations, working in the study area were also reviewed.

It was observed that, in all four states, *Krishi Vigyan Kendras* are mainly involved in conducting training programs, demonstrations and distributing inputs to some extent. The *Krishi Vigyan Kendras* of Karnataka and Uttar Pradesh were found using mobile SMS and *Doordarshan* for animal husbandry related programs and have also developed farmers' literature in animal husbandry sector.

It was found that, the extension services of dairy cooperatives in all four states are focusing on supplying inputs, organizing training programs, conducting health and infertility camps, demonstrations, exposure visits, organizing farmers' meetings, exhibitions and video shows of successful dairy farmers. Dairy cooperatives in Karnataka are also disseminating information through SMS and voice call.

With reference to the extension services and methods used by Non-Government Organizations (NGO), two NGOs i.e. BAIF and JK Trust were found active in the study area. These NGOs are mainly focusing on organization of Self Help Groups (SHGs), supply of input services in the form of artificial insemination, vaccination and deworming in dairy animals, conducting training programs, demonstrations, exposure visits related to value addition and processing of horticulture crops like Mango, Mosambi, Papaya, Ginger and Turmeric etc. However extension activities by NGOs were not found in Sericulture and Fisheries sectors, in the study area.

III. Constraints in Adoption of Extension Services

Majority of the officers in all Allied departments in all four states identified constraints like, lack of technical staff and irregular recruitment of officers. Apart from the lack of man power, lack of preparation of action plan, lack of trained staff in extension management, lack of importance given

to develop knowledge and skills of the agri-allied sector farmers, lack of extension services to change the attitude of farmers towards newer technologies were the major constraints identified by the agri-allied sector department staff.

Hence, focus needs to be on training the agri-allied sector officers in such a way that their main focus is towards improving the knowledge, skill and attitude of the farmers towards newer technologies. Training is also needed in preparation of village/action plans.

Table: 2. Top five Constraints faced by Animal Husbandry Officers in adopting various extension approaches

Constraints	MS (n=20)	OD (n=20)	KA (n=20)	UP (n=20)
No knowledge about different extension approaches	1st	1st	1st	1st
Focus on implementation of schemes rather than developing the knowledge & skills of farmers	2nd	-	2nd	2nd
Fixed with calendar of activities	3rd	1st	3rd	2nd
Officers are overburdened with technical reports, maintenance of records and registers etc., rather than extension services	4th	5th	-	-
Focus on health & breeding aspects rather than on developing knowledge & skills of farmers i.e. educative approach	4th	2nd	5th	3rd
Non-availability of funds for extension services	5th	4th	-	-
Lack of Training and Exposure to different extension approaches	5th	3rd	-	-
Trainings are focused on Technical aspects and not on Extension Management	-	4th	4th	4th
Poor response of the farmers towards extension services and activities	-	5th	-	5th

MS: Maharashtra, OD: Odisha, KA: Karnataka, UP: Uttar Pradesh

IV. Constraints in Convergence of Extension Services

Convergence of line departments in service delivery would accelerate development processes and can contribute towards rapid growth and poverty alleviation. A number of measures have been taken at the national level for convergence of programs of Ministry of Agriculture and Ministry of Rural Development. One of the major constraints identified was that the extension personnel of line departments were not trained to work in broad based extension and there was lack of understanding about why convergence is required. Lack of awareness, knowledge and understanding of broad based extension and absence of training in convergence were ranked the second major constraint in convergence faced by officers followed by lack of policy guidelines, lack of interface for exchange of ideas, information and opinions.

Therefore, focus is needed on training the staff in broad based extension so that strong convergence between different departments can be maintained. Wide spread awareness and effective capacity building of officers of agri-allied departments, formulation of clear policy guidelines and timely communication of information through modern Information and Communication Technology (ICT) with sufficient allocation of budget and other resources will facilitate the convergence process in delivering extension services of Agri-allied departments.

Table: 3. Top five Constraints in Convergence with other line departments by Animal Husbandry Officers

Constraints	MS (n=20)	OD (n=20)	KA (n=20)	UP (n=20)
Extension personnel of A. H. departments are not trained to work in convergence with other line departments	1st	2nd	1st	1st
Lack of understanding about, why convergence is required and important	2nd	5th	3rd	4th
Lack of understanding between organizations engaged in agri-allied activities	3rd	1st	-	5th
Communication gap within the line departments	3rd	-	5th	1st
Awareness, Knowledge and understanding of Broad based extension is lacking	4th	2nd	1st	2nd
Lack of common platform for exchange of knowledge, ideas, information and opinions	4th	3rd	4th	2nd
Lack of resources	5th	4th	2nd	3rd
Lack of policy guidelines	-	2nd	3	2nd
Work overload/lack of time	-	-	4th	-

MS: Maharashtra, OD: Odisha, KA: Karnataka, UP: Uttar Pradesh

V. Farmers' Perception with respect to Services offered by Departments of Agri-Allied Sectors

Perception of Animal Husbandry farmers:

Majority of the farmers were moderately satisfied with the services of Animal Husbandry officers in Maharashtra state followed by Karnataka, Uttar Pradesh and Odisha. Effective strategies and approaches are needed for effective implementation. Intensive monitoring & frequent field visits are suggested for improvement in the animal husbandry sector across states.

Perception of Sericulture farmers:

The highest contacted officer was in Odisha, followed by Karnataka and Uttar Pradesh, which indicates a higher level of information seeking activity in Odisha and Karnataka. Maharashtra sericulture farmers have a higher satisfaction level as compared to Uttar Pradesh, Karnataka and Odisha. Adopting participatory, project and ICT approach including FSA approach in sericulture as a policy intervention could help in improving their satisfaction levels in other states. Intensive monitoring & frequent effective field visits are the suggestions for improvement in the sericulture sector across states

Perception of Fisheries farmers:

Fisheries extension officer is the most frequently contacted in Odisha, Uttar Pradesh, Karnataka followed by Maharashtra. Site selection, pond preparation, seed stocking, feeding, fish health, harvesting, extension services are important. Satisfaction across states was highest in Odisha, followed by Karnataka, Uttar Pradesh and Maharashtra.

Overall quality of fishery extension services offered was superior in Karnataka followed by Maharashtra, Odisha and Uttar Pradesh. Overall all states are similar in quality of service, and difference exists in intensity of service as mentioned in the above paragraph. Withdrawal of service is felt in Karnataka, Odisha and UP, and it should be continued.

Perception of Horticulture farmers:

The data indicates that, extension contact levels are high in Maharashtra, followed by Odisha and Uttar Pradesh. Karnataka data did not reveal any trend necessitating further research on the issue.

The overall satisfaction level of horticulture farmers reveals that there is much progress in horticultural sector in Maharashtra and the satisfaction levels are higher, while Odisha stands at the second position followed by Uttar Pradesh and Karnataka. Therefore, there is urgent need to increase the satisfaction levels and aspirations of horticulture farmers in progressive as well as catching up states as this is the future of diversification and income augmentation interventions.

The above suggestions indicate that field visits are important for horticultural development because seeing is believing and learning by doing is the philosophy of extension.

Farmers' Suggestions for Improvement of Extension Services:

Farmers were asked their opinion for improvement of extension services on the following parameters; frequent effective field visits of agri-allied department officers, intensive monitoring and follow-up of extension activities, provision of adequate budget for extension activity, flexibility to the implementing authority. All the respondent (farmers) in all four states agreed on the above parameters for improvement in extension services in agri-allied sector.

Apart from these, some of the farmers suggested that their participation in planning and implementation of the programs is necessary for the success of programs. They also suggested that, ensuring timely input and advisory services will further improve the adoption of technologies.

3. National workshop on "Issues and Challenges in Strengthening of Extension Services in Animal Husbandry Sector"

During a National Workshop organized by MANAGE on August 20, 2018 veterinary professionals including administrators, policy makers, field functionaries of various state animal husbandry departments as well as scientists from veterinary educational institutions and Non-Government Organizations (NGOs) deliberate on the issues and challenges and provided inputs to come out with an extension policy on livestock extension. The objectives were to explore issues and challenges in extension management in animal husbandry sector of various states and to come up with recommendations to address these issues and challenges.

The Recommendations pertained to:

a) Role of Institutions: Setting up a separate Extension Wing in State Departments of Animal Husbandry (SDAH) to implement extension programs and projects; establishing Distance Education Centers at veterinary and animal science educational and research institutes to

train rural youth to take up animal husbandry related services; focus on research responsive to farmer's needs.

b) Providing extension advisory at doorstep; emphasize on community based extension approach on similar lines of community health workers; extension through group approach and focus on preventive medicine, market oriented approaches and entrepreneurship development.

c) Developing Quality Infrastructure for information delivery

d) Focus on Farmer Empowerment to improve farmers' decision making capacity; and promoting farmers' associations to facilitate farmer to farmer extension.

e) Strengthening Institutional Linkages between Extension wing of State Department with national research institutions and veterinary institutions at regional level along with ATMA, KVK and NGOs for effective technology transfer; explore public-private partnership.

f) Human Resource Development through emphasis on quality education with proper balance of knowledge and skills; capacity building of extension functionaries and continuing education program for Veterinary Officers.

g) Focus on Gender mainstreaming

h) Focus on "e-extension, m-extension, social media" etc. and use of latest technologies.

The workshop concluded that the livestock sector is becoming a major economic activity to support the other needs of a farm family. The continuous growth of this sector is reflected through its increasing contribution to the agriculture sector GDP year after year.

Presently this sector contributes nearly 29% to the total agriculture sector GDP. According to the Central Statistics Office (CSO), for the first time, the value of milk produced has exceeded the total value of food grains (cereals plus pulses) in 2016-17. Moreover, the livestock sector is being viewed as a major engine for doubling farmers' income by 2022.

However, the potential of this sector for doubling farmer's income, still remains untapped due to several reasons. In most states, veterinary officers have a very broad mandate of livestock sector development of which livestock extension is an inevitable part but it remains weak and neglected. These recommendations are expected to act as a guideline for formulation of an appropriate livestock extension policy.

4. Sustainable Information Resource Centre (SIRC): A concept by MANAGE for Strengthening Extension Services in Animal Husbandry Sector

Among all the institutional arrangements for animal husbandry sector, the network of veterinary clinics or dispensaries is a promising solution for various extension activities because of its physical presence and reach through veterinarians and para- vets at village level. On an average each veterinary clinic has 2-3 sanctioned staff, however it is felt that there is ample scope to realize the full potential of these dispensaries with the help of self-operated and self-learning, user friendly information kiosk as **"Sustainable Information Resource Centre (SIRC)"** to address the changing information needs of the livestock farmers. Improved access to relevant information using ICT will help livestock owners to make timely decisions in respect of adoption of technology package of practices, price discovery etc.

In this context, information needs of the livestock farmers can be addressed through digital media in the form of videos, computer based information and expert systems, mobile applications, short message services (SMS) on various animal husbandry practices i.e. scientific dairy farming, goat, sheep, poultry, pig farming, product processing, marketing etc., covering all the aspects with local relevance using text, real pictures, graphics and audio files in local language. It was felt that a Touch Screen Computer with Display Unit could offer inter-activeness which will, in turn, develop and sustain the interest of the learner.

One such unit has been installed by MANAGE in the Veterinary Clinic of Bhonagir, Mandal of Nalgonda district, Telangana State on a trial basis. The basic idea behind the concept is to educate the farmers with new knowledge and skills of various aspects of animal husbandry so that it would result in improved livestock farming practices. When a farmer comes to a veterinary clinic to resolve some problem (treatment of animal or other services), or are waiting for their turn, to get their animal treated by the veterinarian they can utilize the SIRC to explore the information available, with the help of a trained operator available at the veterinary clinic. Once a farmer is familiarized with the usage of interactive touch-screen he could help fellow colleagues to learn. Further, the same content is developed in the form of Leaflet, Pamphlets, Posters etc., and distributed to the livestock farmers, to reinforce the learning activity. In this way the problem of limitation of time with the veterinarian and para-vets for information delivery can be addressed to a large extent.

Once the farmers start using SIRC, a detailed database of visiting farmers can be collected in the form of feedback at the center with respect of his socio-economic profile, herd size, information needs, contact information. This can help in disseminating information through SMS, voice messages by connecting to the prevailing public and private services of mKRISHI®, IFFCO Kisan Sanchar Limited (IKSL), Reuters Market Light (RML), Behtar Zindagi, TCS mKrishi, Nokia Life Tools etc. which are providing mobile based advisory services to the farmers in cost effective manner.

Thus, the basic concept of SIRC is to supplement and complement the potential of animal husbandry institutions i.e., veterinary clinics and its human resource with the help of modern ICT tools is fulfilled. Further the SIRC will create a learning environment for farmers to find solutions to problems relating to animal health and to adopt scientific management practices to enhance production and productivity.

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