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Livestock Extension Services: Time to Think Beyond Treatment and Breed Improvement

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MANAGE Knowledge Series 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 MANAGE Knowledge Series 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

Livestock is an integral part of agriculture, and it plays a significant role in the nutritional security of the people. The livestock sector plays an important role in the rural economy of India. The sector provides livelihood to more than two-thirds of the rural population. The importance of livestock in Indian agricultural economy has been well recognized and next to land and irrigation, livestock is the single largest asset in rural India. Given India's agro climatic diversity, a large variety of livestock are available for draught power, milk, meat, eggs, fish, wool etc and thus ensuring additional income to the livestock farmers. About 75 percent of the Indian rural households are keeping the livestock out of which the resource poor farmers own nearly 80 percent of the livestock. Therefore, livestock and livelihood have an intimate relationship particularly in arid and semi-arid areas.

There are many challenges the sector will come across, during the process of achieving any set target in the future, like disease outbreaks, antimicrobial resistance, greenhouse gas emission, inadequate human resources and infrastructure for veterinary services, low productivity of animals, non-remunerative milk prices, the unorganized markets for livestock products, poor livestock extension, and scarcity of feed and fodder.

Improvement in livestock production is, therefore, an important pathway for increasing the income of marginal and small farmers and landless labourers, given the uncertainties of crop production. The livestock extension education plays an important role in this context to empower the farmers with appropriate technological knowledge and skills through various extension education and training programmes. While the role of extension services in enhancing crop production and productivity is widely recognized, livestock extension never got the attention it deserves and this has been one of the reasons for low productivity of India's livestock sector.

Recent trade policies and liberalization in livestock sector have brought out completely new environment for the farming community. The participation of private sector and cost recovery by the cooperatives and animal husbandry departments has been encouraged systematically. This, in turn, shifts the livestock extension focus from information as public good to "commercial good", denial of access to livestock information for subsistence farming and degradation of environment through promotion of industrialization in livestock.

This issue of the MANAGE Knowledge Series 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 MANAGE Knowledge Series issue will be helpful for all actors in the agriculture and allied sectors and agricultural extension professionals.

(Dr. P. Chandra Shekara)
Director General, MANAGE

Content

Abstract

The present chapter is mainly focused on status and overview of livestock extension services in India, which include the institutions and mechanism involved in livestock extension services the major challenges in livestock extension services, why there is need for specialized livestock extension services and more importantly, the way forward to revamp livestock extension services and thereby bringing sustainable development of livestock sector. In view of importance of National Livestock Extension Policy (NLEP), the article brings out recommendations to improve livestock extension services. For this, the authors have relied on MANAGE research studies, feedback of training programs and outcome of national level workshops.

Keywords

Livestock Extension Services, National Livestock Extension Policy, Specialized Livestock Extension Service, Livestock Sector, Indian Council of Agricultural Research, National Institute of Agricultural Extension Management, Transfer of Technology, ATMA, and KVKs.

1. Overview of Livestock Sector

Livestock production and agriculture are intertwined, each being dependent on the other, and both are crucial for overall food security of the nation. Livestock sector is an important sub-sector of Indian agricultural economy. It is an integral part of livelihood activity for most of the farmers and help sustaining farm activity. Besides, it is supplementary and complementary to agriculture in the form of critical inputs, contributing to health and nutrition of the household, supplementing incomes, offering employment opportunities, and finally being dependable "banks on hooves" in times of need. According to estimates of the Central Statistics Office (n.d) as cited in DADF (2019a), the value of livestock sector output was about Rs. 9, 17,910 crores at current prices during 2016-17 which is about 31.25 percent of the value of output from agricultural and allied sectors. At constant prices, the value of output from livestock sector was about 31.11 percent of the total value of output in agricultural sector.

According to the Central Statistical Office (n.d) as cited in DAHD (2019a), during year 2017-18, the contribution of livestock sector to national Gross Domestic Product (GDP)/ Gross Value Added (GVA) was 4.10 percent. The value of export of livestock and livestock products during 2017-18 was Rs. 457.76 billion while value of import was Rs. 104.24 billion (Singh, A. 2019a).

As per estimate of National Sample Survey (68th round (July 2011 - June 2012) as cited in DADF (2019b) undertaken on employment, it is revealed that livestock sector is engaging 16.44 million workers in the activities of farming of the animals, mixed farming, fishing and aquaculture.

India's livestock sector is one of the largest in the world. As per the 20th livestock census of Department of Animal Husbandry and Dairying (DAHD) held in 2019, the total livestock population in India was 535.82 million, which include 192.52 million cattle, 109.85 million buffaloes, 74.26 million sheep, 148.88 million goats, about 9.06 million pigs, 851.81 million poultry population and 0.85 million other livestock population (DAHD, 2019b).

Table 1. Livestock Sector Statistics of India – 2018 (Singh, A. 2019b)

Rank	Parameters
1st	Total Livestock Population, Milk Production, Cattle Population, Buffalo Population, Carabeef Production, Goat Milk Production, Total Bovine Population
2nd	Goat Population, Bristle Production (a pig industry by-product), Fish Production
3rd	Sheep Production, Egg Production
4th	Chicken Production
5th	Poultry Meat Production, Poultry Production, Meat production
8th	Duck Production
9th	Camel Population, Wool Production

India is blessed with vast livestock resources in the form of varieties of livestock breeds which include 43 indigenous cattle, 16 buffaloes, 34 goat and 43 sheep breeds (DARE, 2019).

The total milk production in the country grew at 6.50 percent and reached 187.75 million tonnes in year 2018-19, which was more than double the growth of world milk production. This record production improved the per capita availability of milk to 394 gm per day per person, considerably higher than recommended by Indian Council of Medical Research (ICMR) i.e. 280 gm per day per person. Uttar Pradesh, Rajasthan, Madhya Pradesh, Andhra Pradesh and Gujarat are the top five milk producing states, constituting 53.10 percent of the total milk production in the country. Nearly 35 percent of the milk production is contributed by Indigenous Buffalos followed by 26 percent by crossbred cattle.

The total meat production in the year 2018-19 reached 8.11 million tonnes with 6 percent growth rate. Out of the total meat production, contribution of poultry meat is 50 percent (4.06 million tonnes) followed by buffalo meat (19.50 percent). The poultry meat production registered a growth rate of 7.80 percent. Uttar Pradesh, Maharashtra, West Bengal, Andhra Pradesh and Telangana are the top five meat producing states, constituting 56.90 percent of the total meat production in country.

In 2018-19, egg production reached 103.32 billion with annual growth rate of 8.50 percent. The per capita availability of eggs is around 79 eggs per person per year, which is far below the recommended level i.e. 180 eggs per person per year by ICMR. Andhra Pradesh, Tamil Nadu, Telangana, West Bengal and Haryana together contributed 65 percent of the total egg production in the country and are the top five eggs producing states. The total egg production from commercial poultry is 84.91 billion (82.20 percent) and backyard poultry is 18.41 billion (17.80 percent).

The total wool production in the year 2018-19 reached 40.42 million kgs, which declined by 2.50 percent as compared to previous year. Rajasthan, Jammu and Kashmir,

Telangana, Karnataka and Gujarat are the top five wool producing states. They together contributed 78.50 percent of the total wool production in country.

The key factor for growth of animal husbandry sector is infrastructure that acts as a catalyst for accelerated growth of livestock sector. In 2018-19, there were 65815 veterinary institutions across the country which includes, 25571 Veterinary Dispensaries and 28168 Veterinary aid centres and 12076 Veterinary Hospitals in country (DAHD, 2019c).

In 2015, India reported 70767 veterinarians out of which only 3116 (4.40 percent) are private veterinarians as compared to 87 percent in USA and 60 percent in Europe (Miftahul, 2017).

As on March 2019, the Indian dairy cooperative network consisted of 1, 90,516 primary milk cooperative societies at village level covering 16.93 million milk producer members and procured 50.7 million kg. Milk per day registering a growth of about 7 percent. The total number of women members in dairy cooperatives across the country was 5.06 million representing almost 30 percent of the total membership. The World Bank (IDA) assisted Central Sector Scheme i.e. National Dairy Plan Phase I (NDP-I) has been implemented by the National Dairy Development Board in 18 major milk producing States through a network of 172 implementing agencies. The project with the implementation period from 2011-12 to 2018-19 has substantially contributed in achieving its prime objective of increasing the productivity of milch animals and thereby increase milk production to meet the rapidly growing demand for milk. The project also had an objective of providing rural milk producers an access to the organised milk processing sector. In India, about 46 percent of the milk produced is either consumed at the producer level or sold to non-producers in the rural area and the balance 54 percent of the milk is available for sale to organised and unorganised players. The organised sector comprises of 'Dairy Cooperatives', 'Producer Companies' and 'Private Dairy Units', which provide fair and transparent system of milk collection round the year at the village level. (NDDB, 2019a).

Presently, about 40 percent of the milk sold is handled by the organized sector (Dairy Cooperatives and Producer companies- 20 percent and Private Dairies- 19 percent) and the remaining 60 percent by the unorganized sector (DADF, 2018a).

2. Major Challenges of Livestock Sector

1. Low Productivity

Despite the fact that India possesses highest livestock population and number one in milk production in the world, the productivity, particularly of ruminants has been extremely low, turning this precious asset of the poor into a liability. Over 60 percent of the rural households maintain large ruminants, mostly for milk and partly for bullock power. However, the average milk yield is significantly low.

Table 2. Average Yield per animal during 2018-19 (Kg/Day) (DAHD, 2019c).

Exotic Cows	Crossbred Cows	Indigenous Cows	Non-Descript Cows	Indigenous Buffaloes	Non-Descript Buffalo	Goat
11.67	7.85	3.85	2.50	6.34	4.35	0.45

2. High economic losses due to animal diseases

The diseases in livestock pose major economic burden on the farmers. With improvement in the quality of livestock through cross-breeding program, the susceptibility of these livestock to various diseases including exotic diseases has increased. The inadequate coverage of vaccination is continuously resulting into economic losses due to various animal diseases. The estimates of losses due to different diseases are not easy because all diseases at all places are difficult to report. The direct losses estimated based on reported diseases indicated that average annual economic losses due to Haemorrhagic Septicaemia (HS), Foot and Mouth Disease (FMD), Brucellosis, Peste des Petits Ruminants (PPR), Classical Swine Fever were in tune of Rs. 5255 crores (2014), Rs. 20000 crores (2016), Rs. 20400 crores (2015), Rs. 2417 crores (2016), and Rs. 429 crores (2016), respectively. It indicated that farmers in India incur almost Rs. 50,000 crores direct loss every year due to the five fully preventable (with vaccination) diseases. Government of India along with state governments spend equally good amount of funds on vaccination against these five diseases that almost one lakh crore rupees, the country is losing due to non-reporting diseases, substandard vaccines, inefficient vaccination, ill-education of livestock farmers etc. (Singh, B. 2019).

3. Inadequate infrastructure and human resources for support services

Indian livestock sector is suffering from poor infrastructure and human resources. As on 31 March 2017, the number of veterinary institutions stood at 65242. As per the recommendation of the National Commission on Agriculture (NCA)-1976, One Veterinary Institution is to be provided for every 5,000 cattle units (one cattle unit =1 cow / 1 buffalo /10 sheep / 10 goats / 5 pigs / 100 poultry) to ensure proper veterinary health care.

Similarly, the Veterinary Council of India (VCI) has recommended that for every 5000 livestock population there is need of one veterinarian for effective delivery of veterinary services. It is reported that there are 67651 veterinarians in India, whereas estimated requirement by VCI is between 1.1-1.2 lakh (Damodaran, H. 2015). This highly inadequate human resources resulted in poor and inadequate veterinary services to the farmers. For the improvement of cattle breed and thereby milk production, Artificial Insemination (AI) technology is adopted in India in 1970 onwards. However, in the last 50 years, due to several such constraints, the average conception rate through AI is not going beyond 30-40 percent at field level and the contribution of milk from crossbred cows to total milk production is not exceeding beyond 26 percent.

4. Shortage of feed and fodder

India with only 2.29 percent of land area of the world is maintaining nearly 17 percent of world human population and 10.70 percent of livestock (more than 535.82 million heads) creating a huge pressure on land, water and other resources. The country is having only 5 percent of its cultivable land under fodder production. Area under permanent pastures and grazing lands comprises a mere 3.30 percent of the total area, and has been declining steadily. Among different resources, crop residues are major one and these feeding resources are meeting more than 50 percent of the livestock sector demand in the country. At prevailing livestock productivity and production, livestock sector is facing severe feed and fodder shortage. In a report titled "Revisiting National Forage Demand and Availability Scenario", released during August 2019 by the ICAR-Indian Grassland and Fodder Research Institute (IGFRI) has pointed out that there is a deficit of 23.40 percent in the availability of dry fodder, 11.24 percent in green fodder and 28.90 percent for concentrates in India (Roy, A. K. et al,. 2019).

There are already proven high yielding varieties of fodder and technologies such as silage making, hay making and urea- molasses treatment for crop residue. However, adoption of such technologies is very poor in many of the states. According to the Indian Ministry of New and Renewable Energy (MNRE) report, India generates on an average 500 million tons of crop residue per year. The same report shows that a majority of this crop residue is in fact used as fodder, fuel for other domestic and industrial purposes. However, there is still a surplus of 140 million tons, out of which 92 million tons is burned each year, which can be potentially used for animal fodder (S, Bhuvaneshwari, et al., 2019).

5. Inadequate public institution support

The livestock sector did not receive the policy and financial attention it deserved. The sector received only about 12 per cent of the total public expenditure on agriculture and allied sectors, which is disproportionately lesser than its contribution to agricultural GDP. The sector has been neglected by financial institutions. The share of livestock in the total agricultural credit has hardly ever exceeded four percent in the total credit. (Short-term, medium-term and long-term). The institutional mechanisms to protect animals against risk are not strong enough. Currently, only 6 percent of the animal heads (excluding poultry) are provided insurance cover. Livestock extension has remained grossly neglected in the past (Vet Helpline India (P) Ltd, 2013a). However, in May 2019, Government of India has formed separate ministry i.e. Ministry of Fisheries, Animal Husbandry and Dairying at central level to address various challenges of livestock sector.

6. Inadequate processing and value addition

Livestock product processing and value addition is being viewed as potential tool for sustainability of livestock production. As of 2018, the milk processing industry in India is expanded at a Compound Annual Growth Rate (CAGR) of 14.80 percent (Laura Wood, (2019). The meat industry is one of the most important part of food processing industry. The processing rate of buffalo meat is around 21 percent and 6 percent for the poultry (Anonymous (2017). The major reason for inadequate processing and value addition in meat product is lack of necessary infrastructure. As on year 2019, there are only 1377 slaughter houses, 68 Abattoirs with meat processing facilities approved by Agricultural and Processed Food Products Export Development Authority (APEDA), 32 APEDA registered meat processing plants, 11 APEDA registered stand-alone abattoirs, 9 carcass utilization centres, and 25000 small scale meat retail shops apart from few private companies (Singh, A. 2019c). It is forecasted in Food and Agriculture Organization (FAO) 2011 report titled "Mapping Supply and Demand for Animal-Source Foods to 2030", the demand for various livestock product will increase by 80-100 percent in 2030 and out of total increase, nearly 60 percent of demand will be due to change in consumption pattern and frequency of intake and remaining 40 percent demand will increase due to increase in population. It clearly shows the importance of value addition and processing of livestock products (Robinson, T.P. & Pozzi, F. 2011)

7. Issues in marketing of livestock and livestock products

Access to markets is critical to speed up the commercialization of livestock production. Lack of access to markets may act as a disincentive to farmers to adopt improved technologies and quality inputs. Currently, the livestock market does not undergo a uniform change. The changes are specific to species or products. But there are

phenomenal changes from informal to formal market system in dairy and poultry. This can be attributed to the private industries participation. However nearly 60 percent of milk is sold by the unorganized sector (DADF, 2018a). On the other hand, sheep, goat and cattle meat remains in the informal sector without much investment from private players. In nutshell, the Indian livestock and livestock product market are mostly underdeveloped, irregular, uncertain, and lack transparency and often dominated by informal market intermediaries who exploit the producers.

8. Lack of attention of small ruminates

The small ruminants i.e. Sheep and Goats are generally maintained by small, marginal farmers and landless, who cannot afford to own large ruminants. However, most of these small ruminants which are dependent on free grazing without any investment on supplementary feeding and health care, do not make significant contribution to the income. While the demand for meat is expected to grow high during the next two decades, the present system of unsustainable husbandry practices, highlights the status of these species deprived of technological and managerial support services.

9. Inadequate attention towards extension services

The delivery of livestock services has three components viz. providing technical services to the animals; Supplying technical inputs and Educating the livestock farmers. Providing services to animals involves vaccination, deworming, breeding and disease management services for which technical inputs such as vaccines, medicines, semen, AI guns, syringes and needles etc., have to be supplied. The livestock farmers have no option but to depend on vets or para-vets for all the above services and, to some extent, supply of technical inputs. Unfortunately, the third component, educating livestock farmers on various aspects of livestock management, (feeding, vaccination, disease management, breeding etc.) is grossly neglected. Many a times, supply of inputs and providing services are considered as an extension service ignoring the fact that "education of farmers is the core of livestock extension service" (Rao, SVN. 2013).

The focus of any extension services needs to be on building the capabilities of the farmers to take care of their animal and crop apart from transfer of technology and strengthening of various infrastructure and support services. Earlier, the State Department of Animal Husbandry (SDAH) were part of State Department of Agriculture but with the changing times, this department got separated and now every Indian state has independent department for Animal Husbandry. However, since beginning, the orientation of the SDAH remained confined towards giving healthcare and breeding services rather than production-oriented focus. In most of the states, the designation of veterinarians is Veterinary Officer (VO), Veterinary Assistant Surgeon (VAS) rather than Livestock Development Officer (LDO) which psychologically restricted their role on livestock

development and building farmer's capacities. The veterinarians are supposed to educate the farmers on scientific management practices, sustainability of livestock farming, ways to meet scarcity of animal feed and fodder, marketing of livestock, livestock products processing, environmental issues due to livestock, social entrepreneurship development etc. Thus, the development role of veterinarians on livestock production aspect is not explored adequately in India.

In spite of above challenges in the Indian livestock sector is performing well, however in view of fulfilling the increasing demand of livestock products, these needs to be addressed.

3. Livestock Extension Service Delivery Institutes

1. Department of Animal Husbandry Dairying & Fisheries (DADF)

DADF is one of the Departments in the Ministry of Fisheries, Animal Husbandry and Dairying, which is responsible for matters relating to livestock production, preservation, and protection from disease and improvement of stocks and dairy development. The Department implements central sector as centrally sponsored livestock development program/schemes through State Governments/Union Territories. It also advises in the formulation of policies and programs in the field of Animal Husbandry, Dairy Development and Fisheries. The main focus of the activities is on development of requisite infrastructure in States/ UTs for improving animal productivity; Preservation and protection of livestock through provision of health care; Strengthening of central livestock farms (Cattle, Sheep and Poultry) for development of superior germplasm for distribution to states and expansion of aquaculture in fresh, brackish water, welfare of fisher folk, etc. (DADF, 2020). Report of the Working Group on Animal Husbandry and Dairying for the 10th Five-Year Plan (2002-2007) for the first-time treated livestock extension differently from crop related extension activities. Hence, a separate sub-group was created to address the issues concerning livestock extension activities. Subsequently, during the 11th Five Year Plan period (2007-12), a centrally sponsored scheme on "Livestock extension and delivery services" was started and during the 12th Five Year Plan period (2012-17), "Skill Development, Technology Transfer and Extension' was started as Sub-Missions under National Livestock Mission (NLM) with the objectives to enhance adoption of new technologies and practices requiring linkages between stakeholders. The sub-mission has provided a platform to develop, adopt or adapt the technologies including frontline field demonstrations in collaboration with farmers, researchers and extension workers, etc.

2. State Department of Animal Husbandry (SDAH)

The SDAH at state level is the major stakeholder as far as livestock development is concerned. The SDAH with its huge infrastructure is primarily involved in livestock health and breeding services. The SDAH have the widest mandate for livestock development and are best placed to deliver livestock production. Veterinary functionaries are expected to perform twenty-five multifarious activities in which extension is one (Venkatadri, 2002). They are available throughout the country for livestock owners to consult for information on livestock related issues, organize livestock fairs, shows, camps, competitions and programs for cattle, poultry, small ruminants and pigs. However, only few SDAH are practically involved in extension and advisory service delivery. It is worth to note that few states like Punjab, Jharkhand are having

separate Department of Dairy Development, Department of Cooperatives with defined and organizational setup, which are mainly involved in extension activities.

3. Directorate of Extension, DAC&FW, MoA&FW, GOI

Directorate of Extension was set up in 1953 in the wake of launching of Community Development Program and National Extension Service throughout the country. It is the nodal agency in the Department of Agriculture, Cooperation and Farmer's Welfare under the Ministry of Agriculture and Farmer's Welfare for agricultural extension policies, programs, schemes and services at the national level. The Directorate is extending support to associated organization such as National Institute of Agricultural Extension Management (MANAGE), Extension Education Institutes (EEI), State Agricultural Management & Extension Training Institutes (SAMETIs) and State Departments of Agriculture in organizing training program, strengthening infrastructure for maintaining and operating professional extension services across the country. The major areas of concern are Extension management, Extension training, Agricultural information, Communication media, Extension reform (ATMA) etc. It is also involved in transfer of technology and dissemination of knowledge and information to the farming community (DAC&FW, 2020).

4. Agricultural Technology Management Agency (ATMA)

ATMA is a society of key stakeholders involved in agricultural activities for sustainable agricultural development at district level. As on October 2018, it is under implementation in 676 districts of 28 States and 3 Union Territories (UTs) in the country (Directorate of Extension, 2018). It is a focal point for integrating research and extension activities and decentralizing day to day management of the public Agricultural Technology System (ATS). As a society, it would be able to receive and expend project funds, entering into contracts and agreements and maintaining revolving accounts that can be used to collect fees and thereby recovering operating cost. Each ATMA has a governing board. The activities such as Farmers Training, Demonstration, Exposure Visit, Farmer Friends and Farm Schools are conducted under ATMA. The district collector is the chairman of the Governing Board of the ATMA.

The objectives of ATMA are; (TNAU, 2020)

a. To strengthen research – extension – farmer linkages.

b. To provide an effective mechanism for coordination and management of activities of different agencies involved in technology adaption/validation and dissemination at the district level and below.

c. To increase the quality and type of technologies being disseminated.

d. To move towards shared ownership of the agricultural technology system by key shareholders.

e. To develop new partnerships with private institutions including NGOs.

Salient Features of ATMA;

a. Creating Farmer Advisory Committee to improve feedback.

b. Using NGOs to organize farmers.

c. Encouraging private sector involvement in technology transfer.

d. Validation and refining technologies through research units in the district.

e. Bottom-up planning procedure.

f. Increased use of Information Technology

g. In-service training to increase staff competence.

h. Developing new Public-Private-Partnerships.

i. Formation and strengthening of farmer's interest group

Under the ATMA, Strategic Research and Extension Plan (SREP) is prepared, which can be defined as a participatory methodology to increase agricultural production, to formulate research extension agenda based on producers' requirement, to develop technology acceptable to users and to prioritize resource allocation to research and extension at the district level.

5. National Institute of Agricultural Extension Management (MANAGE), Hyderabad

MANAGE is an autonomous national institute under the Ministry of Agriculture & Farmers Welfare, Government of India. It is an Indian response to challenges of agricultural extension in a rapidly growing and diverse agriculture sector. MANAGE offers its professional services in the following five streams viz., Extension Management Training, Consultancy, Extension management education, Action research and Information services.

The mandates of MANAGE; (MANAGE, 2020)

a. Developing linkages between prominent states, regional, national and international institutions concerned with agricultural extension management

b. Gaining insight into agricultural extension management systems and policies

c. Forging collaborative linkages with national and international institutions for sharing faculty resource

d. Developing and promoting application of modern management tools for improving the effectiveness of agricultural extension organizations

e. Organizing need-based training for senior and middle level agricultural extension functionaries

f. Conducting problem-oriented studies on agricultural extension management

g. Serving as an international documentation centre for collecting, storing, processing and disseminating information on subjects related to agricultural management

The "Centre for Extension in Agri-Allied Sectors" (EAAS) is one among the 9 centres of MANAGE, specifically focussing on extension management training, research and policy advisory in agri-allied sector. The centre conducts induction training programs for field level Veterinary /Fishery/Sericulture and Horticulture Officers and refresher training programs for middle and senior level officers along with action research, national workshops and conferences to support policy makers.

6. Extension Education Institutes (EEIs)

EEIs are regional level training institute directly working under the Ministry of Agriculture & Farmers Welfare, Government of India with the 100 % financial assistance. There are four EEIs situated in Nilokheri (Haryana), Hyderabad (Telangana), Anand (Gujarat) and Jorhat (Assam) under the administrative control of state agricultural universities. These institutes cater to the training needs of field extension functionaries, trainers working under agriculture and allied departments of States/UTs, besides, research and extension work in their respective areas of operation.

The main objectives of EEIs are; (Hiralal, J. 2016)

a. To provide in-service training to staff of the State Training Institutes/Staff of Line Departments/State Agriculture Universities in Extension Teaching Methods and Communication Media

b. To organize Workshops on Communication and Extension Teaching Methods/Training Methodology for Master Trainers/ Sub Divisional

Agricultural Officers/ Subject Matter Specialists working under broad based Agricultural Extension

c. To conduct Workshops in specialized fields like Monitoring and Evaluation, Supervision and Extension Management for Middle Level Extension personnel working under Broad based Agricultural Extension

d. To undertake program of publication and production of basic teaching/ training material as relevant to extension personnel and

e. To have continuous program of field studies on Extension Education and allied subjects

However, as such, their activity profile reflect more focus on agriculture extension.

7. State Agricultural Management & Extension Training Institutes (SAMETIs)

SAMETI is a State level training institution which is autonomous with greater flexibility in structure and functioning. These are mainly responsible for organizing need-based training programs for the project implementation functionaries of different line departments as well as the farming community. SAMETI has to function with the technical guidance of the National Institute of Agricultural Extension Management (MANAGE).

Functions of SAMETIs (SAMETI, 2020)

a. To provide need-based consultancy services to Agricultural Technology Management Agency (ATMA) in the areas like project planning, appraisal, implementation etc.

b. Develop and promote appropriate and specific management tools for improving the effectiveness of agricultural extension services through better management of human and material resources.

c. Organize need based training program for middle level and grass root level agricultural extension functionaries.

d. It should have close linkage with institutions like KVKs, ZRS, State Agricultural Universities, NGOs, MANAGE to use appropriate faculty resource from these institutions for training and consultancy services to ATMA functionaries, farmers and other clients.

e. To conduct studies on problems related to Agriculture extension management, Communication and information technology, Agriculture product marketing, Human resource development using participatory approaches.

However, as such, their activity profile reflects more focus on agriculture extension.

8. Indian Council of Agricultural Research (ICAR), New Delhi

Agricultural Extension Division of ICAR is mainly involved in technology assessment, demonstration and capacity development through a network of 11 Agricultural Technology Application Research Institutes (ATARIs) and 716 *Krishi Vigyan Kendras* (KVKs).

The mandates of ATARIs are:

a. Coordination and monitoring of technology application and frontline extension education program.

b. Strengthening agricultural extension research and knowledge management.

KVK, is an integral part of the National Agricultural Research System (NARS), aims at assessment of location specific technology modules in agriculture and allied enterprises, through technology assessment, refinement and demonstrations. KVKs are linking the NARS with extension system and farmers. The institute is wholly financed by ICAR with its presence at each district level. KVKs functions under the administrative control of State Agricultural Universities, ICAR institutes, related Government Departments and Non-Government Organizations (NGOs) working in agriculture sector.

The major mandate of KVK is as follows;

a. On-farm testing to assess the location specificity of agricultural technologies under various farming systems.

b. Frontline demonstrations to establish production potential of technologies on the farmers' fields.

c. Capacity development of farmers and extension personnel through need-based trainings to update their knowledge and skills on modern agricultural technologies.

d. To work as Knowledge and Resource Centre of agricultural technologies for supporting initiatives of public, private and voluntary sector in improving the agricultural economy of the district.

e. Provide farm advisories using ICT and other media means on varied subjects of interest to farmers

In addition, KVKs produce quality technological products (seed, planting material, bio-agents, and livestock) and make it available to farmers, organize frontline extension activities, identify and document selected farm innovations and converge with ongoing schemes and programs within the mandate of KVK (ICAR, 2020a).

9. Indian Veterinary Research Institute (IVRI), Bareilly

IVRI is one of the premier research institutions dedicated to livestock research and development. Joint Directorate of Extension Education of IVRI cater to the needs of livestock owners, farmers and other stakeholders by offering multifarious extension services such as farm literature, animal health camps, livestock exhibition, distance education, meeting with farmers etc. It is involved in the transfer of technologies developed by the Institute in the field of livestock health, production and management through various extension activities with the help of scientists and experts of different divisions and sections of IVRI. It also keeps an active liaison with line departments of different state governments like animal husbandry, agriculture, rural development, fisheries, dairying departments, State Agricultural and Veterinary Universities and ATMA besides, NGOs, Corporate sector, private companies working for livestock and agriculture sector and Self Help Groups etc. to have a collaborative extension programme for transfer of technologies for development of livestock sector in the country. The Division of Extension Education, IVRI is actively involved in Under-graduate and Post-graduate education program in the area of Veterinary Extension Education. One of the most important activities of the Division is conducting research on multidimensional issues related to livestock technology transfer through institute funded as well as extramural research projects. The Division also performs some field extension activities mainly to generate inputs for research. The KVK and Agricultural Technology Information centre (ATIC) of IVRI organises training program and implement field extension education program (IVRI, 2020).

10. National Dairy Research Institute (NDRI), Karnal

NDRI as country's premier dairy research institution has developed considerable expertise over the last five decades in different areas of Dairy Production, Processing, Management and Human Resource Development. Information generated at the Institute and the services offered have contributed to the growth of Dairy Industry as a whole and

well-being of millions of milk producers and consumers of milk and milk products. The Dairy Extension Division of NDRI is actively involved in Post-graduate education program as well as research on various aspects of transfer of technology, extension teaching methods, constraints, impacts of program, organisational management etc. The units of NDRI such as, ATIC, Farm Science Centre (FSC), Technology Business Incubator (TBI) and Communication Centre provides single window delivery system for agricultural and dairy farming information as well as products and technologies developed by the institute along with technical know-how. These also impart need based trainings and advisory services to the farmers regarding their problems to improve agricultural and livestock productivity. These units are also involved in consultancy services, entrepreneurship awareness camps, entrepreneurship development program, dairy exhibitions and publication of farmer's literature (NDRI, 2020).

11. ICAR-Research institutes on animal science

The other ICAR Research institutes on animal science such as; National Research Centres, Project Directorates and National Bureau namely ICAR-Central Avian Research Institute, ICAR-Central Institute for Research on Buffaloes, ICAR-Central Institute for Research on Goats, ICAR-Central Sheep and Wool Research Institute, ICAR-National Institute of Animal Nutrition and Physiology, ICAR-National Institute of Veterinary Epidemiology and Disease Informatics, ICAR-Central Institute for Research on Cattle, ICAR-National Institute of High Security Animal Diseases, ICAR-National Research Centre on Camel, ICAR-National Research Centre on Equines, ICAR-National Research Centre on Meat, ICAR-National Research Centre on Mithun, ICAR-National Research Centre on Pig, ICAR-National Research Centre on Yak, ICAR-Project Directorate on Foot & Mouth Disease, ICAR-Directorate of Poultry Research, ICAR-National Bureau of Animal Genetic Resources etc. are mainly involved in animal/avian research and technology generation. However, these institutes are also involved in extension activities like organizing training program, publication of farmer's literature, exhibitions etc. (ICAR, 2020b).

12. National Dairy Development Board (NDDB), Anand

NDDB was created to promote, finance and support producer-owned and controlled organizations, mainly dairy cooperatives. NDDB's programs and activities seek to strengthen these cooperatives and support national policies that are favorable to the growth of such institutions. NDDB also works with private dairies entrepreneurs, NGOs, consumers, social and voluntary organizations related to the dairy sector. NDDB is involved in consulting services, developing and upgrading the knowledge and skills of stakeholders through various types of practical training, workshop/seminar, extension and research activities through its four training centres (NDDB, 2020b. During the year

2018-19, a total 14,118 persons were trained under different categories, at NDDB Anand and its regional training centres (NDDB, 2020c).

13. Dairy cooperatives

The three-tier structure of Indian Dairy Cooperatives (AMUL Model) consists of "Dairy Cooperative Society" at 'Village' level, affiliated to a "Milk Union" at 'District' level which in turn is further federated into a "Milk Federation" at 'State' level. The above three-tier structure was set-up in order to perform various functions such as milk collection at Village Dairy Society; Milk procurement and processing at District Milk Union and Milk and milk products marketing at State Milk Federation. This particular model has been very successful in development of dairy sector in India as it delivers all the three type services to the farmers i.e. providing technical services to the animals; Supplying technical inputs and Educating the livestock farmers. Some of the State Milk Federations have their own Central and Regional training institutes to impart training to the farmers as well as personnel working in these three-tier structure (IASRI, 2020).

14. State Veterinary/Animal Science/Agricultural University

There are 15 Veterinary and Animal Science Universities in India, established on "Land Grant Pattern" of education having a wide mandate of Teaching, Research and Extension. These universities (along with few agriculture and central universities) are governing 40 recognised veterinary colleges across the country. The Directorate of Extension education of the universities along with its constituted veterinary colleges are actively involved in the livestock extension activities such as organization of training programs, publication of farmers' literature, exhibitions etc. It is noteworthy to mention that few veterinary universities have created separate units for extension activities such as "Veterinary University Training and Research Centres" (Tamilnadu Veterinary and Animal Sciences University TANUVAS, Tamilnadu), "Veterinary & Animal Husbandry Information Centre" (Guru Angad Dev Veterinary and Animal Sciences University , Punjab, "Livestock Research & Information Centres" (Karnataka Veterinary, Animal and Fisheries Sciences University, Karnataka) at various places in their respective states and actively involved in livestock extension activities. Some of the veterinary universities have KVKs for various extension activities and also provide a platform for establishing the different farmers' associations.

15. Private Extension Services

Private Extension Service is defined as the services rendered in the area of veterinary, agriculture and allied sectors by extension personnel working in private agencies or organizations for which farmers are expected to pay a fee and it can be viewed as supplementary or alternative to public extension services. Gowda et al. (1999) as cited in

Joshi, P. (2017a). The emergence and encouragement of privatization in India opened the door for private investment and provision of foreign direct investment, which paved way for entry of private players in poultry and dairy sectors. The integration /contract farming in poultry sector have made inroads especially in southern states mainly because of the integration of all the three services viz. supply of inputs, extension advisory and technical service are provided by one agency. Due to assurance of market, at the end of the production period, the farmer is going to get a fixed amount as rearing charges. Though considered exploitative, the integrated poultry farming is gaining more popularity as the farmers are free from investment, production and marketing risks (Rao et al., 2011). The farmers are taking care of the disease risk as millions of birds are being reared in several locations and the chances of spread of diseases in all the locations is bare minimum when compared to rearing all the birds in one location by the integrator. This also facilitates the easy marketing of the product for the integrators in different locations (Rao, SVN. & Natchimuthu, K. 2016a). Similarly, the private dairies have been established over dairy cooperatives and operate with farming community through a contract agreement in which they provide variety of input services like breeding, feed, treatment, disease prevention and extension services to the farmers.

16. NGOs in Livestock Services

a) **Bhartiya Agro Industries Foundation (BAIF):** It was started basically to provide cattle breeding services in areas where government was unable to reach out with support of government and external aid. Later on, during the course of privatization and restructuring, the animal husbandry department started to face shortage of staff. This again curtailed the services from the department which paved way for the entry of BAIF in wider areas. It follows a complete recovery model called self-sustainable model. The farmers have started paying Rs. 100 to 150 per AI. BAIF was quite successful in delivery of services (mainly breeding and training) as they maintain a close contact with the livestock owners. As a result, more than 5 million families across 13 states spread over 100,000 villages, have come out of poverty and are leading a sustainable and dignified life. Their success is attributed to the dedicated leaders and committed staff. However, their impact is confined to only few pockets of the country (Rao, SVN. & Natchimuthu, K. 2016b).

b) **J.K. Trust Gram Vikas Yojana:** The main objective of livestock development activities is to upgrade the local indigenous low milk-yielding cows and buffaloes by breeding

them through Artificial Insemination (A.I) with the use of high pedigree frozen semen of indigenous/ exotic breeds. This is achieved through a special programme called the "Cattle Breed Improvement Program" (CBIP) using an innovative project concept of an "Integrated Livestock Development Centre" (ILDC). The program operator, the "*Gopal*" is the one who monitors each centre and is usually an educated rural youngster who is extensively trained for four months to carry out doorstep veterinary services (Curative, advisory and breeding). All the activities of these program operators are supervised and monitored by qualified veterinarians. The Trust operates a network of 3144 Integrated Livestock Development (ILD) Centres in 117 Districts of 11 Indian states (as on 31st December 2019) (JK Trust, 2020).

c) **Professional Assistance for Development Action (PRADAN):** It is a Civil Society Organisation (CSO) that focuses on grassroots development with disadvantaged communities, specifically women. The organization has adopted integrated approach of livestock rearing particularly in goats and backyard poultry farming. The Community Animal Health Workers (CAHWs) were groomed to conduct routine checks on animal health and growth. These CAHWs also deworm and vaccinate animals. When necessary, they refer livestock owners to government veterinary services. The CAHWs also establish market linkages and maintain cold storage chains for goat rearing and backyard poultry. An institutional mechanism that is emerging to sustain the initiative is a 'livestock rearers group'. Each group is constituted of 30-60 producers in a village and is supported by a CAHW. The resource-poor households are facilitated to adopt a combination of livelihood options to earn a decent income and lead a life of dignity. During the 2018-19 financial year, 495,000 households participated in livelihood activities (PRADAN, 2019).

In reference to livestock extension services, it has been learned in past that, in livestock sector the advisory services alone is not working effectively unless it is supported by appropriate and timely "Input". The success of Indian dairy cooperative model was mainly due to its inbuilt input component.

4. Status and Issue of Livestock Extension Services

1. Lack of National Livestock Extension Policy (NLEP)

The importance of extension policy has been sufficiently emphasized internationally and in Asian countries, Sulaiman & Hall (2005) as cited in Chander (2013a), however there is no policy for livestock extension in India. For want of coherent "National Livestock Extension Policy", livestock extension activities in India continue to remain sporadic, casual, occasional and highly unorganized and therefore do not effectively meet the requirements of a vast majority of livestock keepers (Chander, 2013b). Livestock owners are ready to pay for door step delivery of breeding and treatment services (Ahuja et al, 2008) but not for extension and advisory services (Sangameswaran, 2014). The net result is that the knowledge of the livestock owners on scientific management of livestock is very poor. Today there is nothing like livestock extension in the country. Its necessity is neither recognized by the policy makers nor demanded by the livestock owners. The irony is that many of our extension professionals have also failed to impress upon the policy makers on the significance of the livestock extension and advisory provision (Rao, SVN. & Natchimuthu, K. 2016c).

2. Primary focus on animal healthcare and breeding services

The State Animal Husbandry Department (SDAH) is the major stakeholder in livestock development having its vast infrastructure like veterinary hospitals, dispensaries, personnel and budget. However, its primary focus is on diagnosis/ treatment of animals and breeding services for which it has a clear mandate (Chander et al, 2010a). Even the breeding and health care services are focused largely on cattle and buffaloes (owners are also interested and willing to pay for these services) and the services are restricted only to vaccinations that too during outbreaks (in case of sheep and goat) and almost nil in case of backyard poultry (except Ranikhet disease vaccination at the dispensary). Pigs are never on its agenda except in Goa and north eastern states. Although DAH has a wider network in the states, its effective reach is limited to only few villages around the veterinary dispensary/hospital. In many states the vet is losing his/her technical identity as he is being involved in non-technical activities such as feed distribution, purchases of animals, identification of beneficiaries of various schemes, maintenance of several records etc. (Rao, SVN. & Natchimuthu, K. 2016d).

There is lack of dedicated administrative structure for livestock extension at centre and state level. The veterinarians and other staff like Livestock Extension Officers/Livestock Inspectors of the SDAH hardly have any motivation, appreciation, support, equipment, budget and also the required training to take up extension educational efforts (Ravikumar & Chander, 2011). The paravet initiatives taken up by some of the state governments also failed to bridge the gap as the paravets too often compete for

treatment and breeding services with the veterinarians leading to conflicts, while lacking in proper training on knowledge delivery to the livestock owners (Chander, 2013c). Livestock services, input supply and technology transfer are the main activities taken up in livestock extension programs, however education/improving knowledge of animal owners to make better decisions are neglected (Chander et al, 2010b). It is unfortunate that the emphasis is on delivery of inputs rather than "educating the farmers" which is the essential element of extension. Research has shown that investments in exchange of knowledge, rather than one-way transfer, are much more effective than program aimed at input supply alone (Rangnekar, 2015a). The majority of SDAH never considers extension services as its responsibility as evidenced by the meaning it attaches to extension (delivery of inputs) and the paltry sum allocated to the extension work (Ravikumar & Chander, 2006a); Chander, 2013d).

3. Inadequate human resources

The shortage of human resources in SDAH is already resulting in poor and inadequate veterinary services to the farmers. Moreover, Veterinary Officers, who supposed to act as middle level livestock extension professionals. Rama Rao et al., (2011); Anon., (2012); Anon., (2013); Sasidhar & Reddy, (2013); Rao et al., (2015) as cited in Sasidhar & Suvedi (2016a), have not undergone any extension management training and thus lack in extension techniques to disseminate technology to farmers. Matthewman & Ashley, (1996); Delgado et al., (1999); Ahuja et al., (2000); Chander et al., (2010); Hegde, (2010); SAPPLPP, (2012) as cited in Sasidhar & Suvedi (2016b).

4. Financial constraints

The investment in terms of budget allocated as well as the expenditure incurred on livestock extension activities by most of the SDAH in general is very low (1 to 3 percent of total SDAH budget), while 10 percent is considered as optimum budget allocation in a developing country. (Chander, 2013e). The economic studies from developing and developed countries indicating high monetary returns to extension activity Gill, (1991); Chand, et al., (2011) as cited in Chander & Prakashkumar (2013a) provide solid evidence for the value of extension activities as investment with high returns. Though, FAO Global Consultation on Agricultural Extension (1990) recommends a guideline of not less than 1– 2 percent of the GDP (depending on the size of each country and factor costs) for extension, which should be considered the minimum level of financial investment, many countries including India are yet to attain this level of investment in agricultural extension services. In recent years, the Government of India has spent only about 0.14 percent of Agricultural Gross Domestic Product on extension services. Chand et al., (2011) as cited in Chander & Prakashkumar (2013b). The investments of GOI including share of states in animal husbandry and dairying sector is extremely low.

5. Inadequate programs/schemes support on livestock extension

The role of extension services in enhancing crop production and productivity is widely recognized. Livestock extension never got the attention it deserves and this has been one of the reasons for low productivity of India's livestock sector. The focus of all the five-year plans in India has been on breed improvement and improving health services with inadequate attention given to knowledge provision to livestock keepers. There has not been any major comprehensive livestock extension program sponsored by the government.

During the 11th Five Year Plan period (2007-12), only one centrally sponsored scheme on "Livestock extension and delivery services" with a budgetary outlay of Rs.15.00 crore was proposed by DADF. Here too, Rs 10 crores was earmarked for establishment of private veterinary clinics while only Rs 5 crores was meant for strengthening animal husbandry extension. This small allocation too remained unutilized till close to the end of the 11th plan. This clearly shows the neglect of the livestock extension. (Vet Helpline India (P) Ltd, 2013b).

During the 12th Five Year Plan period (2012-17), the National Livestock Mission (NLM) was launched in 2014-15 with an approved outlay of Rs. 2,800 crore. This Mission is formulated with the objectives of sustainable development of livestock sector, focusing on improving availability of quality feed and fodder, risk coverage, effective extension, improved flow of credit and organisation of livestock farmers etc. The NLM had four Sub-Missions, in which one of sub mission was on "Skill Development, Technology Transfer and Extension". The extension machinery at field level for livestock activities is very weak. As a result, farmers are not able to adopt the technologies developed by research institutions. The emergence of new technologies and practices require linkages between stakeholders and this sub-mission had enable a wider outreach to the farmers. The sub-mission has provided a platform to develop, adopt or adapt the technologies including frontline field demonstrations in collaboration with farmers, researchers and extension workers, etc. (DADF, 2019c). The total budget spent during last five years (2014-15 to 2018-19) on Sub-Mission on Skill Development, Technology Transfer and Extension was 58.97 crore i.e. 2.10 percent of total outlay i.e. Rs. 2800 crore. (Compiled by the authors from data given in DADF & DAHD Annual report from 2014-15 to 2018-19).

6. Biases in Livestock Extension Services

The Livestock Extension Services in India are characterized by five biases that result in neglecting poor rural livestock-keepers; First, many organizations follow only a top-down 'transfer of technology' approach which is considered goal/objective of livestock extension and is implemented as a targeted program with little consideration for variation in situations (Rangnekar, 2015b). Second, focus is mostly on cattle and buffaloes, leading to exclusion of other species. Whatever little extension efforts are there, these are concentrated around large ruminants or dairy animals in particular. The large majority of small holders and the landless livestock keepers rearing goat, sheep, pigs and backyard poultry are largely ignored under the technology transfer schemes of various agencies. The much-discussed National Dairy Plan (NDP), which is currently under implementation, too would cover only dairy animals. The participation of private sector especially in small ruminants is also very poor. Third, focus is primarily on milk production, neglecting other roles of livestock such as economic, input, output, risk coverage and socio-cultural in the livelihood of rural families. Here too, focus is on the conventional dairy extension i.e. improving production in terms of unit cost involved in feeding, breeding and management vis-à-vis commercial dairy extension with focus on marketing, market information, value addition, project formulation, licensing, climate change, pollution control, budgeting, sources of funds, insurance, mechanization etc. Fourth, services are usually concentrated in high potential areas and; fifth, livestock extension is generally provided by men for men, despite key roles that women play in livestock farming. Matthewman & Ashley, (1996) as cited in Sasidhar & Suvedi (2016c); (Rangnekar, 2015c).

7. Inadequate attention towards farm women

In India, women face disproportionate challenges compared to men in accessing livestock services and information. Women account for 55 percent of livestock farming labour, whereas, their participation in works related to the care of animals is above 77 percent. Rural women make up for 93 percent of overall employment in dairying and their average contribution to the entire farm production is estimated around 45 percent to 56 percent of the total labour. Given the strong informal association of rural women with livestock, it is essential to create matching programs with sufficient funds so that their participation gets institutionalized. Several studies have shown that most of the conventional training and extension program are oriented at men. It would be effective if women farmers are reached through women extension workers. Appreciably few dairy co-operatives have done some good work in this regard, but such initiatives need more encouragement and policy support (Chander, 2013f).

8. Implementation failure

India's Planning Commission in its document, 'Agriculture Strategy for 11th Plan: Some critical issues' rightly observed that "unfortunately, extension advice is almost totally absent in animal husbandry and thus, special efforts need to be made in this area". There is no coordination and sharing of information and resources among multitude of agencies claiming to have extension component in their array of activities. The 12th Plan sub-group on Animal Husbandry constituted by the Planning Commission observed that extension services for livestock have so far been a non-starter severely hampering its growth Planning Commission, (2012) as cited in (Chander, 2013g). To address the above challenges in livestock extension service delivery, Planning Commission recommended "building up an exclusive cadre of extension workers with appropriate skills and knowledge" (Vet Helpline India (P) Ltd, 2013c). Accordingly, the states had to create a 'Separate Wing' within the SDAH for livestock extension service delivery (Model-I) or some of the Veterinary Officers of SDAH had to be deputed exclusively for this purpose i.e. 'Designated Officers' (Model-II). So far out of 28 states and 8 Union Territories (UTs), only 8 states created a separate wing. However, number of extension personnel in 'Separate Wing' model is meagre and placed mostly either at head quarter or divisional level. The rest of the states have appointed 'Designated Officers' for extension, but it has been observed that these officers are overburdened with multiple roles and therefore extension remained neglected (Kareem & Phand, 2018a).

9. Lack of training on extension management

In general, capacity building of SDAH officials at regular interval is not getting importance by most of SDAH due to various reasons. To strengthen the extension services in livestock sector, SDAH have created 'Separate Wing' and 'Designated Officers' as per Planning Commission recommendations. However, it has been observed that, most of the SDAH have not given any training particularly on 'Extension Management' to such officers before their placement into new task. In most of the SDAH, the wide notion associated with training is, 'Training' means only 'Technical training'. Few SDAH have well-equipped state of art training centres, but the emphasis is more on technical aspects. Majority of SDAH don't have such training centre. A cursory glance on the training database of National Institute of Agricultural Extension Management (MANAGE), Extension Education Institutes (EEI) and State Agricultural Management and Extension Training Institute (SAMITIs) clearly reveal this. To provide the integrated support efficiently, livestock extension professionals need to have or acquire a set of core competencies in extension management. A study entitled "Analysis of Extension Approaches in Allied Sector" conducted by MANAGE in 2016 has explored extension service approaches and methods adopted by the agri-allied sector departments in four Indian states. The study focused on following extension approaches; General Extension Approach; Extension Reforms Approach; Farming System Approach; Participatory Approach; Commodity Approach and Project Approach. It has been observed that

except General Extension Approach, all other extension approaches are almost unknown to the Officers of agri-allied sector in all the four states (Kareem & Phand, 2017a).

Another in-depth study entitled "Study of Livestock Extension Service Delivery Models in Selected States" conducted by MANAGE in 2018, revealed that, Livestock Extension Officer's (LEO) current level of knowledge and/or skills are inadequate in specific extension competencies viz., extension teaching / training methods, audio visual aids, data collection tools, needs assessment, participatory monitoring and evaluation competencies (Kareem & Phand, 2018b).

In similar study on "Assessment of Core Competencies of Livestock Extension Professionals in India" conducted in 2016 by Michigan State University (MSU) and Indira Gandhi National Open University (IGNOU) under Modernizing Extension and Advisory Services (MEAS) project of United States Agency for International Development (USAID) reported that core competencies (process and technical) of livestock extension professionals are inadequate to provide three types of integrated support services to the farmers viz., (i) Livestock extension and advisory services (to enrich the knowledge and improve the skills of livestock farmers); (ii) To make available and access to input service such as semen, vaccines, medicines, equipment's, instruments, feed etc. (to augment production and productivity) and (iii) Delivery of the technical services (clinical and para-clinical health care of livestock) (Sasidhar & Suvedi, 2016d).

Entrepreneurial extension is an essential area for capacity development among extension staff. Currently there is a lack of institutional shift from extension to entrepreneurship in livestock extension activities (S, Ramkumar 2013).

10. Weak research-extension linkages

The public research and extension system referred as National Agricultural Research System (NARS) is one of the major policy instruments for promoting technological innovations and human resource development in India, Pal et al., (2008); Dev, (2012); Pal et al., (2012); Moreddu, (2013) as cited in Chander & Rathod (2015a). India has the largest agricultural research and development (R&D) system with Indian Council of Agricultural Research (ICAR). Although NARS has been responding to the challenges faced by Indian agriculture, it is often criticized for not attending to the demands for improved technologies and also for the poor linkages between research and extension systems, Desai et al., (2011) as cited in Chander & Rathod (2015b). State agricultural and veterinary/animal science universities have greatly expanded in number with funding support from state government. However, their research capacity has weakened, (Pal et al., (2012) as cited in Chander & Rathod (2015c) leading to poor interface of research, extension and education. Further, the investments for commodity-wise public R&D

indicated that crop sciences got highest focus followed by animal sciences and fisheries in India. Swanson and Mathur (2003) as cited in Chander & Rathod (2015d) have also reported narrow focus of extension, lack of farmers involvement in extension program planning, supply rather than market driven extension, lack of transparency and accountability, inadequate technical capacity, lack of local capacity to validate and refine technologies, inadequate communication capacity and inadequate operating resources and financial sustainability as other major challenges for Indian extension system.

11. Weak linkages and duplication of activities

At state level, various line departments are criticized for working in isolation, with weak linkages and rare partnerships, Sulaiman et al., (2005); Meena et al., (2013) as cited in Glendenning et al., (2010a) limits information flow. India has a pluralistic extension system, with the public, private and other agencies playing certain roles indicating that the sectors tend to work in isolation from each other and hence, suffer from duplication of programs, without any convergence. Despite the guidelines to work together, there is lack of partnership between KVK and ATMA (Glendenning et al. 2010b).

According to World Bank (2004, 2005) as cited in Chander & Rathod (2015e) initiatives like ATMAs were considered very effective instruments for promoting participatory planning and implementation. Raabe (2008) as cited in Chander & Rathod (2015f), although ATMAs improved farm income by strengthening the linkages between research, extension, farming, and markets, still linkage can be strengthened by overcoming shortcomings like limited staff, rigid organization, poor capacity, a top-down linear culture, weak links to the research system and limited reach to farmers. ATMA is pushed as the platform through which the multiple agencies can converge. It suffers from shortages of both personnel and funds GOI (2007) as cited in Chander & Rathod (2015g) and capacity and institutional constraints (Babu et al., 2013). Another initiative, *Krishi Vigyan Kendra* (KVK) also known as "Farm Science Centre" is considered as a centre for transfer of technology in a district for all the agricultural technologies which include crops, livestock, horticulture etc. As on March 2020, there are 716 KVKs throughout India (ICAR, 2020c). However, most of the KVKs do not have animal science Subject Matter Specialists (SMS). Even in KVKs where the SMS (Animal Science) is available, he/she doesn't have the support to conduct on-farm trials of different technologies in different species of animals. The focus thus remains on training of farmers (mostly on campus) with little impact on skill development (Rao, SVN. & Natchimuthu, K. 2016e). It clearly revealed a crop biasness of KVKs with very little contribution towards livestock extension (Chander et al, 2010c). These institutes also face challenges in terms of staff, partnership etc. Chander & Rathod (2015h).

12. Professional issues

Extension agents often are considered to have a lower social status than many other public sector employees and a lower rank in the civil service system, which affect their morale. Another factor affecting their morale is that they do not have the operational funds needed to get into the field and work effectively (Birner & Anderson 2007). Further, Rathore et al., 2008a indicated that very often specialists working in research institutions are considered to have higher status than that of the extension scientist inspite of the same level of educational qualifications. Further, the same study has depicted that professional competency of an agricultural scientist is governed by the number of research publications he has produced than the technologies he has transferred effectively (Rathore et al. 2008b, Mengistu 2010).

13. Lack of demarcated activities

Public sector extension agents are often burdened with other activities that are outside the mandate of extension, Anderson and Feder (2004) as cited in Chander & Rathod (2015i). Another failure inherent in public sector extension is political interest which may be due to large scale farmers who often have more political influence than smallholders and weak political commitments of the leaders. (Ravikumar & Chander, 2006) ;(Feder et al. 2010).

As a result of all these, only 5 percent of farm households in India access any information on animal husbandry against 40.4 percent farm households accessing information on crops as per NSSO survey done in 2003 (NSSO, 2005). The same survey also revealed that public sector extension services are not the preferred option for accessing information on modern technologies on livestock production.

CONSEQUENCES OF POOR KNOWLEDGE/INFORMATION

(Rao, SVN & Natchimuthu, K. 2016f)

- Public health concerns
- Economic loss to the cattle owners
- Low adoption of preventive services
- Underutilization of resources
- Exploitation by middlemen
- Lack of awareness about efficient and transparent marketing methods
- Ignorance about the negative consequences of technologies
- Poor market information

Many states have framed livestock development policies and included livestock extension to some extent. However, planning and approach followed for livestock extension was similar to crops. Though basics of extension would remain the same, livestock extension needs to be planned somewhat differently in view of some characteristics of livestock production that are distinctly different from crops, as indicated below. (Rangnekar, 2015d)

- Livestock plays 'multiple roles (economic, input, output, risk coverage and socio-cultural)' in the livelihood of rural families.
- Livestock have stronger linkage with the socio-cultural aspects of rural society.
- Impact of intervention relatively takes longer duration in livestock.
- Resource poor families own majority of the livestock and make major contribution to livestock produce and hence recommendations and technologies have to be carefully selected before propagation.
- Women play a major role in livestock production.

According to Morton and Matthewman (1996) as cited in Joshi, P. (2017b), so far most of the models tried to integrate livestock into general extension systems by providing cross training of crop specialists in the areas of livestock production and vice-versa. But in practice, its availability has been patchy and the training modules are of short and classroom based. This obviously affected the quality of the extension service to livestock owners, which had inhibited them in adoption of modern livestock technology, Rao et al., (1992) as cited in Joshi, P. (2017c). Moreover, the highly specialized livestock extension service has different requirements, as it has distinct features from crop extension due to longer time-scale of animal production, slower speed of technology development, lack of synchronous of different animals, difficulty in demonstrating merits because of their poor observability, frequently dispersed and non-uniform needs of livestock owners (Matthewman, et al., (1997); Rao & Kherde, (1985) as cited in Joshi, P. (2017d). Livestock extension services to the farmers have the potential to play the key role in improving livestock productivity. However, its importance has not been realised in the right perspective as is evident from the organizational structure, budget and staffing for extension activities both at central and state levels.

Effective Livestock Extension would include:

- Help farmers to identify their production and marketing related constraints through awareness, exposure, exchange of information among other farmers, extension officers and other stakeholders.
- Assist farmers to make best use of the technologies and support services through capacity building.
- Establish linkage with information sources on agricultural innovations, new technologies, market related information such as demand-supply and prices.
- Build capacities and skills of farmers to empower them to adopt good practices in production for improving production while reducing the risk.
- Promote Producers' Organisations, to facilitate a platform for value chain and ensure involvement of various stakeholders to improve the production and profitability.

6. Way forward through Revamping Livestock Extension Services

1. Adequate programs/schemes support on livestock extension

The major purpose behind launching any programs/schemes is to create an environment for sustainable development of particular sector/ community/area etc. by creating awareness, offering a subsidised complete package of activities to adopt/enhance use of appropriate technologies to maximize farm returns and thereby to improve quality of life. Unless the policy frame work is translated into the programs of the concerned departments/ institutions, the policy sounds hollow. The livestock extension services is one of important component remained weak due to several reasons and therefore needs an environment in the form of central /state sector/sponsored programme/schemes. It will help to improve quality of life of farmers' especially, small, marginal farmers and landless whose livelihood is dependent on livestock.

2. Changes in State Department of Animal Husbandry (SDAH) service approach

a) The most of SDAH are being criticized on account of their primary focus being on curative animal healthcare and breeding services while enhancing farmers' knowledge, skills and changing attitude on various aspect of livestock rearing is lacking. There are well proven technologies in animal husbandry and need to be followed by farmers at mass level for sustainable livestock production. Moreover, these services (along with inputs) are being provided by SDAH at doorstep of farmers with no/meagre cost. However, it has been observed commonly that Veterinary Officers have to pursue animal owners particularly small, marginal and landless to follow such practises. Even then, majority of animal owners are ignoring to follow prescribed schedules of deworming, vaccination, unable to identify oestrous symptoms in animals and many farmers take their sick animals to quacks. This is happening years together here and lies the importance of livestock extension services and professionals who can take up the responsibility to educate and motivate livestock owners to follow good livestock production practices. The change in knowledge, skills and attitude of livestock farmers are utmost important to make them more responsive towards their own livestock. It is a challenging task and often more difficult than treating individual animals, since livestock professionals have to deal with humans having complexities of mind, attitudes, perceptions, socio-psychological barriers, level of literacy, level of knowledge etc. (Chander, 2013h).

b) The SDAH in most states face shortage of both Veterinarians and Para-Veterinarians and this needs to be addressed at different levels. Along with technical and input services, educating the livestock farmers is also equally

important hence, the SDAH needs to shift their focus gradually from curative medicine to preventive medicine. The researchers have shown that, the three important services, namely, education of farmers (extension advisory), supply of inputs and technical services must be delivered by one agency as it facilitates better coordination (Rao, SVN & Natchimuthu, K. 2016g). Establishing a Directorate of Livestock Extension at central as well as state level within Ministry of Fisheries, Animal Husbandry and Dairying/SDAH is mandated with the responsibility to plan, implement, monitor and coordinate livestock extension activities. (Chander, 2013i). It is important for the SDAH to streamline its extension activities through creating /already created extension setup with well-trained staff and equipped infrastructure to support and building capacities of livestock owners. This would lead to increased demand for professional and timely veterinary services, which will ultimately lessen the burden of Veterinary Officers.

c) In India, majority farmers are following mixed farming system. The SDAH should realise that livestock production is an integral and interdependent part of mixed farming system. Livestock extension needs to concentrate on increasing the effective use of different sub-systems by adopting a Farming Systems Approach (FSA) rather than Commodity Approach (Rangnekar, 2015e).

d) It has been observed that, the subject specialization of veterinary post- graduates who join the SDAH as Veterinary Officer (VO) is not being recognised fully. The VO having a post-graduation in Veterinary/Dairy/Animal Husbandry Extension acquire skills good enough to change the behavioural complex of livestock owners, making them receptive to new ideas/practices. Hence, they should be given opportunities to practice their acquired skills.

3. Developing capacities of extension personnel on extension management

a) Developing capacities among livestock extension personnel on technical skills as well as process (extension management) is crucial for sustainable livestock development. The livestock extension personnel need to have or acquire process competencies such as training methods, audio visual aids, data collection tools, needs assessment, participatory monitoring and evaluation competencies etc. for effective extension services. Moreover, livestock extension professionals are aware about how important these core competencies are and what level of knowledge and or skills they currently possess to perform the required competencies (Sasidhar & Suvedi, 2016e).

b) The livestock and poultry production systems are changing as result of increasing trend of globalization and commercialization hence, there is need for livestock

extension to adopt 'demand led-pro-poor approach' and take cognizance of newly emerging development issues such as; Information about market changes and facilitating market links; Promoting social mobilization and formation of interest groups for providing organizational back up and reducing dependence on other organizations; the need for making livestock production environment friendly and to mitigate or cope with impact of climate change; Production of clean and safe livestock products; Promote sustainability based on principle of 3 Ps (People, Planet and Profit) and Pay due attention to ensure 'Welfare of Animals'. (Rangnekar (2006) and (2014) as cited in (Rangnekar, 2015f).

c) In the light of the above challenges, livestock extension professionals need to have or acquire core competencies not only in technical and process skill but also need some additional competencies. The MANAGE in their study revealed that, time management, stress management, motivational techniques, digital communication technologies, writing and orator skills, priority setting and performance appraisal methods, SWOT analysis, team work and group dynamics, value chain and market analysis, policy facilitation, economics, legislations on veterinary and animal husbandry, entrepreneurship development and business management are the additional competencies that livestock extension professionals perceived as needed skills for effective service delivery. The study also revealed that, pre-service, in-service and basic induction trainings, attending national and international seminars, workshops and webinars are appropriate to very appropriate ways to acquire these core competencies. (Kareem & Phand, 2017b).A similar research finding has been reported by Sasidhar & Murari in 2016f.

d) In order to develop competencies among the extension personnel's, SDAH have to create/strengthen training centre, curriculum at appropriate places with regional sub-centres (staffed and equipped with trained livestock extension specialists and supporting infrastructure) and should allocate sufficient departmental budget for all types of required trainings. The academic institutions viz, state veterinary/ agriculture universities/colleges can play important role in creating/developing training centres as well as organising such trainings.

e) The Veterinary Council of India (VCI), the apex body to regulate the minimum standards for Veterinary education in the country must assess the needs of the livestock owners, and ways and means to address these needs through appropriate curriculum development. (Rao, SVN & Natchimuthu, K. 2016h).

4. Allocation of sufficient budget

An appropriate and timely budget is crucial for success of any development activity. A comparative study with respect to extension expenditure on crop and livestock sector

and its reflection in growth rate during 1972-73 to 2010-11 shows that on an average, Rs. 5936.4 million was spend on crop extension and Rs. 413.3 million on livestock extension per year, which reflected in average growth rate as 5.50 percent and 5.30 percent respectively during the mentioned period. (Compiled by the author from data given in V. K. Sajesh and A. Suresh, 2016). This clearly shows that investment in livestock extension is more valuable and therefore as discussed at several platforms, the SDAH in developing countries should spend at least 10 percent of the departmental budget for extension activities covering all livestock species.

5. Enabling role of KVKs and ATMA

a) The KVKs are the ideal institutions having their presence at district level and exclusively meant for taking care of extension component of agri-allied sector in India. Moreover, KVKs are viewed as one of India's important institutional innovation inspiring the world in the 21st Century (ICAR, 2012). Direct contact with the farmers is one of the strengths of KVKs. The first and foremost need to strengthen livestock extension activities through KVK is ensuring representation of Animal Husbandry Subject Matter Specialist (SMS) along with necessary infrastructure in each KVK. The representation of Animal Husbandry-SMS will certainly help in organising various livestock extension activities such as farmer's training, on farm trials on different technologies, the result of which form basis for making appropriate recommendations to the livestock owners for wider adoption (in their locations or regions) as well as to the concerned researchers to refine the technologies (Rao, SVN & Natchimuthu, K. 2016i). Considering the existing orientation of livestock production systems and specialized requirements of livestock owners, it would be desirable to have a differentiated approach of providing extension and input services. This would call for establishment of *Pashu Vigyan Kendra* (PVK) exclusively for livestock activities, as done by Anand Agricultural University, (AAU) Gujarat.

b) Agricultural Technology Management Agency (ATMA) is responsible for all the technology dissemination activities at the district level through linkages with the line departments, research organizations, NGOs and other agencies associated with agricultural development in the district. One of the major reasons of poor livestock extension activities in ATMA model are major focus on crop and ignorance and poor participation of Animal Husbandry (AH) officers. There is need to own ATMA by the AH officers. The participation of AH officers in ATMA will facilitate strengthening of various livestock extension activities. The private AI and other workers could also be effectively utilized for providing extension services.

c) KVKs and ATMA are expected to work in true partnership mode, wherein, the KVK functions as a frontline extension system, while, ATMA- as a field extension agency work for large scale technology dissemination/adoption, out scaling of successful technologies/innovations through large-scale demonstrations and further verification/validation etc. (Chander, 2016). In districts where livestock and fisheries play a major role, staffing structure within ATMA and KVKs should be modified to include sufficient staff with specialization in these sectors.

6. Strengthening research-extension linkages

a) There is now a growing concern among the researchers, extension staff and policy makers to better understand the farmers' perceptions with reference to technology generation and adoption. Situation analysis of the prevailing livestock production systems in each region has to be undertaken with the participation of key livestock producer's (to understand their needs and perceptions and knowledge) while planning extension strategy and implementing it. 'Pre-testing of technological recommendations to confirm their appropriateness for livestock owners of different socio-economic strata, before wider application is necessary for its wide adoption. There needs to be shift in emphasis from "high input and high output" solutions to "low input and low output, if not low input and high output" solutions to help the resource poor livestock owners. (Rangnekar (2006) and (2014) as cited in (Rangnekar, 2015g). There is a need to shift from "researcher managed tests" to "farmer managed tests" of the technologies (Rangnekar, 2015h). There is nothing like a standard package of practices suitable for all farming locations. It is the responsibility of the extension professionals to identify and advise the livestock owners based on field trials which must be conducted in a systematic way with the active involvement of the livestock owners (Rao, SVN & Natchimuthu, K. 2016j).

b) The academic and research organizations; ICAR institutes, veterinary universities/colleges have to play an important role in conducting need-based research and field testing of various technologies. The Directorate of Extension of the veterinary universities in Tamil Nadu and Punjab state have developed good linkage between the university research system, field functionaries and farmers by establishing regional centres.

7. Aggregation as tool for economies of scale

a) The Indian dairy cooperatives have set an ideal example of aggregated production, processing and marketing of milk. The cooperatives have ensured involvement of milk producers in the management and decision making and provide collective bargaining power to the producers. It also provides scope for

leadership development among milk producers. However, due to certain inadequacies of the cooperative model, it has not extended to other livestock commodities and also not rooted equally across the country. In recent years, it has been seen that the private dairy companies are competing with dairy cooperatives in handling of milk. In the changing scenario of liberalization and globalization the Farmer Producer Company (FPC) model which is a hybrid between cooperative societies and private limited companies seems to be promising to deal with the problem of small and marginal farmers. These FPCs has adopted all the good principles of cooperatives and the efficient business practices of companies and also seek to address the inadequacies of the cooperative structure. The Government of India is promoting FPOs and in 2019 budget, it is planned to form 10,000 farmer FPOs in the next five years. In these contexts, there is need to promote FPCs in various livestock commodities across the country.

8. Strengthening linkages and associations

a) The extension wing of SDAH needs to link up with veterinary/animal science academic/ research institutions, ATMA, KVKs, NGOs, producers' groups and other stakeholders for timely and regular advisory services, transfer of regional specific technologies and feedback of the end users. A regular interaction and meetings of all these stakeholders are necessary to plan extension activities actively. A collaborative programs for livestock extension can become more effective with self-help groups, dairy cooperatives, producer groups, women SHGs and para extension workers involved in the livestock sector.

b) A greater understanding of public-private partnerships is also needed, including what works and why, and what mechanisms help encourage partnerships. Hence, public-private partnership which is not existing effectively can be one of the best modes of strengthening linkages among various stakeholders for effective research and extension activities. The involvement of private sector can be ensured by tapping corporate social responsibility funds for such extension activities. An interaction between different multi-stakeholders should be organized at the grassroot levels to establish policy dialogues and program plans for the future.

9. Gender mainstreaming

a) Since there is a strong informal association of rural women with livestock, it is necessary to create a matching program and budgeting for women so that their participation gets institutionalized. Extension meetings/ training programs for women should be planned at their convenience, should be of short duration, deal with subjects of current importance and should be practical oriented. Initiating a

major program on livestock extension with specific focus on women may improve livestock development. There should also be a provision for training and deployment of women extension workers for livestock extension at the Panchayat level (Chander, 2013j).

10. Information and communication technologies (ICTs)

a) Fast and timely dissemination of technological information from the Agricultural Research System to the service providers and farmers and reporting of farmers' feedback to the research system is one of the critical inputs in development of technology. The extension personnel have been disseminating the technological messages to the farmers manually. This approach has not been able to reach majority of the farmers who are spread across the country due to scarcity of expert human resource, especially in terms of manpower. This gap remains a challenge for the extension system even today. In this context ICT particularly, social media seems to be promising and being widely used in livestock extension, however it needs to be strengthened further in terms of its coverage, infrastructure and capacity building.

11. Formulation of National Livestock Extension Policy (NLEP)

a) It is not enough to highlight the importance of livestock and role of extension in development of livestock sector and improving the livelihoods of the livestock dependent families. Though the policy makers recognize the importance of livestock extension, formulation of sound NLEP do not get the needed attention. There is an urgent need to formulate implementable NLEP with concomitant support. Several extension specialists have given recommendations on this issue.

b) In 2018, MANAGE has taken initiatives and given recommendations to formulate "National Livestock Extension Policy" based on its research studies and outcome of national level workshop, which are as follows;

7. MANAGE recommendations for "National Livestock Extension Policy" (NLEP)

MANAGE recommendations for "National Livestock Extension Policy"

(Kareem & Phand, 2018c)

1. A separate Extension Wing/ Extension Directorate to be established at State Department of Animal Husbandry to implement extension program, projects with sufficient budget allocation.
2. The Central Government mainly DADF and all state governments must give more importance to budget allocation and human resource development. The governments may allocate 10% of planned animal husbandry budget to extension activities. In this direction, CSR funds of different organizations/agencies may also be tapped for extension activities.
3. There is need of focused livestock extension services, major stakeholder is SDAH, KVK's are to be strengthened and right time to take up private extension into fore front.
4. Quality inputs and infrastructure like training hall, hostels, mobile vehicles and printing press with relevant audio-visual facilities for delivery system are major elements and they should be addressed with certain issues like; what farmers' want? Demand and supply, low input and high output with special emphasis on technology solutions.
5. There is need to improve the decision-making capacity of farmers through networking and coordination of all service agencies, capacity development of field veterinarians and shift from subsidized services to quality services.
6. Quality education: Approaches, strategies and process of curriculum need to be developed with proper balance among knowledge and skills, which can able to meet all the social, management and technical competencies and revision may be carried out at regular intervals as the requirement is dynamic in nature.
7. Provision of extension advisory along with input services at door step and public involvement will certainly improve the number of farmers to avail the advisory services.
8. Veterinary Officer to be placed at district level to help and guide extension work in the district.
9. Focusing of research on farmers needs to provide feasible solution through technologies and pilot testing and refining of technology before releasing to end users.
10. Capacity building of extension functionaries through training particularly on soft skills at regular intervals, which include communication, leadership, motivation skills etc.
11. The performance of extension functionaries in SDAH may be judged on the basis of number of farmers started/continued livestock farming in his jurisdiction, which may directly correlate to his promotion and career advancement scheme to boost work efficiency. Grading of services of veterinarians and rewarding them for encouragement.
12. More focus on "e-extension, m-extension, social media and market led extension" etc. Use of latest technologies like geo tagging, online portals, mobile apps etc.
13. Recognition of successful farmers and including them in farmers to farmer's network for transfer of recommended practices.
14. Mandatory continuing veterinary education program/trainings may be linked with promotion and career advancement scheme.

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15. Migratory extension officers for sheep husbandry, wherever sheep population is predominant.
16. Community based extension approach in the similar lines of community health workers

in case of human medical field.

17. Extension should be made compulsory part of subsidy schemes and should be through group/cluster approach.
18. At university level there is lack of human resources in extension hence, Public Private Partnership (PPP) mode may be followed to take results of research to the end users.
19. Extension wing of SDAH may be linked with academic and research institutions at regional level along with ATMA, KVK and NGOs working in the area to transfer latest technology effectively and efficiently.
20. Establishment of Distance Education Centres by educational and research institute to train rural youth, to take forward animal husbandry related input and advisory services in livestock sector.
21. More emphasis on hands on training to UG students in the villages, for improving extension and communication skills.
22. State Department of Animal Husbandry (SDAH) may be renamed as Department of Livestock Development Extension and Marketing for having the impact of economic importance.
23. There is a need to improve the knowledge, skill and attitude of field functionaries towards livestock extension through induction trainings, refresher trainings etc. In this context, the initiation may be taken-up through selection and nurturing of few selected professionals towards extension.
24. The focus of SDAH must shift from clinical and reproduction-oriented approach to preventive medicine, production, market-oriented approaches and entrepreneurship development.
25. Promotion of farmers' associations in livestock sector such as Progressive Dairy Farmers Association, Small Ruminant Farmers' Association, Poultry Farmers' Association, Pig Farmers Association, Dairy Cattle Breeders Association, Buffalo Breeders Association, Sheep and Goat Breeders Association, Poultry Breeders Association etc. will facilitate community extension and farmer to farmer extension.
26. Since there is a poor linkage between the universities and the farmers, the extension system must be strengthened and build a farmer friendly extension system for the livestock production based on linkages with National Research Institutes and Agricultural Universities.
27. Since there is a strong informal association of rural women with livestock, it is necessary to create matching program and budgeting for women so that their participation gets institutionalized or else they will continue to remain invisible workers. It would be more effective, if women Extension workers disseminate the technologies to the women farmers both in formal and informal mode.
28. The focus of extension also should shift towards small ruminants (Sheep & Goats) along with large ruminants.
29. All the input services for livestock farming such as concentrate feed, mineral mixture, semen doses, pharmaceutical drugs, vaccines, utensils, equipment, insurance services etc. at block level may be brought under the control of the veterinary officer, who will monitor and regularize such services in his jurisdiction (block level) to avoid indiscriminate use and thereby further loss to the farmer.

Conclusion:

Among the all stake holders for livestock extension services. The SDAH, KVK and ATMA having its reach up to farmers' level and these institutions can be viewed effective for livestock extension services. There is need to create favourable environment for livestock extension activities by formulating adequate programs/schemes with

sufficient budget and human resources. The focus of SDAH needs to change gradually towards enhancing farmers' knowledge, skills and changing attitude on various aspects of livestock rearing. Developing capacities among livestock extension personnel on technical skills as well as process is crucial for effective extension activities. The academic and research organizations have to play an important role in conducting need-based research and field testing of various technologies. There is need to create extension wing in SDAH which will link up with veterinary/animal science academic/ research institutions, ATMA, KVKs, NGOs, producers' groups and other stakeholders for timely and regular advisory services, transfer of regional specific technologies and feedback of the end users. A regular interaction and meetings of all these stakeholders are necessary to plan extension activities. Finally, though the policy makers recognize the importance of livestock extension, formulation of sound "National Livestock Extension Policy" (NLEP) is an urgent need for effective livestock extension services.

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