# LIVESTOCK EXTENSION EDUCATION

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The livestock sector plays an important role in the rural economy of India. 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, 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. Further, livestock production in India is largely an output of small holders and more than 70 million rural households depend either directly or indirectly on livestock for their livelihoods. Even more importantly, livestock provides a major source of supplementary income for a large majority of rural households and this sector is therefore, highly livelihood intensive and more importantly provides sustenance during drought and other natural calamities to rural families.

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. This chapter briefs about livestock extension education with special reference to Indian livestock farming situations. The concept of extension with a focus on livestock extension, development process and goals, extension approaches, communication and adoption of technologies and various livestock development programmes are discussed briefly for providing a holistic understanding of livestock extension education.

## Concept of Extension Education

James Stuart was considered as the father of University Extension for taking first practical steps and taking lectures to women's associations and working men's clubs in England in 1867-68. The term extension education was first used by Cambridge University in 1873, with an objective to take educational advantages of the university to ordinary people. After being influenced by this, the Land Grant Colleges in the United States of America formally established the Agricultural Extension work by integrating different activities of the colleges. From then it was spread to other parts of the world as well as to India. The concept of extension was then applied to various fields depending upon the sector which is being addressed. This has led to the development of disciplines like agriculture extension, livestock extension, home science extension, fisheries extension etc.

The word extension is derived from the Latin roots „*ex'* meaning „out' and „*tensio'* meaning „stretching'. Extension education is stretching out to the people who are beyond the limits of educational institutions. Most definitions refer to extension education as an out of school education. The National Commission on Agriculture

(1976) refers to extension as an out of school education and services for the members of the farm family and others directly or indirectly engaged in farm production to enable them to adopt improved practices in production, management, conservation and marketing. Several authors defined extension in various ways emphasizing the importance of one or the other aspect of extension.

Extension involves the conscious use of communication of information to help people to form sound opinions and make good decisions (van den Ban and Hawkins 1996). Extension is also defined as a professional communication intervention deployed by an institution to induce change in voluntary behaviour with a presumed public or collective activity (Roling, 1988). These definitions indicate that extension is for;

i. extending educational advantages
ii. forming sound opinions to make good decisions
iii. inducing changes in voluntary behavior.

The main objective of all extension work is to teach people living especially in rural areas how to raise their standard of living by their own efforts using their own resources of manpower and materials with the minimum assistance from Government (Paul Leagans, 1960). The broader function of extension work to help people to solve their own problems through the application of scientific knowledge is now generally accepted. Extension is largely educational in nature and approach. Hence, the words “extension” and “extension education” are used interchangeably.

Education is a process of bringing desirable changes into the behaviour of human beings. These changes must be desirable to the society at large. The education is effective when it results in changes in all the following behavioural components as specified by Paul Leagans:

| | | |
|---|---|---|
| i) | Knowledge | - What an individual knows? |
| ii) | Attitudes | -What he thinks? |
| iii) | Skills (both Physical & Mental) | -What he can do? |
| iv) | Action | - What he actually does? |

This aspect is known by the acronym „**KASA’**.

**Objectives of Extension Education**

It can be said that the objective of extension education is to bring desirable changes in the quality of life of the target group which it serves by helping them to change their attitude, knowledge, skill and resources (both natural and man made) like land, pasture, water, livestock, equipment etc in a right way. The ultimate objective of livestock extension education is development of livestock farmers by improving their living standards. This could be done by;

* Bringing about a desirable changes in the knowledge, attitude and skill.
* Assisting livestock farmers to realize their needs and problems.
* Developing rural leadership, mobilizing people and their resources.

* Providing knowledge about recent technologies and their application.

## Principles and Philosophy of Extension Education

Principles are the specific guidelines or the base for any decision making process or initiating an action. The principles are the guiding force behind any work. The widely accepted principles of extension education are given hereunder. They are principles of;

1. interest and needs
2. grass-roots level organization
3. cultural difference
4. cultural change
5. cooperation and participation
6. applied science and democratic approach
7. learning by doing
8. trained specialists
9. adaptability in the use of extension teaching methods
10. local leadership
11. whole family approach
12. satisfaction of client group needs.

## Philosophy

Philosophy is the pursuit of wisdom, a body of general principles or laws in a field of knowledge. Essentially, philosophy is a view of life and its components. The practical implication is that the philosophy of a particular discipline would furnish the principles of guidelines with which to shape or mould the programmes or activities relating to that discipline. The philosophy of extension education can be explained as expressed by Mildred Horton in the following lines:

- The individual is supreme in a democracy
- The home is the fundamental unit in a civilization
- The family is the first training group of the human race
- The foundation of any permanent civilization must rest on the partnership of man and land ( nature).

According to Ensminger, Extension involves

- changing attitudes, knowledge and skills of the people.
- working with men and women, young people, boys and girls to answer their needs and wants.
- helping people to help themselves
- principles of "Learning by doing" and "Seeing is believing"
- development of individuals, their leaders, their society and their world as a whole.
- working in harmony with the culture of the people.

- a two way channel
- a continuous educational process.

The extension education philosophy is based on the hypothesis that rural people are intelligent, are interested in obtaining new information and at the same time have a keen desire to utilize this information for their individual and social welfare. The basic philosophy is directed towards changing the outlook of man by educating him. Its primary aim is, therefore, to transform people by bringing about desired changes in their knowledge, attitudes and skills.

**Extension Educational Process**

Extension education is a process and it is participatory in its approach. According to Leagans the sequence of steps involved in the process are (i) situation analysis (ii) formulation of objectives (iii) deciding the content and teaching methods (iv) outcome evaluation and impact analysis and (v) feedback and formulation of corrective action. In this way the continuous process of extension education goes on resulting in progress of the farmers from a given situation to a desirable situation.

**Effective Teaching Learning Situation**

Teaching in extension education reflects the philosophy of change in knowledge, skills, attitudes, values, beliefs and understanding. It is the process of arranging situation that initiates and facilitates the learning activity among the learners towards the goal that brings about the desirable changes in their behavior. Leagans defined teaching as the process of arranging situation in which the important things to be learnt are called to the attention of the learners, their interest developed, desire aroused and action promoted. The teaching learning process is usually explained with the help of the following six steps:

**Attention:** Bringing attention of the learner is the first and foremost step in the teaching learning process.

**Interest:** Once the learners' attention is focused next responsibility of the teacher is to arouse the interest in the learner towards the subject matter.

**Desire:** Once the interest is created the teacher has to sustain the interest and stimulate the learner to convert the interest into desire.

**Conviction:** The action followed when desire, conviction and satisfaction of the learners is achieved. Therefore, the teacher should see that the learner knows what action is necessary and just how to take that action. He also should help the learner to visualize the action in terms of his own situation and gets confidence in his ability to apply the things by himself in practice.

**Action:** In this step the conviction is converted into action and the job of the teacher is to make his student act in the lines of the knowledge acquired. Action means

implementation in the actual situation.

**Satisfaction:** The end product of the teaching effort is the satisfaction that comes to the learner as a result of solving the problem, meeting a need, acquiring a new skill or some other change in behaviour. The goals of learning are achieved through accomplishment of the learner in applying the knowledge and achieving satisfaction out of the results.

Learning is a process through which the learner gains knowledge or by which he changes his behaviour through his own effort and experiences. Learning occurs out of the application of knowledge gained by the learner and through his own experience. Research revealed that people learn 1 % through taste, 1.5 % through touch, 3.5 % through smell, 11 % through hearing and 83 % through sight. Dale Edgar's (1964) Cone of experience provides a linkage between learning activity and participants' involvement in the process of learning. It illustrates that people tend to remember 10 % of what they read, 20 % of what they hear, 30 percent what they see, 50 percent of what they hear and see, 70 percent of what they say and 90 percent of what they say and do.

An effective learning situation comprises of all the essential elements such as teacher, learner, subject matter teaching materials and physical facilities **(Fig. 1).** Therefore, an effective learning situation is a system with structurally and functionally interacting sub systems or elements. The learning situation must be effective in enabling the learners to acquire the knowledge, improve or learn skills, develop positive attitudes finally leading them to take appropriate decisions. In the usual situation the theory classes are organized to impart knowledge and practical classes to impart skills. Extension being an applied science must focus on field practical to help livestock owners to improve their knowledge and acquire skills to enhance the production of their animals. For an effective learning situation the following are the essential requirements.

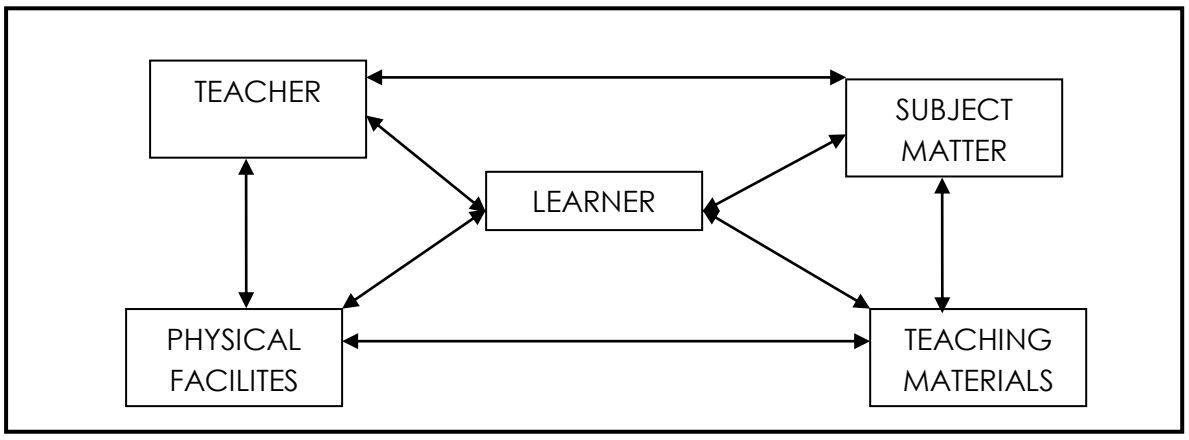


**Fig 1: The Elements of a Learning Situation**

**Teacher:** The teacher plays an important role in arousing the interest of the learner and sustains it throughout. He should be able to create a congenial learning

situation wherein the learner participates actively in the teaching process. The teachers could be placed on an ineffective – effective continuum depending upon the extent they are able to communicate and sustain the interest of the learners by using appropriate teaching materials.

**Learner:** The participation of the learner in the teaching process depends upon the extent to which the subject matter is useful to him and it was communicated in a manner that he can understand very well. The learner's ability in learning a subject depends upon the extent to which his sense organs are involved in the process of learning.

**Subject Matter:** The topics chosen for teaching must address the needs of the learners which is necessary to sustain the interest of the learners. It is advisable for the extension professionals to conduct need analysis to assess and prioritize the areas of interest to the learners.
Tailor made programmes are better in achieving the objectives of learning rather than standard programmes which may not address the needs of the learners.

**Teaching Materials:** There are various ways of teaching a subject matter to the learners. Here too the teacher plays an important role in selecting appropriate teaching materials or aids which suit to the subject matter, learners and local situation. But in no case these materials will substitute a teacher. These are only aids which need to be used judiciously taking into consideration various factors which include the characteristics of the learners, availability and cost of aids, familiarity with the use of aids and subject matter to be delivered.

**Physical Facilities:** The place where the subject matter has to be taught is very important. Depending upon the subject matter and the characteristics of the learners an appropriate place could be chosen which preferably should represent a real life situation. The place must be adequate, easily accessible and a learning atmosphere comparatively free from noise.

Although the learner is in the centre of learning situation, for an effective learning the teacher has to play a vital role in imparting the subject matter by employing teaching methods appropriate for the subject matter as well as suitable for the learner, local conditions and for himself. The ability of the teacher lies in involving the learners in active learning process which will be long lasting. He should try to involve as many senses of the learners as possible in an effective learning process.
The extension teacher must bear in mind that the flow of teaching in extension is horizontal as he also gains from the livestock owners which is possible by encouraging the livestock owners to participate actively in the learning process.

**Purpose and Significance of Livestock Extension Education**

Livestock extension involves systematic and organized communication with livestock owners with a view to helping them in such a way that the livestock owners

- obtain a better insight into their present and future position as livestock owners;
- acquire sufficient knowledge and skills necessary to increase production or reduce cost of production;
- develop positive attitudes of livestock development
- able to choose feasible and optimum objectives;
- able to identify problems, look for solutions, solve the problems identified; and
- evaluate the results within the farming system situation in which they are operating.

The ultimate aim of extension is depicted in the following flow diagram**:**

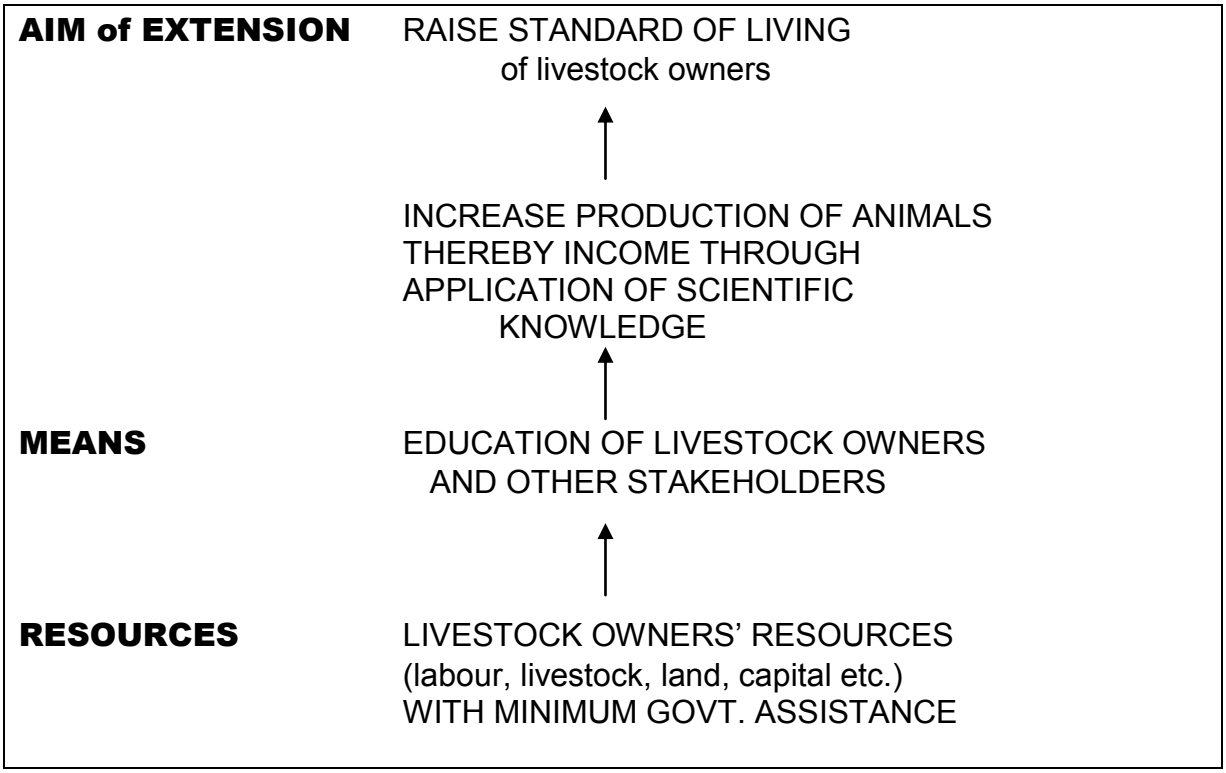


**Fig. 2 Aim of Livestock Extension**

The subject matter delivered should be directly applicable to the livestock owners, which is necessary for livestock development. This could be accomplished by designing the training programme based on needs of the livestock owners. It is also equally important for the extension agencies to help the development of leadership among the livestock owners. Development of appropriate local leaders helps the extension agencies in several ways.

There are no means by which a large number of livestock owners spread throughout the length and breadth of the country can be forced to practices animal husbandry in a specific way. Such attempts usually meet with passive and even at times active form of resistance. The better option could be is to influence their

decision making through livestock extension so that their decisions will be to their own and to their society's advantage. Livestock extension alone is seldom sufficient to increase animal production. Livestock extension cannot operate in stand alone situation as it needs the support of various institutions and several groups of people. In addition to livestock extension, the other elements required for increasing animal production are;

i) remunerative market
ii) assured water and electricity supply
iii) local availability and accessibility of inputs such as feeds, medicines, vaccines, technical services and equipments
iv) roads, transportation and storage facilities
v) credit supply
vi) appropriate policy on animal husbandry.

The domain of knowledge covered by Livestock Extension are;

i) technical problems such as selection of livestock, improved breeding, better feeding, housing and management
ii) farm economics and organizational problems which include importance of culling of animals, labour management, labour saving equipments (milking machines, meat processing equipments) acquisition of credit and its repayment, farm plans etc. How to reduce cost of production of milk, meat or eggs etc. is forms an important aspect for the livestock owners. ?
iii) issues pertaining to globalization and WTO regulations

The change must be

i) felt by the livestock owners as important
ii) significant economically and socially to a relatively large number of people
iii) related to the primary needs of the society.

People must undergo change because

i) it is the people who must make changes in farming, home-making, health, community etc. that contribute to development
ii) change in people, educationally, is a pre-requisite to the attainment of other changes in a free society
iii) changes in the mind (Head) and heart of people precede changes in actions (Hands).

**Livestock Situation and Challenges for Livestock Extension**

1. About 250 million people depend on livestock whether directly or indirectly
2. Livestock owners spread throughout the country
3. Resource poor livestock farmers contribute a lot to production of milk, meat, egg, wool etc.
4. Common property lands are shrinking leading to increased dependency on

purchased inputs
5. Majority of livestock keepers are poor and women
6. Veterinarian is the most credible source of information on livestock rearing
7. The market for livestock and livestock products is mostly unorganized
8. Per capita consumption of milk among the resource poor milk producers is very low
9. Majority of the poor own few less productive animals
10. The livestock owners have no control on quantity and quality of production.

This dynamic livestock situation is posing several challenges to livestock extension services. Some of the challenges with which the extension personnel have to cope up with are;

1. How to reach millions of livestock owners spread in every nook and corner of the country especially those who are thriving in Complex, Diverse and Risk prone (CDR) environment?
2. How to improve the living standards of the rural livestock owners through livestock rearing especially when the pressure on land is increasing and common property lands are slowly fading out forcing the rural poor to maintain the animals on purchased fodders?
3. How to sustain the production of livestock products with decreasing area under fodder and increase in the competition for feed resources and decreasing interests of the people in livestock rearing?
4. How to face the emerging livestock development situation as a sequel to the technological and development interventions?
5. How to take cognizance of the changes that are taking place in the society which include : Shift from farming to industry; Shift from rural to urban (migration ); Shift from grazing to stall feeding; Shift in focus from social to economic issues.

**Target Groups:** Livestock development involves a number of target groups with whom the extension agents need to work with. These groups include;

1. Livestock owners: All those who own livestock (dairy farmers, sheep and goat keepers, poultry farmers, etc.)
2. Livestock service providers:
   Animal Husbandry department personnel,
   Marketing institutions like Milk Cooperatives, APEDA,
   Training institutions like KVKs, NGOs,
   Research / Academic institutions – Veterinary Universities/ Colleges, ICAR animal science institutes, Bankers, Insurance agencies etc.
3. Input suppliers:
   Semen banks, feed mixing plants,
   Pharmaceuticals, vaccine production units,
   Livestock product processing units,
   Fodder seed production units, Agro related industries etc.
4. Policy makers:
   Ministry of Agriculture and Animal Husbandry, Secretaries of AH organisations, Senior officials of AH Department, Milk Federations,

Researchers, Farmer organisations etc.

**Differences between Agriculture Extension and Livestock Extension**

It is difficult to transfer livestock development technologies compared to crop technologies for a variety of reasons which emanate basically from the differences in crop and animals itself **(Table 1).** The livestock owners depend upon the technical persons for adopting technologies/ practices which include Artificial Insemination (AI), pregnancy diagnosis, vaccination, de-worming, diagnosis and treatment of animals. This means the livestock owner needs to take the animals to the technical person (veterinarian or stock assistant) or the latter have to be brought to the animal for services/adoption of practices. As a sequel not only the distance between livestock owner and the technical person but also the attitude and skill of the technical persons also come into the picture. If Roger's attributes of innovations are taken into consideration it will be very clear that crop technologies outweigh the livestock technologies in terms of observability of results, simplicity and cultural compatibility **(Table 2).**

**Table 1. Comparison of Crop and Livestock Research**

| Characteristics | **Crops** | **Animals** | Implications for using Animals |
|---|---|---|---|
| Mobility | Stationary | Mobile | Difficult to measure and Control non experimental factors |
| Life cycle duration | Generally less than 4 month | Generally over 1 yr | Increased costs, likelihood of losing experimental units |
| Life cycle synchronization | All units synchronized | Units seldom synchronized | Difficult to find comparable units |
| Multiple Outputs | Only grain/tuber and residue | Multiple outputs: meat, hides, milk, manure, power | Difficult to measure value, treatment effect |
| Non market inputs and outputs | Few | Many | Difficult to value inputs and outputs |
| Size of experimental unit | Small, divisible | Large, indivisible | Increased cost, risk to cooperator |
| Producer attitudes | Impersonal | Personal taboos | Difficult to cull, castrate |
| Management variability | Low | High | Difficult to isolate treatment effect |
| Number of observation units | Many | Few | Large statistical variability |
| Variability of Observations | Low | High | Large statistical variability |

Source: Bernsten, et al., 1983

The livestock owners depend upon the technical persons for adopting technologies/ practices which include Artificial Insemination, Pregnancy diagnosis, vaccination, de-worming, diagnosis and treatment of animals. This means the livestock owner

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**Table 2. Comparison of Crop and Livestock Technologies on Attribute of Innovations**

| **Attributes of innovations** | **Technologies / Practices** | |
|---|---|---|
| | **CROPS** | **ANIMALS** |
| Relative advantage | Easy to demonstrate as the production period in crops are short and comparison is easy | Difficult to demonstrate as the production periods are long |
| Observability of results | Easily observable preventive technologies are less in numbers | Difficult to observe the results of say Vaccination, colostrums feeding etc. |
| Simplicity - complexity | Simple | Complex- Animal it self has many systems in the body |
| Cultural compatibility | High (Less level of Sentiments attached to crops) | Very low especially in case of Culling of animals through slaughter |
| Initial cost | Depends upon the type of crop | Depends upon the species and yield potential. |
| Trialability/ Divisibility | High scope as it is easy to divide the plots. Small scale experiments are possible. | Low scope as it is difficult to divide the animals especially large ruminants |
| Dependency on technical person in adoption of practices | Very low as most of the practices depend upon the farmers (done by farmers ) | Very high as the livestock farmers need the help of technical persons in adopting practices |

**Gender and Livestock Development:** The role and contribution of women to livestock development is very well recognized. Studies clearly revealed that women spend on an average about 5 to 6 hours a day on various livestock activities which include cleaning of sheds, washing of animals, feeding, milking etc. They have fairly good control and accessibility on the income they get from the animals which is being used for children's' education, household expenses, treatment of sick people in addition to feeding of animals. The women especially below poverty line have been encouraged to form themselves into Women Self Help Groups (WSHG) to

bring about social and economic empowerment. These groups are being promoted by various government agencies including NABARD, nationalized banks, DRDA and NGOs. As a result millions of WSHGs are formed and registered with livestock rearing as the most sought after income generating activity. To reach and educate them on various aspects of livestock management in the context of very few or negligible women extension force in the country is the greatest challenge. Realizing the importance of gender and livestock development, the ICAR has incorporated this aspect as a teaching module in the post graduate programme for the veterinary extension students.

**Communication**

The most important challenge in communication of livestock technologies is to find out ways and means to convey the messages to the livestock farmers in an effective manner which enable them to take appropriate decisions on adoption of the technologies. To meet this challenge, it is important to understand the communication process, extension teaching methods, audio visual aids and their usage for effective communication. The word communication originated from the Latin word "*Communis"* which means common. Leagans defined communication as a process by which two or more people exchange ideas, facts, feelings or impression in such ways that each gains a common understanding of the meaning and use of messages.

Through communication, an individual shares his idea, information and knowledge with others. A good communication is the one which conveys the receiver what exactly the communicator wants to convey. A good communication depends upon the communicator's ability to organize the message with proper treatment in suitable channel keeping in view the receiver's type, cognitive ability and experience.

**Key Elements of Communication**

There are several models to explain the concept of communication. There are six important elements involved in the communication process. The six key elements are: Communicator, Message, Channel, Receiver, Feedback and Effect. In extension education the element „effect' can be called as „impact'. Brief meanings of the key elements are as follows.

1. Communicator : is the person from whom the message originates.
2. Message : is the information or the meaning the communicator wants to convey.
3. Channel : is the media through which the communicator sends/conveys his message.
4. Audience : is the receiver of the message or to whom the message is sent.
5. Feedback : gives the details about audience response to the given communication process.
6. Effect or Impact : is the end result of the communication. It is the change that has taken place with the receiver due to the communication.

Some of the important models of communication are given below **(Fig.3):**

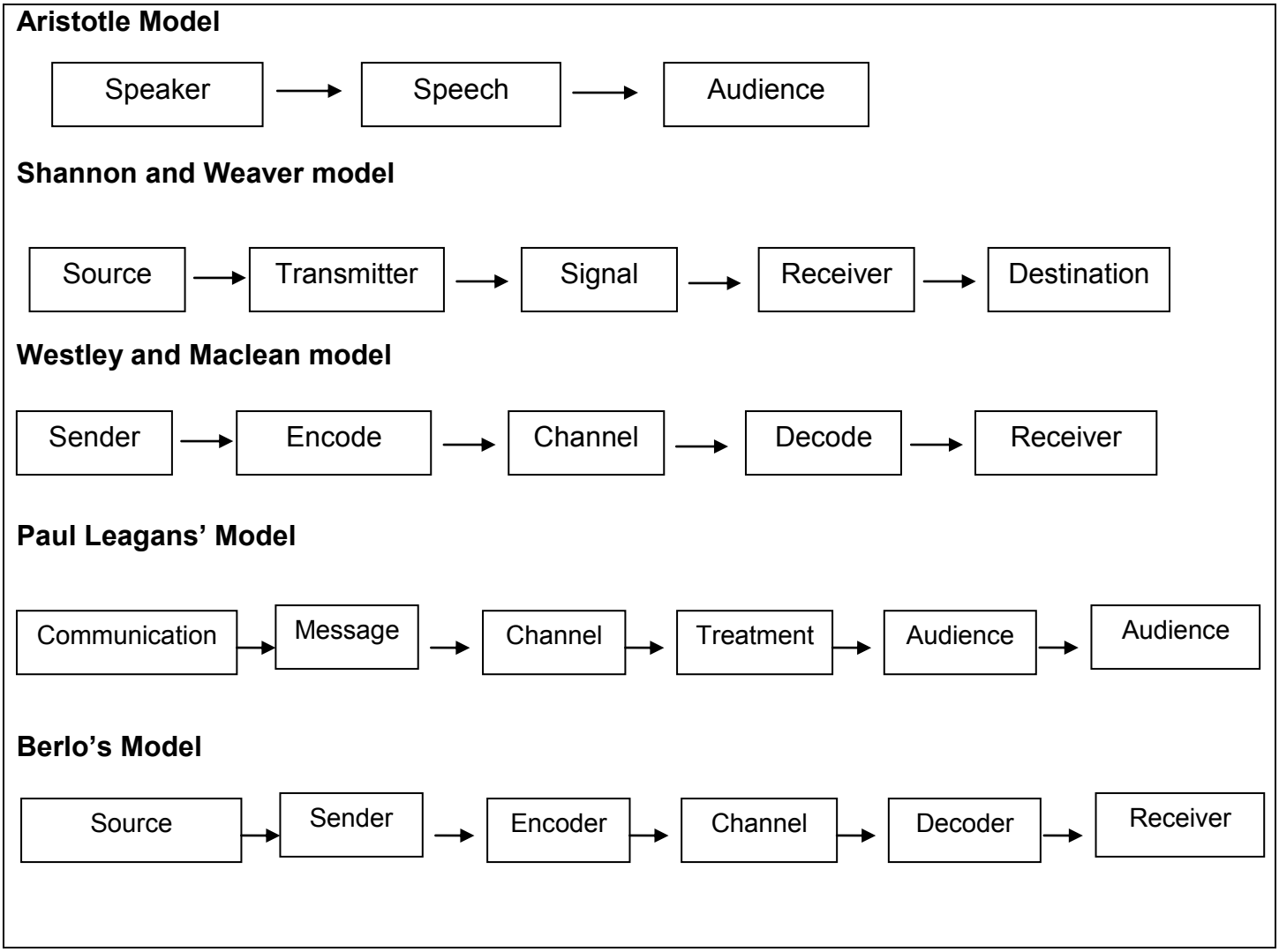


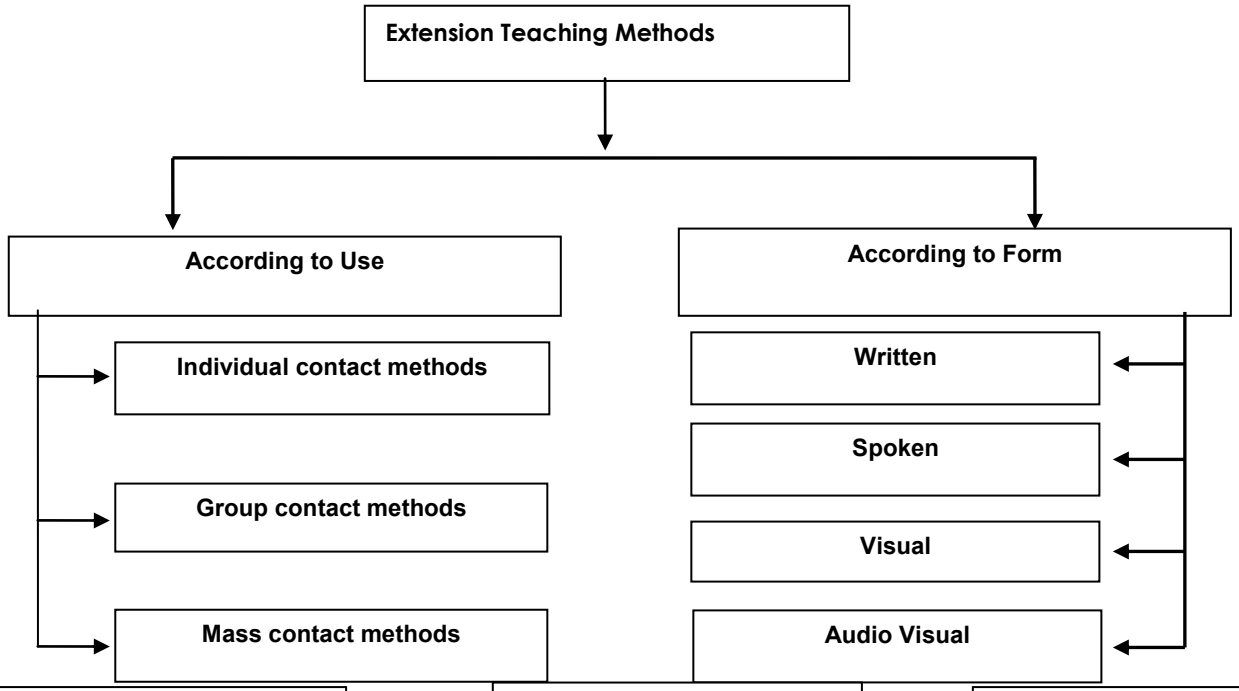

**Fig. 3 Communication Models**

**Extension Teaching Methods**

Teaching methods may be defined as the devices used to create situations in which communication can take place between the instructor and the learner. An understanding of different extension teaching methods help the teacher to select an appropriate method which suits his subject matter to be delivered and the type of audience involved in the learning process. It is, however, understandable that every method has certain advantages and disadvantages and there is no one single method which suits all the situations. Research indicates that aids used in combinations are always better than any one type of aid used alone.

Classification of Extension Teaching methods (Wilson and Gallop): The extension teaching methods are classified into different methods based on the use and form. The detailed list is provided below **( Table 3):**

## Table 3: Classification of Extension Teaching Methods




**INDIVIDUAL CONTACT METHODS**

Farm & Home visits
Office calls
Telephone calls
Personal letters
Result Demonstrations
Informal contexts

**GROUP CONTACT METHODS**

Method demonstration
Result demonstration
meetings
Leader Training meetings
Lecture meetings
Conferences
Tours
Schools
Workshop
Symposium
Brain storming
Debate
Panel
Buzz session
Filed Day
Filed Trip
Seminar
Role playing

**MASS CONTACT METHODS**

Printed materials
Radio
Television
Posters
Campaigns
Exhibitions
Cattle shows/ calf rallies
Motion pictures
Farmers' fairs
Public Address system (PAS)

**WRITTEN**

News paper, Circular letters, Advisory letter, Leaflets, Folders, Pamphlets, Bulletins, Newsletters

**VISUAL**

Exhibitions, Flash cards, Flannel graphs, Flip books, Posters, Charts, Slides, Photographs, Black board, Result demonstration, Slide projectors, OHP

**PROJECTED AIDS**

Movie films, Film-strips, Slides, Over-Head Projector Opaque Projector material, material and LCD projector.

**According to Form**

**SPOKEN**

Farm and Home Visits, Hospital/ Office Calls, Telephone ///calls, Meetings, Radio, Tape recordings

**AUDIO VISUAL**

Method demonstration, /Result Demonstration, Television, Motion pictures, Campaign, Multimedia projector, puppet shows, drama/songs

**NON-PROJECTED VISUAL AIDS**

Photography and Flash pictures, Posters and wall news sheets , Flash cards, Flip charts and Strip charts, Blackboards and Magnetic boards, Flannel graphs, and Felt boards, Diagrams, illustrations and Graphs, Specimens, samples and Models, Displays, Display boards and Bulletins, Exhibits, Illustrated booklets, Folders, Pamphlets and Cartoon pictures.

**Table 4: Extension teaching methods and aids commonly used in livestock extension**

**Methods and Aids commonly used in Livestock Extension**

| Context/Method | Teaching aids |
|---|---|
| **1. Hospital/Dispensary calls** | Individual interviews<br>Posters<br>Leaflets/folders or other printed media<br>Flip books<br>ICTs |
| **2.Farm visit/Home visit/ House calls** | Individual interviews<br>Leaflets/folders |
| **3.Village seminars** (self help groups, cooperative societies, Banks, other development departments**)** | Lecture<br>Flip books/flash cards<br>Panels/exhibitions<br>Leaflets/folders |
| **4.Demonstrations** | Leaflets/folders/booklets |
| **5.Campaigns** | **Different methods**<br>Radio, TV, PA systems, Megaphone, notice bits<br>Exhibitions<br>Examination of dung sample (deworming campaign)<br>Leaflets |
| **6.Training on scientific livestock rearing** | Chalkboard<br>Video<br>Overhead projector<br>Multimedia projector,<br>Training manual,<br>Booklets/pamphlets,<br>Flip books,<br>Feed back cards |
| **7.Group meetings** | PRA/RRA for need analysis<br>Chalk boards |

The ideas or new technologies generated or evolved in the research institutions are transferred or communicated by the extension workers by spoken word or the picture word or a combination of both. They establish direct contact with the farmers in person, in group or through indirect media. The role of extension agent is not limited to communication with livestock owners. As a potential link between research institutions and livestock owners the extension agent must have good skills in effectively communicating with various stakeholders which include policy makers, researchers, input suppliers, market agents, credit institutions etc. For better communication of ideas or technologies extension workers have to use the combinations of teaching methods, and audio-visual aids as visual and auditory senses together aids a faster learning.

**Why use of Audio-Visuals?**

For communicating an idea, experience or technology, extension worker use audio-visual aids because audio-visuals help to communicate the message effectively and efficiently. Although providing direct contrived experience to the learners is ideal to create an effective learning situation, it may not be possible every time to do so because of various limitations. Hence the effort is to bring the learners very close to direct experience by using appropriate visuals or audio visual aids. They provide the audience with a situation nearest to the reality and readily get the idea. Visuals help to give correct initial concepts by giving true mental impressions. For this purpose, extension workers take the audience to demonstrations, pictures, photographs, slides, models, specimens, movie films, film-strips, puppet-shows, television etc. These audio-visual aids help to make out the meaning of the spoken words clear as the ideas or information are put across through more than one sense. Research showed that the use of visual aids help people to learn faster and better than by verbal method, alone. The audio-visual aids help to create a favourable learning situation through facilitating teaching learning process. The learning will be effective when the dairy farmers were shown the milking machine and it will be more effective when they were taught how to use it and much more effective when they were allowed to practice on using it. If it is not possible to show the machine (direct exposure) the extension agents have to rely on pictures (less effective), films or multi-media projector (more effective). But none of these aids can either replace the teacher nor will they be as effective as direct experience.

Each type of audio-visual has certain advantages as well as limitations. All are needed at one time or the other to induce audience in the adoption process. Audio-visuals in combinations are always better than any one type of aid used alone. With the advancements in printing technology and electronics some of the aids are becoming obsolete. A list of aids that are currently in use is given in **table 5.**

**Table 5 - List of aids currently in use**

| Aids getting replaced or becoming obsolete | Aids currently in use |
|---|---|
| Wall posters | Digital cut outs, banners, collapsible banners |
| Slide projector | Multi media projector |
| Black board | White marker board |
| 16 mm film projector / film strips | Multi media projector |
| Epidiascope | Direct projector |
| SLR camera | Digital camera |
| Radio | TV |
| VCP/ VCR | CD player |
| Telephone / land line | Mobile phone |
| Personal letters | E mails |
| Two dimensional pictures | Three dimensional pictures |
| Meetings/ discussions | Audio/ Video conferencing |

## Choice of Audio-Visual aids

Audio-visual aids are just tools or aids or vehicle for transfer of ideas, technology or message. The success depends upon the selection of right type of audio-visual aids at the right way. There is no inherent magic in the visuals. They have to be used in support of a talk for highlighting the most salient feature in the talk to make the audience to understand and remember. They are only aids to verbal words of the communicator. Audio-visual aids are not necessary for each and every type of communication. For example, there are ideas simple enough that can be easily communicated through verbal words. Audio-visuals are therefore need to be used judiciously for subject matter that is beyond easy comprehension of the audience or out of their experience or abstract enough or complicated enough for their easy understanding. It is only then that audience will have a sustained interest for learning through audio-visual aids. While planning for the use of audio-visual aids the extension agent need to be selective in using the aids taking into consideration different factors like the audience (age, sex, level of literacy, previous experience etc.), availability and cost of equipments, familiarity of extension agent with the equipments, facilities required for use of the aids, subject matter etc. Above all it also depends upon the objective or purpose of the communication.

## Literature

Literature is write ups or written materials about an idea or a thing. In extension teaching literature plays an important role in the message dissemination process. Some of the common literature, that forms the part of extension teaching learning process are, leaflets, folders, pamphlets, bulletins, circulars, newspapers, magazines, journals and newsletters. The literature serves the purpose of communicating precise and reliable scientific information in a simple and easily understandable language to a common man. A brief explanation of various literature used in extension are given below.

**Leaflet:** A leaflet is a single sheet of printed matter. It is made to give accurate or specific information on a specific topic.

**Folder:** A single sheet of printed information in a folded form. There can be any number of folds in a folder. Like leaflet, folder is also primarily meant for dealing with a specific topic.

**Pamphlet:** A pamphlet consists of 3 to 12 pages and deals with a specific topic in a detailed manner.

**Bulletin:** The number of pages for a bulletin ranges from 12 to 20. A bulletin is a written piece of information about a number of related topics presented in a detailed manner.

**Booklet:** When the number of pages exceeds 20 then it is called a booklet. Usually a booklet deals with number of topics and the discussions are carried out more elaborately with illustrations, pictures, figures and tables.

**Circulars:** Letters are sent to a group of people by passing it out from one man to other to pass on certain information or messages. Circular letters help to maintain a continuous contact with farmers.

**Newspaper/ Newsletter/ Magazine/ Journal:** Periodicals give a wide range of information about what is going on in the next door and around. It is mass media which can be of immense use in message dissemination. It helps to serve as a forum for extension activity in an area. It plays the role of communicating the information to people of various levels and acquaint the public with programmes, activities and progress made in an area.

**Advances in Communication Technologies**

The newer technologies in communication system include Expert Systems (ES), Geographic Information Systems (GIS), Databases (DBS), Compact-Disc-Read Only Memory (CD-ROM), Networks, Electronic Mail (E-Mail), Electronic Bulletin Boards (EBB), On-line Service (OLS), Electronic Journals (EJS), ICTs, Kiosks, Teleconferencing and Electronic Information Retrieval System (EIRS). Some of these technologies are discussed hereunder.

**Geographic Information System (GIS)**

Geographic information system (GIS) is computer assisted methods and procedures for the capture, storage and analysis of data having location or geographic properties and the display of the results in the graphical form. GIS can be positively explored to plan and implement ecologically sustainable, economically viable, socially acceptable transfer of technology programmes for an equitable use of global land resources. Concern for the ecological issues in extension added a new dimension in the implementation of extension programmes. Any project is assessed in terms of its sustainability, eco- friendliness and economic viability. Decisions are being made based on the information about natural resources and

conditions in a particular location, whereas policy makers and project formulators were severely handicapped in this respect. This GIS dimension in the modern extension, therefore, helps to overcome such difficulties in planning need based system specific extension programmes.

**Expert Systems**

Expert systems are computer programmes that emulate logic and problem solving proficiency of a human expert. Like human experts they can also use heuristics, a problem solving technique that uses experience based rules of thumb to arrive at appropriate solutions. Expert systems are advantageous in the sense that they bring performance to the expertise of an expert and at once they can be easily duplicated unlike in case of the human experts. Perhaps the most significant merit of expert systems is that they combine the expertise of several experts in the field. This is particularly useful for the present day context of multidisciplinary approach. When the experts are becoming more and more specialized and in a particular area of the field, such expert system helps us to get the entire knowledge of expertise in the field.

Timely advice is also very much crucial for the farmers to save the plants and animals from further damage in case of emergencies. Some of the expert systems developed in this line are COUNSELLER (to manage insects and diseases on wheat), GRAPES (a pest management system for grapes) and POMME (to manage disease and insects in apples) and Poultry Expert System (dtraju@yahoo.com).

**Tele and Audio Conferencing**

Satellite communication has revolutionized the communication process and made the interaction among people located at different places possible at a point of time. Satellite technology links the communicator with his audience located at different places and makes the two way communication possible. A farmer in Haryana can directly interact with the group of experts available at AIR or Doordarsan studio or research institutes to clarify his doubts. Such type of tele or audio interacts are being used successfully by ICAR in linking the farmers with experts over a wide range of issues. The tele and audio conferencing is a boon to the extension communication as it facilitates direct interactions between the scientists, extension workers and farmers irrespective of their locations and distance.

**Cyber Extension and Information Communication Technologies (ICTs):**

Cyber extension refers to the process of extension done over cyber space. Cyber space refers to the virtual space of interconnected networks over the globe which provides connectivity round the clock. Information and communication technologies (ICTs) make this possible over the cyber space. In recent years cyber extension has gained popularity and successful cyber extension initiatives were taken up by both public and private sectors in India.

ICT encompasses all those technologies that enable the handling of information and facilitate different forms of communication among human actors, between

human beings and electronic systems, and among electronic systems. India is having a population of more than one billion with more than 18 languages and 1650 dialects. ICTs can play a dominant role in making information at right time in right place at a reasonable cost. With the shift towards an information society, the role of ICTs such as email, cell phones, World Wide Web and kiosks promise to provide innovative solutions to the problems of poverty and inequality by accelerating development through introducing transparency to the systems and operations. India with the highest English speaking population in Asia has the highest number of information kiosks established across rural areas.

**ICT Initiatives in Animal Husbandry and Dairying**

Some of the successful ICT initiatives taken up under different projects in India are the Warna Wired Village Project providing Internet access to cooperative societies spread in 70 villages of Maharashtra. The aim is to provide information to the villagers by establishing networked booths in the villages. The Information Village Project of M.S Swaminathan Research Foundation (MSSRF) established a hub of information network, in Villianur village ( Pondicherry ) to cater to the information needs of the rural people. It is aimed at bringing the benefits of modern ICTs to rural families in Pondichery. The DAH&D has already established a Local Area Network (LAN) with 230 nodes at Krishi Bhawan, New Delhi with Internet access through NICNET gateway. An ICT Learning (e-Learning) Centre has also been established to provide on line internet access.

The Dairy Information and Services Kiosk (DISK) is one of the successful initiatives taken up by Gujarat Cooperative Milk Marketing Federation Ltd (GCMFL) with the help of Indian Institute of Management, Ahmedabad. „DISK' model includes a complete history of milk cattle owned by the member farmers. The details such as breed and history of diseases, inoculation, and artificial insemination are maintained in the system. It is being used at milk collection centers and in cooperatives to measure butter fat content of milk, test the quality of the milk and to make prompt payment to the farmers. It has resulted in the removal of incentives to those who adulterate milk, reduced the time for payments from 10 days to less than 5 minutes and instilled confidence in farmers on cooperative set up. The National Dairy Development Board has established "AKASHGANGA" which provides total integrated solution for automatic milk collection.

The Central Institute for Research on Goats (CIRG) has developed e-mail Conference System for Goat Outreach on its goat-nic.in server using free software called 'majordoma' which is available on www.greatcircle.com on a free Linux operating system. Three e-mail conferencing systems, viz., mail to: goat-net@cirg.nic.in., livestocknet@cirg.nic.in and fishnet@cirg.nic.in have been launched by the institute to help information inflow among technologists, farmers, development officers and planners.

Under Animal Health Project funded by Department for International Development (DFID), Rajiv Gandhi College of Veterinary and Animal Sciences (RAGACOVAS) Pondicherry in collaboration with University of Reading, UK, has designed an interactive touch screen information Kiosk. It has information on important cattle

diseases in addition to management of cattle and methods of acquiring information. Livestock farmers can access the needed information on cattle management with the touch of the screen which had text and pictures with sound back-up. A similar attempt was made in developing a touch screen information kiosk on dairy cattle management by TANUVAS, Chennai. RAGACOVAS also developed an Information kiosk on management of goats for the benefit of the goat keepers under Rural Innovation Fund project in collaboration with MSSRF.

**ICT Efforts of ICAR and Government of India**

- IP-Telephony and Video Conferencing at ICAR Institutes/ HQs
- V-SAT Connectivity to 192 KVKs and eight Zonal Project Directorates through ERNET-KVK, ICAR Network
- Upgrading ICAR-ERNET network involving all ICAR Institutes and SAUs under on going NAIP Project Component
- **Toll free number** 1800-180-1551created by Ministry of Agriculture, Govt of India, can be used by farmers anywhere in the country to access the information on agriculture and allied subjects.

**Sources of information on animal husbandry:**

- There are several sources which can be tapped to get the information on animal husbandry. These sources include State Departments of Animal Husbandry, Veterinary Universities/ Animal science institutes of ICAR, Livestock research stations / farms, Milk federations/ unions, Training organizations like KVKs, Biological production units ( Semen, vaccines etc.), Pharmaceutical companies, Veterinary medical shop keepers, Veterinary medical representatives, Progressive livestock keepers, Non Government Organisations etc.

- However, there is nothing like animal husbandry extension person per se who is entrusted with the responsibility of education of livestock owners. The para-vets or the veterinarians who are the grass root level service providers on animal husbandry are considered as veterinary extension personnel. The present day veterinarian is considered as the most reliable source of information on livestock in the villages but unfortunately his role as livestock advisor is marginalized by his role as clinician. But in the years to come with an increase in the gap between information available and information to be utilized on technologies or make the information technology accessible to the livestock owners, he/she has to play an active role in acquisition, processing and delivering relevant information to the livestock owners.

- National Sample Survey Organisation (NSSO) survey indicated that 60 percent of the farmers do not access any source of information for advanced agricultural technologies. As a result, there is a wide adoption gap among farming community to achieve the vertical increase in production through optimum resource utilisation. If this be the case with agricultural technologies where there is a network on extension and lot of funds are being used for transfer of technologies, one can imagine the plight of livestock extension.

Research clearly revealed the yawning gaps in the knowledge levels of livestock owners which could be attributed to lack of livestock extension services in the country. Unlike in agriculture extension, there is a need to combine the education of livestock owners with the supply of quality inputs at right time to facilitate easy adoption of recommended practices by them.

**Barriers to Effective Communication**

The following are some of the common problems which come in the way of effective communication:

1. Lack of planning
2. Unclarified assumption (s) of the sender
3. Semantic distortion
4. Badly expressed message
5. Loss by transmission
6. Poor listening and premature evaluation
7. Fear, distrust and threat
8. Insufficient adjustment period to change
9. Biasness of the communicator.

The extension agent being the sender of communication must be aware of these barriers so that their negative impact on effectiveness of communication could be mitigated if not totally avoided.

**Innovation Decision and Adoption**

Innovation and its adoption by the livestock farmers is considered as essential to enhance the production of livestock to meet the demand for the products both internal and external. The current extension approach should focus on innovation rather than technology. It does not mean that technology is not required. The technology needs to be brought in at an appropriate time which is ripe for its introduction. Innovation does not mean it should come only from researchers or extension personnel. It can emanate from any source including the farmers.

The ICAR has very well recognized the importance of innovation and the initiation of National Agricultural Innovation Project (NAIP) itself is a testimony for that. These innovation projects give scope for the researchers to apply their ingenuity at different stages of the project as the problems in the field quite often will not have standard solutions. This indicates that the extension professionals must gain expertise in formulating and implementing action research projects which are flexible and innovative in nature. When the livestock situation is fast changing in the country because of various pressures and pulls from several corners, the extension agencies must be geared to adopt flexible and innovative approaches rather than recommending the standard methods of transfer of technology which has very often failed to yield the desired results.

The extension approach is to help the farmers to take appropriate decisions rather than taking decisions for them. Livestock farmer being the owner of the animals

must take various decisions in day to day management of his stock. There are several socio- economic and technological issues on which the livestock farmers have to take appropriate decisions. Hence, it is the responsibility of the livestock extension personnel to train the livestock farmers in taking proper decisions. The quality of the decisions taken depends upon the quality and reliability of the information that is being used by the livestock farmers. However, the information needs vary from one livestock farmer to the other. The idea is to empower the livestock farmer to solve his problems by taking appropriate decisions. Knowledge is rightly considered as key to empowerment and extension agencies may do well in improving the knowledge of the livestock farmers. The National Commission on Farmers has drawn attention to the knowledge deficit, which impedes agricultural productivity. Knowledge deficit which constrains productivity of livestock is therefore no exception to this.

**Information Needs and Client Groups:**

The working group on the formulation of XI Five Year Plan emphasized the significance of information needs of different clients. It is stated in the Plan document that "Understanding and appreciating the information needs of different clients (farmers, farm women, labourers, youth, etc.) and providing quality extension services is central to its success, which necessitates quality manpower at different levels. Among extension services, training is a key input for human resource development and contributes substantially to face the challenges by all concerned". All those who rear animals for production are considered as livestock owners. However, the objectives of rearing may differ from region to region and within the region from one livestock owner to the other. The basic premise in development is that extension must be client centered. A technology which is useful to one group of livestock owners say cattle keepers may not be useful or relevant to other cattle keepers leave alone poultry farmers. This is mainly because of variations in their socio-economic situation, type of animals, purpose of rearing animals, level of technology adoption, resource availability, market structure, extent of extension exposure or contact, etc. The livestock farmers could be classified on the basis of species (cattle /buffalo keepers, sheep / goat keepers, poultry farmers, fishermen groups), level of education (illiterate, semi literate and literate) size of the farm (small, medium and large), type of the farm (subsistent, commercial, pastoralist), location (rural, peri-urban and urban) ownership (private, contract or cooperative), type of labour involved (family or hired or both) etc. Obviously the information needs of these groups of people differ and extension advisory service must take cognizance of these needs rather than promoting blanket recommendations.

**Technology adoption:**

Putting a technology into practice by the livestock farmers depends upon several factors and all of them in a village or region will not adopt the technology at the same time. The adoption of a technology usually follows a normal, bell shaped curve when plotted over time on a frequency basis. If the cumulative number of adopters is plotted, the result gives a "S" shaped curve. Based on their time of adoption since the technology is introduced in the system, the adopters are categorized into, innovators, early adopters, early majority, late majority and

laggards. Innovativeness is the degree to which an individual is relatively earlier in adopting new ideas than other members of a system.

The adoption process of a technology involves stages like awareness, interest, evaluation, trial and finally adoption. The rate of adoption is the relative speed with which a technology is adopted by the members of a social system. On adoption of a particular technology, in a given system the resulting outcome is measured in terms of technological consequences. The technological consequences can be classified into (i) desirable vs undesirable (ii) direct vs indirect (iii) expected vs unexpected. The studies on technological consequences are therefore conducted to evaluate the net technological impact in a given system due to its adoption in the system (Rao et al, 1994).

## Technology Adoption and Consequences

The adoption of recommended technologies depends upon the perceived technological characteristics (Rogers, 2003). The user system evaluates the suitability of the technologies based on the factors such as (i) relative advantage of the transferred technology over the existing practices, (ii) the suitability or compatibility of the technology to their system, (iii) the degree of technological complexity in integrating it in their existing system, (iv) the possibility of testing the technology on trial basis in a limited way before the large scale adoption and (v) observability of the relative benefits over the adoption of the technology in their system. For example, the technologies related to disease prevention and control has got a limited observability of the benefit by the farmers resulting in farmers' reluctance in vaccinating their cattle **(Table – 6).** It is well recognized that those technologies with high perceived relative advantage, compatibility, trialability, observability and predictability are adopted immediately whereas complexity of the innovation is negatively related to its rate of adoption.

**Table – 6: Perceived Technological Characteristics**

| Sl. No. | Perceived Technological Characteristics | Description/ Example |
|---|---|---|
| 1. | Relative Advantage | Dairy farmers consider cross bred cows produce more milk than indigenous cows. Similarly they consider the crossbred bullocks are inferior to local bullocks. |
| 2. | Initial cost | Initial cost of milking machine is high and not suitable for dairy farmers who rear one or two cows. |
| 3. | Simplicity vs. Complexity | Proper disposal of dead cows (burial or burning) is a complex practice. |
| 4. | Trialability | AI as a practice can be tried on one cow and see for its performance before adopting in all the cows. |
| 5. | Observability | Benefits of vaccination or colostrums feeding to new born calves, de-worming etc are difficult to |

| | | |
|---|---|---|
| | | observe in the short period of time |
| 6. | Compatibility | Culling of cattle especially cows through slaughter is not compatible with the social system. |

There can not be any technology which is devoid of negative consequences. It is necessary for the extension agent to provide the information on both positive and negative consequences of the technology to the livestock farmers which enable them to take appropriate decisions **(Table 7).** However, this is possible if adequate information on the advantages and disadvantages of a particular technology in a particular social system are gathered through on farm trials. It is equally important for the extension agent to resist from the tendencies of painting a rosy picture of a technology to avoid future mistrust between him and the livestock farmer.

**Table 7: Consequences of technologies or practices**

| Sl. No. | Technology or practice | Positive consequences | Negative consequences |
|---|---|---|---|
| 1 | vaccination | Protect the animal from disease | Reduction in milk yield<br><br>Vaccine failure |
| 2 | AI with exotic bull semen | Female calf | Male calf |
| 3 | Crossbred cow | Gives more milk provided it is managed properly. | Susceptible to diseases;<br>Poor performance under poor management |
| 4 | Urea treatment of straws | Slight increase in milk production and at a low cost | Feed gets exhausted fast thereby requiring more dry fodder. |

The adoption of a technology usually follows a normal, bell shaped curve when plotted over time on a frequency basis. If the cumulative number of adopters is plotted, the result gives a “S” shape curve. Since all the individuals in a system do not adopt a technology at the same time, based on their time of adoption since the technology is introduced in the system, the adopters are categorized into, innovators, early adopters, early majority, late majority and laggards. Innovativeness is the degree to which an individual is relatively earlier in adopting new ideas than other members of a system.

The adoption process of a technology involves stages like awareness, interest, evaluation, trial and finally adoption. The rate of adoption is the relative speed with which a technology is adopted by the members in a social system. On adoption of a particular technology, in a given system the resulting outcome is measured in terms of technological consequences. The technological consequences can be classified into (i) desirable vs undesirable (ii) direct vs indirect (iii) expected vs unexpected. The studies on technological consequences are, therefore, conducted to evaluate the net technological impact in a given system due to its adoption in the system.

**Technology Application: Assessment and Refinement, Demonstration and Training**

The technology application in the farmers' field is a pre-requisite for further steps in the process such as dissemination and adoption. The technology application refers to assessment and refinement, demonstration, and training of the farmers. The Technology Assessment and Refinement (TAR) refers to the process or a set of activities undertaken before taking up new scientific information for its dissemination in a new productive system. It is expected that the situation prevailing at farm condition differs from that of experimental condition under which the scientist develops technologies resulting in performance gap and dissatisfaction. Therefore, the technologies need to be reviewed, assessed and refined in terms of specific needs, opportunities and constraints faced by the farmers in different production systems. Some of the reasons for low acceptance of technologies are;

- not economically viable
- not operationally feasible
- not stable
- not matching with the farmers' needs and
- not compatible with the farmers' overall farming systems.

Therefore, the assessment and refinement of technology need to be :

- site specific
- holistic
- farmer participatory
- technical solutions to existing problems
- inter-disciplinary
- interactive and
- gender sensitive

The operationalisation issue involves a shift from discipline to programme mode, following the principles of systems approach, integration of bio physical and socio economic factors, and applied to local situations and farmers' resource in the form of On Farm Trials (OFT).

**On-Farm Trial** aims at testing a new technology or an idea in farmers' fields, under farmers' conditions and management, by using farmer's own practices as control. The OFT is conducted in the farmers' field to know the suitability or applicability of the chosen technology in the farmers' conditions. It should help to develop innovations consistent with farmer's circumstances, compatible with the actual farming system and corresponding to farmers' goals and preferences. There are five steps involved in conducting OFT. They are (i) diagnosis (ii) planning (iii) conducting (iv) assessment and (v) extrapolation/extension.

**The diagnosis** involves understanding of farming system and system interaction in the given situation, identifying the problems limiting productivity of the resources

available to the farmers, understanding the problem causes, and listing out of possible solutions.

**The planning** phase involves setting out the priorities for conducting on farm trials. On listing out the priorities, the problem ranking is done based on the factors such as severity, importance, frequency and extent of prevalence. Further, the identification of the problem cause needs to be done to look for possible solutions and analyze the feasibility or applicability of the solution to solve the problem in the given situation. The identification is done through the methods like PRA and formal survey methods (direct observation), yield surveys, previous studies such as exploratory trials and long term monitoring of the situation.

**Conducting** on farm trials to see the technological applicability is a real challenge and need to be done by following the step wise procedures such as selection of the farmer, animals or farm, technology screening, actual implementation, recording of data, analysis, refinement based on the local situation in case of technology performance shortfalls due to situational demands.

**Assessment** of the technology/refinement by using its performance indicators is an important step in OFT as it involves selection of appropriate indicators, their measurement and making the farmers familiar with the procedures of measurement and recording the values.

The final step is the **dissemination of technologies** in the similar farming situations or micro climatic environment through conducting field demonstration, and empowering the farmers with suitable training for successful adoption of the technology in the given farming system.

The OFTs could be classified into three based on the stakeholder who is going to take the lead role. They are i) Research driven: Research system designed and managed (with the assistance of extension) ii) Extension driven: Extension System or KVK system designed and managed by farmers and iii) Farmer driven: Farmers designed and managed, with the assistance of Extension/KVK system

**Demonstrations**

Demonstrations are very widely used extension teaching methods in demonstrating the skill or method or the result of a particular practice to the audience. Demonstrations if organized properly will arouse interest and improve the learning process. The demonstration is the most effective way to show how thing works, how to do the work, principles involved in an operation and to show the end results of the method adopted. On the basis of purpose for which the demonstration is conducted it is classified into (i) method demonstration and (ii) result demonstration.

**Method Demonstration:** A method demonstration is conducted to explain how to carry-out a particular operation according to its principles so that it is carried out systematically and yields better result. Through method demonstration the learners are taught “how to do something”. The extension principle involved in the method demonstration is “learning by doing.” The learners will be shown the right method for doing an old practice or taught about a new practice that are introduced to them.

The method demonstration teaches new skills and helps the learner to obtain practical knowledge about something they need to practice or do in their day to day life. These demonstrations are intended to impart skills such as right method of milking, dehorning, feed formulations, de-beaking in chicks etc.

**Result Demonstration:** The value of a new practice can be realized better by seeing the end product or outcome in comparison with the existing practice. This is based on the principle of "seeing is believing". The result demonstration serves as an important tool to convince the farmers about the value of a new idea or innovation that is introduced to them as an option to their existing practice. Unless the farmers see the outcome or results of the recommended practice in comparison with their existing practice with their own eyes and experience, it becomes difficult for the extension worker to induce the farmer to adopt the recommended breed, strain or practice. In such circumstances the result demonstration helps the extension worker to make his job easy. The result demonstration could be ideally employed when it is intended to demonstrate the effect of a new breed or feed formulation on milk production. However, the main constraint in conducting the result demonstrations is the observability of results. For instance the effect of drugs on health of the animals could easily be demonstrated and compared to the effect of vaccination on disease incidence. In addition, demonstration of certain practices like the superiority of a crossbred cow compared to a local cow in milk yield will take very long time and the farmers may not have patience to wait for such time.

**Front-Line Demonstrations (FLD):** FLD is a concept of field demonstration evolved by the Indian Council of Agricultural Research during the inception of Technology Mission on Oilseed Crops during mid-eighties. The field demonstrations conducted under the close supervision of scientists of the National Agriculture Research System (NARS) is called front-line demonstrations because the technologies are demonstrated for the first time by the scientists themselves before being fed into the main extension system of the State Department of Agriculture.

The main objective of front-line demonstrations is to demonstrate newly released crop production technologies and its management practices in the farmers' fields under different agro-climatic regions and farming situations. While demonstrating the technologies in the farmers' field, the scientists are required to study the factors contributing towards higher crop production, field constraints of production and thereby generate production data and feedback information. Front-line demonstrations are conducted in a block of two or four hectares land in order to have better impact of the demonstrated technologies on the farmers and field level extension functionaries. The purpose is to convince extension functionaries and farmers together about the potentialities of the technologies for further wide scale diffusion.

Frontline demonstration is a long term educational activity conducted in a systematic manner in farmers' field to show the worth of a new practice/ technology. Only proven technologies are selected for field demonstrations. Field demonstrations educate farmers through results obtained in terms of varieties resistant to disease and pest, quality of the grains and overall higher yields. In

addition, it also educates the farmers in term of input-output ratio and economic gains in terms of net returns. These frontline demonstrations are being used to demonstrate crop technologies and to a negligible extent in case of livestock technologies.

The front-line demonstrations are different from the normal demonstrations conducted by the extension functionaries. The special features of front-line demonstrations are:

- Front-Line Demonstrations are conducted under the close supervision of the scientists of the NARS comprising KVKs, ICAR Institutes, National Research Centres, Project Directorates and the State Agricultural Universities and their Regional Research Stations.
- Only latest proven technologies are selected for front-line demonstrations.
- Front-Line Demonstrations are organized in a block of two to four hectares involving all those farmers whose plots fall in the identified demonstration block.
- Only critical inputs and training are provided from the scheme budget, while the remaining inputs are supplied by the farmers themselves.
- Training of the farmers is a pre-requisite for conducting such demonstrations.
- The target audience of the front-line demonstration is both farmers and the extension officers and
- Front-Line Demonstrations are used as a source of generating data on factors contributing higher crop yields and constraints of production under various farming situations.

**Training**

Training is a process of acquisition of new skills, attitudes and knowledge in the context of preparing for entry into a vocation or improving one's productivity in an organization or enterprise. ILO (1986) defined training as activities which essentially aim at providing attitude, knowledge and skills required for employment in a particular occupation or a group of occupations for exercising a function in any field of economic activity.

Training provides a systematic improvement of knowledge and skills which in turn helps the trainees to function effectively and efficiently in their given task on completion of the training. Among extension services, training is rightly considered as a key input for human resource development and contributes substantially to face the challenges by all concerned (Working Group on Agricultural Extension for formulation of XI Five Year Plan).The training programmes are idealistically designed and conducted for inducing changes in the durable aspects of persons, changes in relationships and changes in action. The training strategies vary depending upon the learning outcome the trainer seeks to achieve among their trainees. The training may be for improving the proficiency in the task performed or learning a process. The training modalities also need to be differentiated based on the requirement and type of organization which is imparting the training. Modality is a broader concept than the training method: for example several methods can be used for designing a particular modality. Training modality can be classified on the

basis of (i) contact with learner (ii) formalization of training (iii) management of training and content emphasis (Lynton and Pareek, 1990).

Any training programme starts with identification of training needs, followed by translation of training needs into objectives. Based upon the objectives, the contents of the programme are developed, taking into consideration the knowledge, skill and attitude elements needed to achieve each objective. Once the training contents or topics are decided, appropriate training methods suitable for each topic should be selected. Then, the topics have to be put in a particular sequence and a complete course schedule with time and duration is to be decided. All learning and training is best done through active subject and therefore all extension professionals must understand well the basics of training in order to design and conduct successful training programmes. The effectiveness of training depends upon the extent to which the training objectives are realized which again depends upon the active participation and involvement of the trainers in training sessions.

**Types of Training**

Training has been conceived as a process consisting of three phases, viz. pre-training, training and post training (Lynton and Pareek, 1990). Pre-service training and in-service training are the types of training generally organized.

**Pre-Training:** Preparatory phase prior to the actual training process is very much essential. The trainer usually assesses the training needs of the intended trainees and designs appropriate course content as well as methods to realize the objectives set for the programme. Arrangements for selection of participants, appraisal of course details and necessary preparations for conducting the training programmes are completed during the pre-training phase.

**Actual Training:** The training is organized as per the training plan/schedule. The activities such as reception of trainees, board and lodging, inauguration, guest lectures, organization of instructions, demonstration skill training, field trip, evaluation etc. are conducted during this phase. Due care is to be taken for creating proper training climate (favourable learning situation) for the participants to learn new ideas and skills. Good rapport and team building among the trainees need to be encouraged.

**Post Training:** The success of the training programme largely lies with the follow up activities undertaken after the conclusion of training. Post training tie up with related line departments for continuity, making arrangements with financial institutions for linking up trainees for getting financial assistance, providing them with information about further opportunities available in the field for their improvement, and impact analysis are must for making the training programme successful. The post training evaluation needs to be done and based on the feedback, necessary corrections for bringing about further improvement is a must.

**Basic Training Approaches:** The training approaches can be classified into traditional, participatory and performance based approaches. In the traditional approach the trainer designs the objectives, contents, teaching techniques etc. and

the participants have no say in the process. In the participatory approach the trainer and trainees jointly decide the programme. In case of performance-based approach, the emphasis is given to acquiring of specific observable skill or attainment of a specific level of proficiency before clearing the trainee for successive levels.

**Training Need Assessment**

Training need refers to the gap between "what is" and "what should be" in terms of the trainees knowledge, skill, attitude and the behaviour in a given situation and time. It is important to analyze the training needs for designing an effective training programme as the programme must address the training needs of the trainees. The following are four major approaches to assess the training needs:

**(i) Performance Appraisal**

In this method the actual performance of the trainee in a given situation is compared with that of the ideal or expected performance. It can be evaluated through direct observation, evaluation of performance records for a period of time and the individuals' self appraisal about their performance compared with their actual output. Through this method one can link between knowledge and skill requirements with their job performance.

**(ii) Task Analysis**

A detailed analysis of the task performed by an individual as per the standards and job chart is done. The data pertaining to the knowledge and skill requirement for the task, their performance in the actual situation need to be collected through interviews, case methods, and direct observation techniques. A detailed interview schedule need to be prepared for the assessment of training needs based on the task analysis for collection of relevant data. The schedule contains the details of different tasks and the frequency of performance of each task. The details such as level of importance and level of competency are obtained in a differential rating manner for each task. The common methods used for task analysis are interview, questionnaire, case method and observation. The task analysis is a process by which one can know the different elements or sub-tasks which are critical for its performance.

**(iii) Survey method**

It is one of the most frequently used methods. The need analysis is done based upon the individual perceptions and opinions of the individuals for whom the training programme is intended. Data will be collected through structured schedule, questionnaires and interviews. This method is comparatively fast and less expensive. Through this method a large number of people can be involved in the training needs identification.

### (iv) Competency Study

Under this method, a thorough job analysis is undertaken to know the different qualities needed for the individual to perform his job effectively and efficiently. Based on the qualities required, the individuals are further assessed in terms of their competencies in performing the job. The competencies in terms of knowledge, skills and other qualities required are identified by involving the experts. A thorough analysis is made by matching the individual qualities with the expected competencies required for the job. It involves active involvement of experts and the trainees through a whole hearted open discussion approach to arrive at the right conclusion. This method is relatively fast and less expensive.

### (v) Skill-Gap Analysis

It is a process of determining the training needs of individual trainees in relation to important tasks-steps or components of tasks identified for training. It determines how skilled or proficient individual trainees are on these tasks or components, how many of them differ from the desired performance and whether or not they need training in a precise manner.

### Leadership in Livestock Extension

Leadership is the process of influencing people to direct their efforts towards the attainment of particular goal(s). The success of a leader depends upon his ability to work with people and to get things done through people. This involves the use of effective communication skills. To be effective, the leader must have the ability to convey meanings to his people. Leaders must be both efficient and effective. Efficiency is the ability to do things right whereas effectiveness is the ability to do the right things. When leaders deal with efficiency they generally communicate in terms of objectives such as cost, productivity and worker turn over. When they deal with effectiveness, they often communicate in terms of demand, growth rate, return on investment and other criteria that can be used in comparing the agencies performance with that of the expected targets to be achieved. Successful leaders are interested in both efficiency and effectiveness.

### Communication effectiveness triad

Effective communication is a triad consisting of the leader, the members of the work group and the task which the work is to be performed **(Fig.4).** The leader exists as long as there are followers (subordinates) and a task to be performed. The followers will look forward to the leader for direction and goal satisfaction.

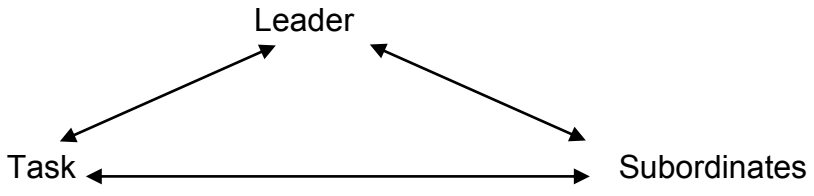


**Fig 4: Effective communication triad**

**The Leader:** The Leader's job is to build an environment in which team work can be achieved. It is his responsibility to create and maintain credibility with the work group. The four factors which influence his efforts are:

**i) Drive:** The physical and mental effort expended by the leader. Individuals who have a great deal of drive were found to have more influence with their peers and work group.

**ii) Dependability**: The reliance people can place in the leader's word. A highly dependable leader is trusted by his subordinates.

**iii) Competence:** The ability of the leader to get a job done effectively and efficiently.

**iv) Credibility:** The degree to which a leader is believable. It is an important asset which is directly affected by the perception people have of the individual's honesty, discretion and ability.

**Leader characteristics**

Some of the most common personal characteristics possessed by successful leaders are:

i) **Superior intelligence:** Effective leaders tend to be more intelligent than the average of their followers. This provides them the mental skills needed to formulate and communicate information, process input from subordinates and make decisions regarding work related matters.

ii) **Emotional maturity:** Successful leaders are emotionally mature in that they have self confidence and are able to direct their subordinates in a calm and meaningful manner. This is particularly noticeable in case of crisis or unexpected events.

iii) **Motivation drive:** Effective leaders are highly motivated to get things done. They seek subordinates who feel the same way they do. As a result successful leaders tend to work with, develop and train other high achieving people like themselves

iv) **Problem solving skills:** Effective leaders are problem solvers. They are able to differentiate between cause and effect and focus their attention on the former. These leaders tend to be self confident and are able to learn from past experience. They realize that they cannot single handedly solve all the group problems. However, they can help in focusing on the important issues and see that the group is involved in the solution.

v) **Managerial skills:** Effective leaders have managerial skills. These skills can be categorized into

**Technical skills:** are needed in doing things and these are extremely important for lower level managers. e.g. VAS must have technical skills of diagnosis and treatment of animals at ground level.

**Human skills:** are needed for dealing with people. They include the ability to communicate, motivate and lead personnel. These are most required for the middle level managers. The Deputy Directors or Joint directors of AHD need to possess the human relations skill as they are to translate the goals of AHD and get these goals achieved through VASs. They are in between top management and lower level management and hence must possess more of HR skills to satisfy the Superiors as well as subordinates.

**Conceptual/ Administrative skills:** are needed mostly by the top level management. They include the ability to pull together all parts of the organization, determine how each can be integrated into the overall picture and formulate a long range action plan based on the results. The Director or Additional Director of DAH need not to possess the technical skills but must possess the skills of formulating goals of DAH and plans to accomplish these goals especially the long term goals.

All these skills require ability to communicate effectively. At the lowest level the leader must be able to tell the follower "how to do it". At the middle level, it is the leader who must translate top management's orders into lower management action. At the top level, the leader must use communication to pass on information related to long range plans and policy implementation.

**Types of Leaders:** Leaders can be classified into different categories based on various criteria. They are;

a) Democratic, Autocratic and Laissez Faire leaders
b) Formal and Informal leaders
c) Professional and Lay leaders
d) Operational, Popularity and Prominent leaders
e) Elected, Selected and Nominated leaders
f) Political, Religious, Social, Academic, Business, Recreation leaders etc

**Formal Leader:** may be a local person who holds some kind of official post within the bureaucratic and administrative structure. Example: Panchayat president, Elected president and governing body members of Milk Cooperative Society, etc.

**Informal Leaders:** are farmers who are not holding any particular position in any organization. They are prominent in their area and show the qualities and abilities to influence others. These leaders will be very useful in planning and implementing the extension programmes as they have influence over the people of his/her group.

**Local Leaders**

Spiritually, intellectually and physically a leader should be high above his followers. The three important qualities of a good leader are Integrity (honest and pure in thought, word and action); Intelligence (mental ability) and Physical health (energy). The local leaders must be properly selected, trained and used to make them more effective in bringing about socio-economic development. The following points should be kept in mind.

i) Extension is the primary responsibility of grass root extension agent.
ii) The role expectancy of leaders must be carefully determined and adhered to.
iii) The relationship between professional workers and voluntary leaders must be a cooperative and continuing one of mutual assistance and joint responsibility.
iv) Local leadership is potentially a great human resource for promoting change in a democratic society.
v) Mobilising, developing and properly utilizing voluntary leadership is a highly complex process of human relations that must be carefully applied and worked out constantly.

The grass root level extension agent or the primary professional agent of change must assume responsibility for all professional leadership and joint responsibility with the people for the success of the programme at the local level.

**Use of the local Leader**

A good veterinary extension agent must always try to get the support of the local leaders/ livestock owners in his extension work. In any extension organization there will be a small number of professional extension agents compared to the huge number of livestock owners to be reached. It is not possible for the extension agent to contact each and every livestock owner in his area of operation. This can be solved by engaging and encouraging the local leaders in planning and implementing the extension programmes.

The local leaders serve the following purposes:

(a) Assume responsibility for certain activities in the absence of extension agent.
(b) Help to organize local extension agents.
(c) Assist directly in the spread of new ideas and practices by demonstrating them in their fields.
(d) Serve as point of contact between the agent and the livestock farmers.
(e) Working with local leader also builds closer ties with local farmers, and encourages livestock farmers' confidence in the extension service.

**Identification of local Leaders**

Local leaders (lay /informal /prominent /opinion /natural leaders/key communicator) can be selected by following methods.

* Group observer method *Discussion method

* Election method
* Key informant technique
* Sociometry
* Workshop method
* Self-designating technique

The word *sociometry* comes from the Latin "*socius,*" meaning social and the Latin "*metrum*," meaning measure. Jacob Levy Moreno coined the term *sociometry* and conducted the first long-range sociometric study in nineteen thirties at the New York State Training School for Girls in Hudson, New York.

Sociometry helps in measuring, mapping and building relationships so that the invisible forces within an organisation are made visible and can be explored. It is an essential tool for people to build mature group networks and positive relationship behaviours. Sociometric tools are invaluable in identifying informal leaders, and strengthening informal networks of relationships. Sociometry can be a powerful tool for reducing conflict and improving communication because it allows the group to see itself objectively and to analyze its own dynamics. It shows the patterns of how individuals associate with each other when acting as a group toward a specified end or goal.

**Sociometry** is very useful to the extension agent in finding out the „local-informal' leader in the villages, who are the influential persons that help in organising various extension programmes in the villages, for example vaccination campaign, demonstrations, exhibitions, introduction and popularization of new or improved practices in their communities etc. Under this method, an extension worker goes into a given area and asks the livestock farmers to indicate whom they ordinarily consult for advice on say dairy farming. The livestock farmers can make choices and describe why the choices were made. From these choices a description emerges of the networks inside the group. Usually, after a few interviews it becomes clear which livestock farmer is the influential person or natural leader. A drawing, like a map, of these networks is called a ***sociogram*****.** The data for the sociogram may also be displayed as a table or matrix of each person's choices. Such a table is called as a ***sociomatrix*****.**

**Working with Local Leader:**

The extension agent should ensure that the trained persons are actually used for augmenting extension work. For this purpose there should be regular follow up by the extension worker by way of frequent contacts in person as well as by correspondence with the trained-leader. Local leaders are not only to adopt improved practices in their own farm and home but also they should consciously try to influence others to adopt the practices.

The extension worker's own relationship with local leaders will be more important and he should always try to be available to support and encourage their work. There are four main aspects of working with local leaders, which the agent should keep in mind.

a) Inform the local leader(s) about his extension activities.

b) Visit the places of extension work.
c) Train the local leader as they need.
d) Encourage them to adopt new practices.

**National Goals and Different Extension Approaches**

The extension programmes must address the national goals. Swanson (2008) outlined three important agricultural development goals at national level and the objectives of the extension and advisory system to accomplish the national goals. These National goals are

i) National food security
ii) Improving rural livelihood to reduce poverty and food insecurity and
iii) The sustainable use of natural resources within the country.

To accomplish these goals the extension system ( whether it is agriculture or livestock extension) needs to be focused on the below mentioned four objectives:

**Technology transfer,** especially for improving the production of food grains, milk, meat, eggs, fish etc.
**Human capital development,** especially the skills that poorly educated farm households need to increase farm income,
**Building Social capital development** or getting farmers organized into producer groups or other types of farm organizations to carry out specific activities and
**Educating farmers** to utilize sustainable natural resource management practices.

These national goals and extension objectives are as relevant to India as to any other developing nation. Today, India cannot boast of self sufficiency in staple foods and livestock products mainly due to monsoon failure, droughts followed by floods, shifting of staple crops to commercial crops, improper policies, turbulent markets, farmers losing interest in animal husbandry etc. Livestock including poultry and fisheries are also getting impacted due to these changes. Setting proper goals and appropriate objectives to realize these set goals is necessary to save the nation from poverty, malnutrition and disease. It is in this context the extension services need to be innovative in their concept, objectives and approaches.

**Different Extension Approaches**

Many of the projects did not yield the expected results, which is mainly attributed to the poor participation of the farmers. Stray attempts have been made by several organizations to improve the farmer participation in the development projects. Some of the approaches which focus on farmer participation are discussed below:

**Livelihood Approach:** It is very well documented that livestock provided livelihood security to at least one fourth of our population. The research has clearly indicated the “asset role” being played by the livestock particularly bovines to the landless people whose livelihood depends to a great extent on the animals they rear. The dependency on cattle will increase with increase in their level of poverty. Similarly,

the small ruminants and poultry are considered as important resources for the poor and the income they generate from these resources is quite substantial. Hence, while formulating the livestock development policies the policy makers must take into consideration the interests of these resource poor livestock owners. Or else their livelihood will be at stake.

**Group Approach:** The Extension approach needs to be changed from individual to group mainly because the decision making is shifted from individual to groups of producers. The development of sustainable farming practices often requires collective decision making, whereas extension in the past mainly supported individual (Head of the family) decision making (van den Ban and Hawkins, 2004).

NABARD's SHG bank linkage programme boasts of over 26 lakh SHG and 3.9 crore households influencing the lives of over 160 million poor population. During the year 2006-07 alone, as many as 4,58,591 groups were credit linked. Out of this total population assisted through this group approach, 90 % are Women Self Help Groups (WSHGs). Livestock rearing projects account for about 25 % of the total cost of the projects sanctioned to SHGs under Swarna Jayanthi Gram Swarojgar Yojana. The livestock development projects include cattle development, dairy development, sheep and goat, poultry rearing etc. (GOI, 2007). There is enough evidence to show that as groups, the WSHGs could achieve social and economic empowerment with the involvement of government and non government institutions. However, the sustainability of these WSHGs is doubtful especially when the loans sanctioned for establishing IGAs have not been used for that purpose instead were used for unproductive purposes like house construction or repair, marriages, purchase of ornaments , repayment of previous loans etc. (Usharani, 2007). This is the reason why the basic purpose of advancing loans for starting an IGA to eke them out of poverty is defeated instead they may end up in debt trap **( Fig. 5 )**

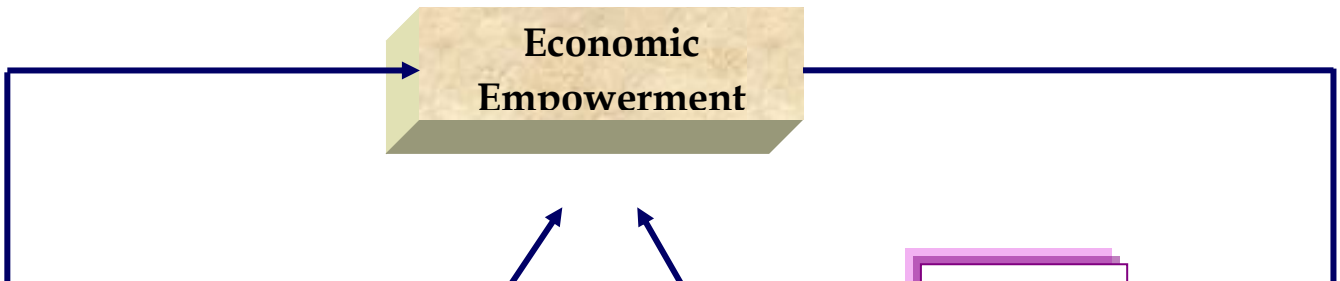


**Figure 5: Impact of SHG on livelihood of members**

The present day extension must be geared to understand the concept of group factors which influence group cohesion and acquire skills in working effectively with these groups to eke them out of poverty.

**Market Driven Approach:** It is being clear now that the adoption of technologies is market driven rather than technology driven. With the available technologies, it is not a problem to produce milk, chicken, meat, eggs or wool but it is very difficult to market these products due to lack of proper marketing infrastructure. Procurement, transportation and sale of livestock products are more difficult and complex than producing them. Although dairy sector has been doing quite well, not more than 20 per cent of the milk is being handled by the organized sector. Except in case of poultry eggs and chicken the marketing of other livestock products is totally in unorganized sector. There are no organized markets for livestock transactions either. Unless the markets are improved with price fixation based on proper standards and grading it is difficult to encourage the livestock owners to adopt technologies to enhance production. Mosher (1966) highlighted five "essentials" for "agricultural development" which are quite relevant even today. These include: (i) markets for farm products (ii) constantly changing technology (iii) local availability of supplies and equipments (iv) production incentives for farmers and (v) transportation. In addition, he listed five potential "accelerators" of agricultural development. They are: (i) education for development (ii) production credit (iii) group action by farmers (iv) improving and expanding agricultural land and (v) national planning for agricultural development.

**Entrepreneurial Development Approach:** It is well known that some farmers have got entrepreneurial abilities which enable them to try new methods of farming. Such entrepreneurs who are usually described as innovators exist in almost all social systems and skill of the extension personnel lies in identifying as well as encouraging such people to enter into new ventures of livestock development. The experiences of these path finders could be profitably utilized to up scale for wider use. It is necessary to identify such entrepreneurs, prepare success stories and give wide publicity through various mass media channels to enable the interested people to emulate them. However, the success of such entrepreneurs depends upon several factors which at times may be specific to the area or individual concerned.

**Participatory Approaches:** Of late it is very well recognized that the farmers are considered as partners in development rather than as end users of technology. Evidence supports that it is beneficial to involve the livestock farmers in developing, adopting and evaluating the technologies. Many of the extension programmes were not successful due to poor participation of farmers. For its obvious advantages, ICAR included on farm testing as one of the key activities of Krishi Vigyan Kendras (KVKs) while reviewing their activities. However, it is necessary to understand the differences between transfer of technology and participatory extension (**Table 8).** The livestock extension should aim at empowering livestock farmers rather than making them just an agency of TOT. It is necessary for the extension service providers to shift their approach from a fixed TOT to more flexible and sustainable

participatory extension to face the challenges in livestock development.

**Table 8: Differences between Transfer of Technology and Participatory Extension**

| PARTICULARS | TRANSFER OF TECHNOLOGY | PARTICIPATORY EXTENSION |
|---|---|---|
| Main objective | transfer of technology | empower farmer |
| Analysis of needs & priorities | by outsiders | **Farmers facilitated by outsiders** |
| Transferred by outsiders to farmers | "commandments"<br>messages<br>package of practices | Principles<br>methods<br>basket of choices |
| The „menu' | fixed | according to choice |
| Farmers behaviour | hear messages and act on Commandments<br>adopt, adapt or reject the packages | use methods<br>apply principles<br>choose from basket & experiment |
| Outsiders' desired outcomes emphasis | widespread adoption of package | wider choices for farmers, farmers' enhanced adaptability |
| Main mode of interaction | Extension worker to farmer | farmer to farmer |
| Roles of extension agent | teacher & trainer | facilitator searcher for and provider of choice |

**Source: Chambers (1993)**

One of the goals of extension is to transfer technology and in the process the extension agent is involved in education of farmers as well as arranging for the technical inputs and services, and hence, many people consider that extension and transfer of technology as one and the same. However, Swanson and Claar (1984) argued that though extension is an essential and major part of technology transfer the terms are not synonymous. Transfer of technology includes additional function of technical input services. On the other hand extension is concerned mainly with education of farmers on management of resources and decision-making skills, which may contribute to technology transfer. The National Commission on Farmers stressed the relevance of linkages as **……..''Farmer participation and feedback should become an integral part of agricultural resource and technology transfer ''.** Considering that more than 60 % of our livestock farmers are resource poor (land less and less land people) and depend heavily on public sector for their information needs as well as inputs and technical services , the personnel involved in animal husbandry extension should be empowered and sensitized to meet the demands particularly by forging research-extension-education-farmer-market linkages".

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Technology must be developed based on the demand from the users i.e livestock farmers. It is now amply clear that majority of the technologies developed were not adopted by the livestock farmers probably because the needs of the livestock farmers were not taken into consideration. It is not uncommon to find the technologies which address the needs of the livestock farmers get adopted faster than those technologies which do not match their needs. The objectives of researchers may conflict with that of livestock farmers' objectives and also the consumer of livestock products.

**Multi Disciplinary Approach**

With the realization that the problems in the field are usually multi dimensional which requires the expertise of different fields of knowledge, emphasis is being given to multidisciplinary approach in formulating as well as implementing the research projects. The livestock extension issues revolve around livelihood, livestock, women, social groups, markets, economics of production, policies etc. With liberalization and fast changes in the societies the problems are becoming more and more complex. Even the donors prefer multi-disciplinary projects for funding. RRA also lays emphasis on constitution of multi-disciplinary team of researchers to conduct surveys and analyse the farmers' problems.

**Farming Systems Approach**

Farming System Approach replaces the conventional single discipline based, commodity oriented approach. The farming system approach considers the farm, the farm household and off-farm activities in a holistic way to take care not only of farming but also all aspects of nutrition, food security, sustainability, risk minimization, income and employment generation which make up the multiple objectives of farm households. Farming system considers interdependencies of the components under the control of members of the households as well as how these components interact with the physical, biological and socio-economic factors not under the household's control **( Fig. 6)**

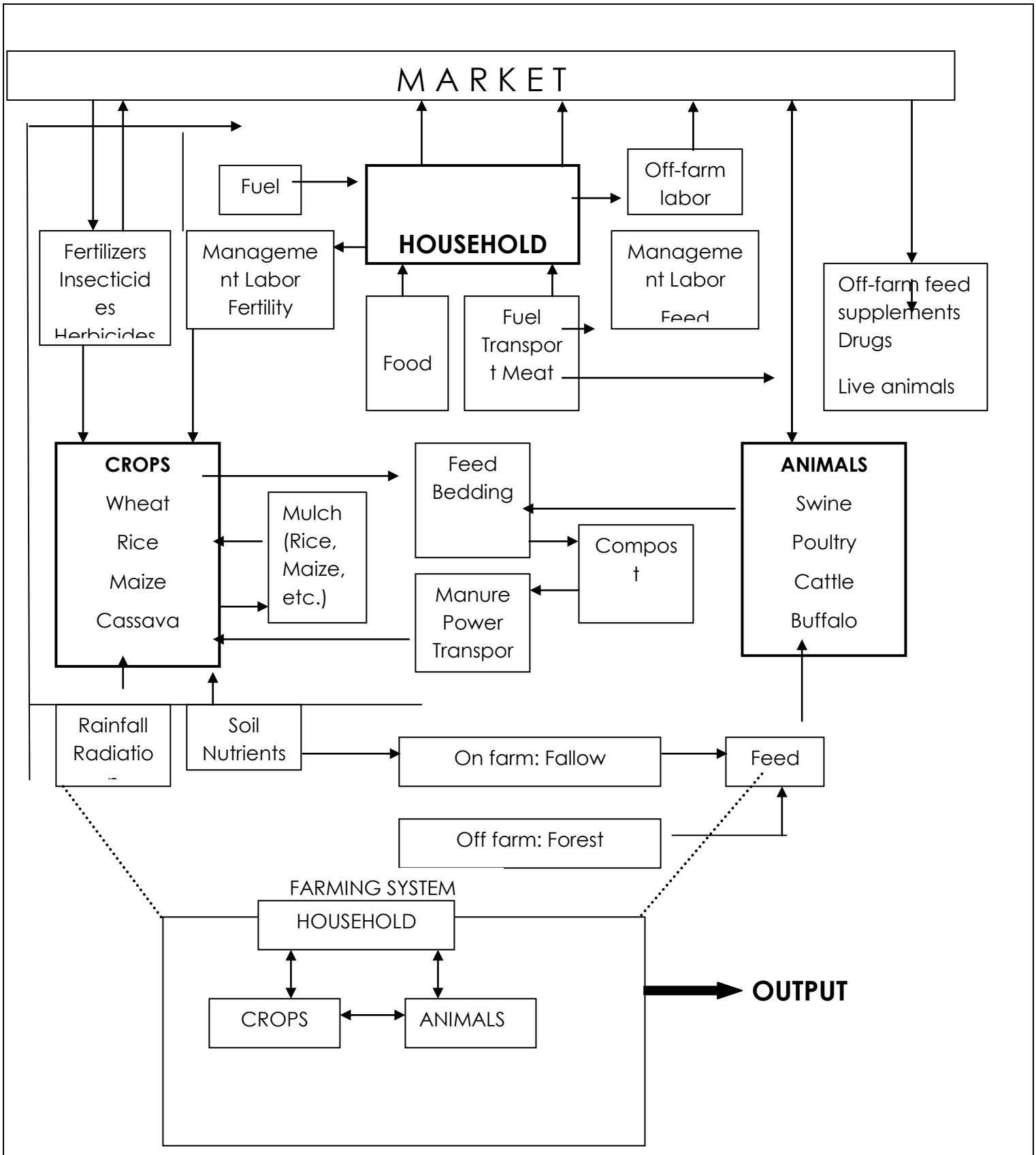



**Fig. 6.The interdependent elements of a farming system and their connection with other elements within the agrosystem**

*Source: Amir, P. and Knipscheer,H.C. 1989. CONDUCTING ON-FARM ANIMAL RESEARCH: Procedures & Economic Analysis*

It is also necessary to understand the linkages between various elements of the farming system to get a better comprehension about the farming situation in which he operates. Because of this interdependent nature of several elements many a time it is difficult to find solutions for farmers' problems especially when one tries to look at the problem in isolation.

The Farming System Research considers the whole farm as a system with interdependent subsystems such as household, crops and animals. It aims at enhancing the efficiency of the entire farming system as a whole by utilizing all its sub systems. It lays emphasis on interactions between the sub systems or components with physical, biological and socio economic factors which are not under the control of the farmers. The farming system approach emphasizes that research and extension agenda should be determined by explicitly defined farmers' needs through an understanding of the existing farming systems rather than the perception of research scientists or extension functionaries.

**FSR/E STEPS** (abstracted from Singh et al., 1995)
The stages or steps of FSR/E vary from four to six and the most widely used steps in the process of FSR/E are:

- diagnostic stage,
- design stage,
- testing stage,
- dissemination stage

A fifth stage, that divides the dissemination stage into a pilot development phase and the dissemination phase is also common. In fact, most stages of FSR/E occur simultaneously. For instance, when urea treatment in paddy straw has been tested in the Operational Research Project of the National Dairy Research Institute at Karnal some alternative solutions are developed and designed for on-farm testing, e.g. adjusted crop rotations and supplementation. The important concepts of each of the five phases are discussed below.

**Diagnostic stage:** The diagnostic stage has a major objective to identify, characterize and analyze the existing farming systems through close consultation with farmers. It is supposed to diagnose problems and constraints of different components of the faming systems and to understand the felt needs, goals and preferences of relatively homogeneous groups of farmers engaged in a particular farming systems (the "recommendation domain").

The nature of on-farm research in a research domain is exploratory; i.e.to answer the questions, what and where? In defining a research domain, a multidisciplinary team conducts, analyzes and characterizes the environments of each location, to design plans for farmers' evaluation of technology, and then to define recommendation domains. The purpose of on-farm research within recommendation domains is to confirm answers about how each alternative technology or management approach responds and where each alternative

performs the best. In order to achieve the objectives of the diagnostic stage, informal survey methods such as **Rapid Rural Appraisal (RRA**) can be used. These are done by multidisciplinary teams that interview the farmers in groups or individually. These informal survey methods have an advantage of being quicker and less data intensive with more feedback. In order to focus the choice or area, and the relation with surrounding systems, it can be useful to proceed these exercises with zoning and transect studies.

**Design Stage:** The RRA's are carried out once the process of identification and ranking of problem has been completed. The FSR team has to identify possible solutions; it should review previous research findings, and consult scientists, extensionists and farmers before planning on-farm research. There might be readily available on-the shelf technologies that can be selected for on-farm testing after assessing their economic feasibility. Ex-ante evaluation of the technologies should be done at this stage. There may also be problems for which technologies are yet to be developed on-station, leading to the identification of new research priorities. Thus, in design and planning stage, four distinct steps can be distinguished.
They are;

- identification of causes of the problems
- analysis of inter-relation among problems and causes
- identification of possible solutions
- evaluation of solutions.

**Testing Stage: I**n order to test new technologies, three types of on -farm trials may be conducted by the team. They are;

- researcher-managed trials
- farmer managed trials
- superimposed trials.

The researcher-managed trials are conducted to develop new technologies under the management and control of the researchers. However, farmer managed trials are conducted to learn how farmers respond to the suggested improvements to be made under their management control. Super imposed trials are conducted to experiment across a range of farmer managed conditions.

The **technical feasibility** of a new technology needs to be tested by on-station and on-farm research. **Socio-cultural acceptability (Cultural compatibility)** may be tested by personal discussion with farmers to know their reactions. **Sustainability** of new technology may be assessed through the evaluation of its impact on human, livestock and natural resources. **Economic viability** can be assessed through partial budgeting, gross margin analysis, cost-benefits analysis and break-even analysis. The use of these tools depends upon the type of technology, design and objectives of the experiments, type and availability of data on relevant parameters, etc. Various economic models can be used both for ex-ante and ex-post evaluation of any technology. It is extremely important to assess farmers' evaluation and perceptions of the technologies.

Non adoption of technologies by farmers occurs even though technologies were found to be technically feasible, economically viable and socio-culturally acceptable. It's, therefore, often necessary to study, examine or redefine the extension process and institutional or input supply constraints. This was a reason why new approaches such as Pilot Outreach Projects or Operational Research Projects (ORP's) were started. The ORP of NDRI is an example where close linkages with various institutions and organizations at village, district, state and national level have been established and various proven technologies for dairy and crop production are transferred. In addition, veterinary services, artificial insemination, credit and milk marketing facilities were made available to the farmers. Thus, new technologies are fine-tuned during this stage for their effective extension on a large scale. In ORP, a system of continuous monitoring, evaluation, constraint identification and feedback has been developed which help the researchers and administrators to bring about desirable changes in the technology transfer programme.

**Dissemination Stage:** Once "lab to land" and "land to lab" mechanisms have been developed in the Pilot Outreach Programme, the major task of transfer of benefits of new technologies to the rest of the region or the country remains to be fulfilled. It can be achieved by collaboration with extension organizations of both public and private sector including Non Government Organisations.

**Rapid Rural Appraisal**

An RRA can be defined as a systematic but semi-structured study, carried out in the field by a multi-disciplinary team over a short period ranging from three days to three weeks, based on information collected in advance from published and/or unpublished sources, direct observations and interviews as to generate working hypotheses for subsequent action (Chambers, 1985; Ison and Ampt. 1992).

RRAs are used to:

- quickly identify, explore and diagnose rural systems and problems
- design, implement, monitor and evaluate programs/projects
- develop and disseminate new technologies
- record farmers' perceptions about new technologies, and projects, i.e. to assist in policy formulation and decision making
- identify priority areas for on-station and on-farm research
- improve, supplement or complement other types of research
- locally verify the details of zoning and transects made at state or level

**Types of RRA**

Based on the objective, RRAs are catergorised into, (i) Exploratory RRAs, (ii) Topical RRAs, (iii) Participatory Rural Appraisals or (PRAs) and
(iv) Monitoring RRAs

**Participatory Rural Appraisal (PRA)**

It comprises a set of techniques aimed at shared learning between local people and outsiders. The term itself is misleading because more and more PRA is being used not only in rural settings, and for project appraisal, but throughout the project cycle, as well as for research studies. Indeed, the term PRA is one of many labels for similar participatory assessment approaches, the methodologies of which overlap considerably. It is probably more useful to consider the key principles behind PRA and its associated techniques, rather than the name per se, when assessing its appropriateness to a particular situation. There are **five key principles** that form the basis of any PRA activity no matter what the objectives or setting:

- **Participation.** PRA relies heavily on participation by the communities, as the method is designed to enable local people to be involved, not only as sources of information, but as partners with the PRA team in gathering and analyzing the information.

- **Flexibility.** The combination of techniques that is appropriate in a particular development context will be determined by such variables as the size and skill mix of the PRA team, the time and resources available, and the topic and location of the work.

- **Teamwork.** Generally, a PRA is best conducted by a local team (speaking the local languages) with a few outsiders present, a significant representation of women, and a mix of sector specialists and social scientists, according to the topic.

- **Optimal Ignorance.** To be efficient in terms of both time and money, PRA work intends to gather just enough information to make the necessary recommendations and decisions.

- **Systematic**. As PRA-generated data is seldom conducive to statistical analysis (given its largely qualitative nature and relatively small sample size), alternative ways have been developed to ensure the validity and reliability of the findings. These include sampling based on approximate stratification of the community by geographic location or relative wealth, and cross-checking, that is using a number of techniques to investigate views on a single topic (including through a final community meeting to discuss the findings and correct inconsistencies).

PRA offers a "basket of techniques" from which those most appropriate for the project context can be selected. The central part of any PRA is semi-structured interviewing. Participatory development leads to increased self-reliance among the poor and the establishment of a network of self-sustaining rural organisations. This carries important benefits. The greater efficiency of development services stimulates economic growth in rural areas and broadens domestic markets, thus favouring balanced national development. Politically, participatory approaches provide opportunities for the poor to contribute constructively to development. The

most important PRA methods used are described below:

**Village Transect :** Transects are systematic walks with key informants through the area of interest, observing, asking, listening, looking, and seeking problems and solutions. The main objective of the transect walk is to understand and study the major land uses, topography, water resources, natural vegetation and different ecological zones by observing, interacting and discussing with the Key Informants (KIs), while walking in the deciding direction. The findings can be mapped on a transect diagram. Most transect walks result in the outsiders discovering surprising local practices such as indigenous conservation practices, multiple uses of plants, and a great variety of crops. The items for discussion include topics such as soil type, water resources, crops, vegetables, fruit plants, trees and shrubs, forages, animals, land use pattern, interventions, problems and opportunities.

**Agro ecosystem map:** Agro-ecological or agro-ecosystem map shows the macro and micro ecological (sub-systems) features in a village. The meteorological parameters like rainfall, temperature, relative humidity and the major flora and fauna of the village and the basic land use pattern such as crops, agro-forestry, forest cover, wasteland, animals and the natural resources like soil type, water resources (wells, river, channel, ponds etc.), common property resources (CPRs), use of locally available resources are depicted in this map. This map helps in the preparation of perspective planning for the village development. Here the villagers were encouraged to draw the major landmarks such as roads, boundaries, household area, low lying land and high lands first. Then, based on the land topography they were asked to indicate soil types, crops, trees, animals, water resources etc.

**Agro-Ecological Zoning and Transects:** An agro-ecological or agro-climatological zone is a geographical or socio–economic area on macro or micro-scale, for example at village, regional or national level, which is relatively homogeneous in terms of natural conditions and agricultural activities (Jain et al, 1995). A transect is a cross cut through a village, region or larger area that graphically depicts the (agricultural) differences in the main zone.

The relevance of zones and transects lies in the possibility to extrapolate research results and extension approaches, since conditions within zones are more similar than among zones. It is assumed that farmers living in the same zone would have similar problems whereas their technical requirement would also be similar. Since, the soil and climatic conditions of a region largely determine the suitability of different crops and livestock and their yield potential, intensive efforts have been made by various researchers to map agro ecological regions having uniform soil site characteristics.

India was divided into different climatic regions on the basis of

- Livestock units per 100 ha of cropped land ( Singh, 1974)
- Soil types and moisture index ( Krishnan, 1988)
- Livestock density and per capita milk production ( Muthaiah, 1988)
- Physiography and Climate ( Alagh et al, 1989)

The National Bureau of Soil Survey and Land Use Planning of ICAR has prepared two agro ecological maps with 54 and 21 delineations in 1992. However, the map with 21 delineations was finally approved by the Government of India.

Agro climatic zoning involves

1. Identification of homogenous agro ecological zones (with in a state, region or district level) suited for the purpose of the classification.
2. Transects are drawn to specify the areas with nearly identical conditions
3. Identification of target groups through RRA/ PRA by multidisciplinary team.
4. Focused RRAs to assess the needs and constraints of the target groups which further help in identifying thrust areas for future research.

Agro ecological transects are relatively easy to define depending on the ruggedness of terrain and visibility as affected by topography and vegetation. The transect is particularly appropriate when relatively rapid changes in topography and natural conditions are found on village or state level. The transect exercise will be very useful to identify areas with homogenous conditions, as well as to focus discussions of RRA team. It helps to plan, manage, channel and target the resources for technology generation, on farm testing and other extension efforts.

**Resource Map:** Resource map was drawn after collecting information by the active participation of Key Informants (KIs) of different age groups including female. Resource map describes main crops grown in the village, trees, animals, common property resources (CPRs), types of houses, school, farm implements, luxury and communication items, social resources like women groups, self help groups (SHGs), local self government etc.

**Seasonal Calendar**: This is a calendar, which indicates month wise activities related to agriculture and livelihood, threats, abundance, and shortage with regard to agriculture in a diagrammatic way. The items to be included in seasonal analysis must be of those items, which really affect the agriculture. This explores seasonal constraints and opportunities by diagramming changes, month by month throughout the year.

The main activities, problems and opportunities of the village were identified by using seasonal calendar. It depicts time-to-time crop related operations being carried out in the existing farm situation. Seasonal analysis helps in identifying the period which are critical in respect of labor demand, pest and disease problems, non-availability of fodder during dry months.

**Gender Disaggregated Seasonal Calendar :** The animal husbandry activities are being done by both men and women. There are certain activities, which are carried out exclusively by men or women. So, it is important to know those specific activities pertaining to a particular village for which the above method is used.

**Seasonal Analysis:** To know about the seasonal problems related to livestock seasonal analysis is carried out. In this method, the diseases affecting various animals are documented pertaining to their months of attack. Other information like

availability of labor and fodder for animals are also recorded by involving the farmers. The information collected is depicted in the form of a table.

**Social Map:** This method gives a social profile of the village. This method can throw light on religious and caste preferences in animal husbandry.

**Time Line:** Historical analyses have been found to be a good icebreaker for field exercises and include detailed accounts of the past, of how things have changed, particularly focusing on relationships and trends. These include livestock technology histories and review, livestock breed histories, labor availability, trees and forest histories, education change, and population change. Folklore and songs are also valuable resources for exploring history.

**Time Trend:** Time trend shows quantitative changes over the period of time and can be used for many variables of agricultural, livestock, poultry production, price, yield and areas under cultivation. For instance the trends in sheep and goat population in the country over a period of time could be depicted in a line diagram **( Fig. 7).**

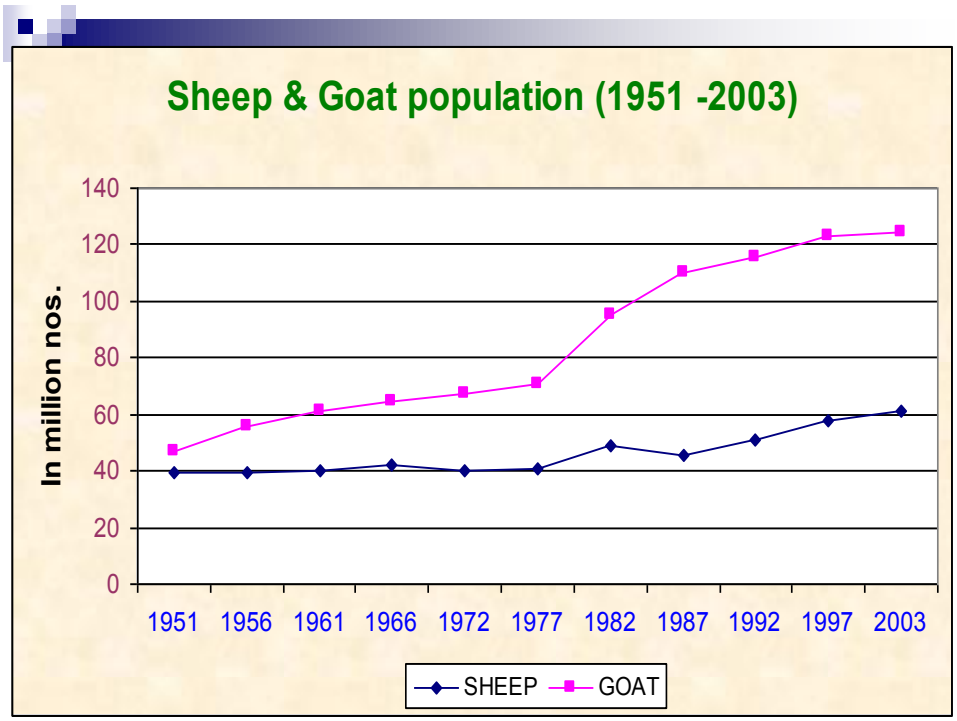



**Fig 7: Trends in sheep and goat population in India**

**Mobility Map:** The mobility map indicates the places to which the villagers go outside their village for various purposes like purchasing fodder, inputs, family needs, animal husbandry needs, getting higher education, medical needs, social relations, recreation etc. Mobility map indicates:

- Places to which the villagers go for various purposes.

- Direction of the place situated.
- Mode of transportations.
- Distance of the place from the village.
- Cost of mobility in term of money spent etc.

**Venn Diagram:** Venn diagram is used for understanding institutional relationship with village and the villagers for a particular enterprise. Each circle in the diagram represents individual/ institution and the size indicates the magnitude of influence.

Venn diagram is drawn to indicate the contributions of outside and inside agencies to animal husbandry development, organizations and individuals in the decision making process of the inhabitants as perceived by the villagers themselves.

**Wealth Ranking:** Wealth ranking refers to placing the people on different categories according to their own criteria. The purpose is to find out the persons of the village, who belong to the rich, middle, poor and very poor group categories as perceived by the villagers themselves. Wealth ranking is based on the assumption that the community members have a good sense about fellow villagers in their own village and are able to categorize themselves. Livestock development must take into account the differences in wealth among farmers in order to determine the priorities for research and to develop the interventions and technical packages that are to be adopted by the majority of the farmers.

Wealth ranking helps the extension workers, developmental staff, researchers and others concerned with rural and livestock development to find out the inequalities and differences in wealth in every farmer and which in turn lead to overall understanding of socio-economic conditions of entire village community. This also will help in selecting the right type of beneficiaries for various programmes.

This ranking was employed to see the differences within the members of the Women Self Help Groups. The members of the group were asked to write their names on a small card and place it in either of the boxes poor or rich depending upon their individual perceptions. The wealth ranking carried out by 1198 respondents belonging to 101 livestock dependent WSHGs spread in five states of southern India including Puducherry revealed that 50 % of these members considered themselves as poor thereby indicating polarization of members within WSHGs, otherwise usually thought as a homogenous single unit (Ramkumar et al. 2009). The survey also revealed that the poor category respondents were mostly illiterates, landless, own kutcha houses, rear fewer animals when compared to their counter parts " better off " within the WSHGs

**Livelihood Analysis:** Livelihood analysis refers to finding out the degrees to which the pattern of life differs from one social class to another social class in term of family size, landholding size, type of house, implements, annual income, income source, expenditure pattern, crisis management pattern, indebtedness etc. Studies have brought out clearly that livestock rearing helps the resource poor people to reduce the intensity of poverty as the livestock offer livelihood options, security in the event of financial crisis to the families. For landless rural people livestock

rearing stands out to be the better livelihood option as they are mostly less literate, unskilled and that too with out land. Keeping an animal ( as an asset ) provides more social status than continuing as agricultural labour.

**Stakeholder analysis**: Stakeholders are those who are either directly or indirectly effected by the programmes or policies of the government. The stakeholders could be individuals or groups or communities in the operational area of the programme. By increasing the procurement price of milk the stakeholders who get benefit are milk producers, SHGs, MCSs, input suppliers etc. whereas the stakeholders like milk and miik products consumers have to pay more than what they were paying before. A well organized de-worming campaign in a village with the involvement of Veterinary students benefits the livestock owners in getting their animals cured for internal parasites; veterinary students in learning skills in organising a campaign, collection and examination of dung samples (refresh their knowledge in veterinary parasitology), drenching of de-wormer; veterinary faculty in assessing the parasitic load, types of parasites prevalent in the area, collection of samples of parasitic ova as teaching materials; Local veterinarian in getting the animals examined for parasites and de-worming with appropriate medicines in a short span of time because of students help; MCS in getting more milk from the animals free from parasites as a result of de-worming. Virtually a de-worming campaign if organized properly helps all the stakeholders either directly or indirectly. An example of stakeholder analysis on milch cow scheme which is being implemented in several parts of the country is given in **table 9**.

**Table 9: Stakeholder analysis on milch cow scheme**

| Stakeholders | Benefits | Limitations |
|---|---|---|
| Members of WSHG | Access to credit at low interest to meet their needs (Able to construct/ repair houses, Better education to children, Perform daughters' marriages, health care expenses and also during emergencies)<br>Come out of money lender's clutches<br>Better social awareness,<br>Improved decision making<br>Better standard of living | Lack of awareness on IGAs.<br>Lack of training on IGAs.<br>Lack of promoter's participation.<br>Many a time it was the men who were carrying out the economic activity but availing the loans through their wives.<br>Inability to take up larger issues of gender and social inequality.<br>Inability to take livelihood promotion.<br>More indebted than before<br>Within the group there exists a wide gap between poor and rich and obviously the rich exploits the poor |
| SHG Promoters | Target achievement in Social and rural Development.<br>Easy to approach and organize the programme. | Lack of adequate man power.<br>Limitation in providing capacity building & other necessary input at a desired scale. |
| Micro-finance Bankers | Increased volume of business.<br>Target achievement in lending to rural development.<br>Easy repayment of loans as the interest charged by the group for internal lending is higher than bank interest<br>Scope of recovering the loan from the defaulters through group pressure. | Diverted a portion of loan to unproductive activities even in repeat linkages.<br>Inability to understand and accommodate the needs of the SHGs.<br>Bank is more concerned about repayment rather than whether the group has invested on IGA or not. |
| Money lenders in rural area | Scope for investing in other avenues | Losing business in rural area |
| Society | Good for rich among the group as they have more share in the interest earned by the group through internal lending. They take loans mostly for productive purposes. | Bad for the poor among the group as they contribute more towards the interest for the loans taken mostly for consumption or to meet the crisis situation. |

Natchimuthu et al (2010)

**Bio-Resources Flow Diagram:** Bio-resource flow diagram reflects the inflow and outflow of farm and animal products and its byproducts from and to the household. It explains the interrelationship between different farm enterprises that enables holistic planning for development of farm household. In a mixed farming system, the most common farming system in developing countries like India, crop farming and livestock rearing are taken up as complementary enterprises. The output of crop farming (crop residues) will be inputs of livestock rearing and the out put of livestock rearing (dung and urine) will become the inputs of crop farming thereby assures better utilization of the resources and reduce the risk of loss due to either of the enterprises. The interdependent elements of a farming system and their connection with other elements within the agro-system are well depicted in fig. 6

**Indigenous Technical Knowledge (ITK):** Indigenous technical knowledge (ITK) is the information gained over a period of time and passed on from generation to generation by word of mouth. ITK is the sum total of knowledge and practices which are based on accumulated experiences of people in dealing with situation and problems in various aspects of life. Such knowledge and practices are special to a particular culture. ITK in animal husbandry is a treasured source of local wisdom. It is comparatively easy to document the ITK but very difficult to validate by adopting appropriate scientific methods. Despite its advantages in terms of cost effectiveness and local availability of resources many a time ITK falls short of evidence based on scientific testing. The ITK needs to be documented, validated and the appropriate technologies or practices could be taken up for wider adoption. Appreciable work was done by the Institute of Innovation Foundation under the guidance of Prof. Anil Gupta. Efforts have been made to document, validate and refine the ITK in animal husbandry by giving proper recognition to the source of ITK. These ITK is being circulated widely through the publication “Honey Bee”. Similar attempt was made by ICAR to document and validate the ITK across the country and published it as a reference book on ITK.

**Technology Map:** Technology map is one of the most important maps in PRA exercises necessary for preparing research or extension programmes. This gives a clue to the researcher about the type of technologies that should be developed in the technology development projects so that it will have better adoption rate. The technology map depicts the technologies related to animal husbandry and farming that are found in the village as well as technology adoption behaviour of farmers that indicates the technologies that are adopted, rejected, discontinued and reinvented with reference to livestock and fishery sectors.

Technology behaviour includes the process of;

1. **Adoption**: refers to use of technology by an individual more than once. There are two types of adoption, namely active and passive adoption.
2. **Over adoption:** refers to continued adoption of a technology by an individual when experts feel that he or she should have rejected it.
3. **Discontinuance:** refers to decision to reject a technology after having previously adopted it. There are three types of discontinuance, namely replacement, disenchantment and forced discontinuance. Dairy farmers usually adopt the recommended practices as long as the technical inputs are

supplied free of cost or on subsidy and later discontinue the practices once the subsidies are withdrawn.

4. **Reinvention:** refers to the degree to which a technology is changed or modified by the user in the process of adoption. Dairy farmers usually add wheat bran or oil cakes to compound cattle feed while feeding their cows in milk as they believe that the compound cattle feed will not support the milk yield.
5. **Rejection:** It is of two types, namely active and passive rejection. Active rejection consists of considering adoption of technology (including even its trial) but then deciding not to adopt it. Passive rejection refers to the decision of not considering the technology without any valid reason.

**Matrix Ranking:** Matrix ranking as a PRA technique involves scoring and ranking items to reveal priorities and preferences. Matrix ranking exercise has been used in revealing preferences and priorities of farmers regarding breeds, livestock enterprises, feeding methods etc. In this exercise, different attributes and criteria are listed in a matrix which is ranked either on the basis of fixed scoring (e.g. Scoring out of 10) or free scoring according to their relative importance.

**Consequence Diagram:** Consequence diagram of technology is a tool to assess the impact caused by any technology in terms of changes that occur to an individual or society as a result of its adoption or rejection. It helps to predict the consequence of similar technology so that positive consequences could be promoted and negative consequences could be minimized. It is also useful for developing the strategies how to reduce the negative effects of the technologies being used.

**Problem Identification and Potential Solutions**: Acceptance or rejection of a technology by livestock farmers depends on the nature of the technology, quality and distribution of extension personnel, livestock farmers' knowledge and attitude towards the technologies, performance under their conditions, accessibility to inputs and services. The rate of adoption has been found to be influenced by relative profitability, observability of results, simplicity or complexity of the technology, cultural and technical compatibility and initial cost. Gender bias is also an issue, particularly in provision of extension services as farm women have major roles in many animal husbandry activities.

In order to match field problems and technical/ management solutions from the field, there can be a mix of two directions of thinking: from the *"lab to land*" and from the *"land to lab".* The direction from lab to land is a traditional approach in India whereas the land to lab approach is closer to FSR concept.

The lab to land approach helps the researchers from the "lab" to evaluate the usefulness of the research output for specific farming systems, the "land ". This process could be considered as "ex ante" evaluation of technologies. This process involves examination in detail of the requirements and characteristics of a particular technology, followed by listing of ideal conditions for the technology to be most successful (technically, socially and economically). Then the conditions existing within various farming systems are examined. They can be examined by means of simple ranking of existing conditions relative to the ideal state in order to determine

which farming systems or recommendation domains appear to be most favourable for the use of this technology. Subsequently, one should proceed with on farm testing and validation of the priorities. The “land to lab” approach focuses on the description of important features of farming system (land) including problems, objectives and constraints. It then proceeds to evaluate a range of available technologies (lab) that suit the farming system. It may even be able to select one outstanding technology from the available set and then proceed with **On farm testing**.

**Tools and Methodologies:** The variety of tools and methodologies that are available to identify and to analyze the problems, and to find possible or appropriate solutions, include methods such as, decision analysis, problem analysis, risk analysis, fit analysis, screening, and ranking.

**Decision Analysis:** It is used to screen an individual technology. Livestock farmers have to routinely make decisions about breeding, feeding, culling and animal health treatments. Decision analysis can enhance our judgments about the possible acceptability of new technologies. The four steps in carrying out a decision analysis are:

1. adequately define the problem at hand, including identification of possible alternative courses of action.
2. construct a “decision tree”, involving the structuring of the problem over time starting with the initial decision to be made. Each course of action represents a branch of the tree. Branches are referred to as nodes which may be under the control of the manager or a chance node (determined by fate)
3. identify probabilities associated with each branch arising from a chance node. The sum of the probabilities assigned to the branches must be equal to 1.00 and assign monetary values to the ends of each branch (the final outcome).

The solution to the problem is the outcome with the highest expected value. Costs assigned to a node are subtracted from revenues generated by the nod. One intervention (technology) examined during a BIOCON mini-workshop was the use of high yielding multi-cut forage sorghum intercropped with finger millet (Ragi) in the Eastern Dry Zone in Karnataka State **(Fig. 8).** That option was compared with the traditional pattern of lab-lab/finger millet intercrop. The chance node is rainfall; decision nodes are use of this technology plus choice of crossbred or local cows. The example could be completed by adding probabilities and net returns for each combination. Costs are subtracted along each branch from the revenue figure for each cow type – weather-cropping system technology combination. The highest estimated outcome would give the preliminary indication of the potential usefulness of this technology, but risk attitudes play and important role in technology adoption and this should eventually be factored in through risk aversion studies. Potential topics that may require improved technologies are then set out as a set of separate branches, leading finally to potential solutions to be subjected to a screening process.

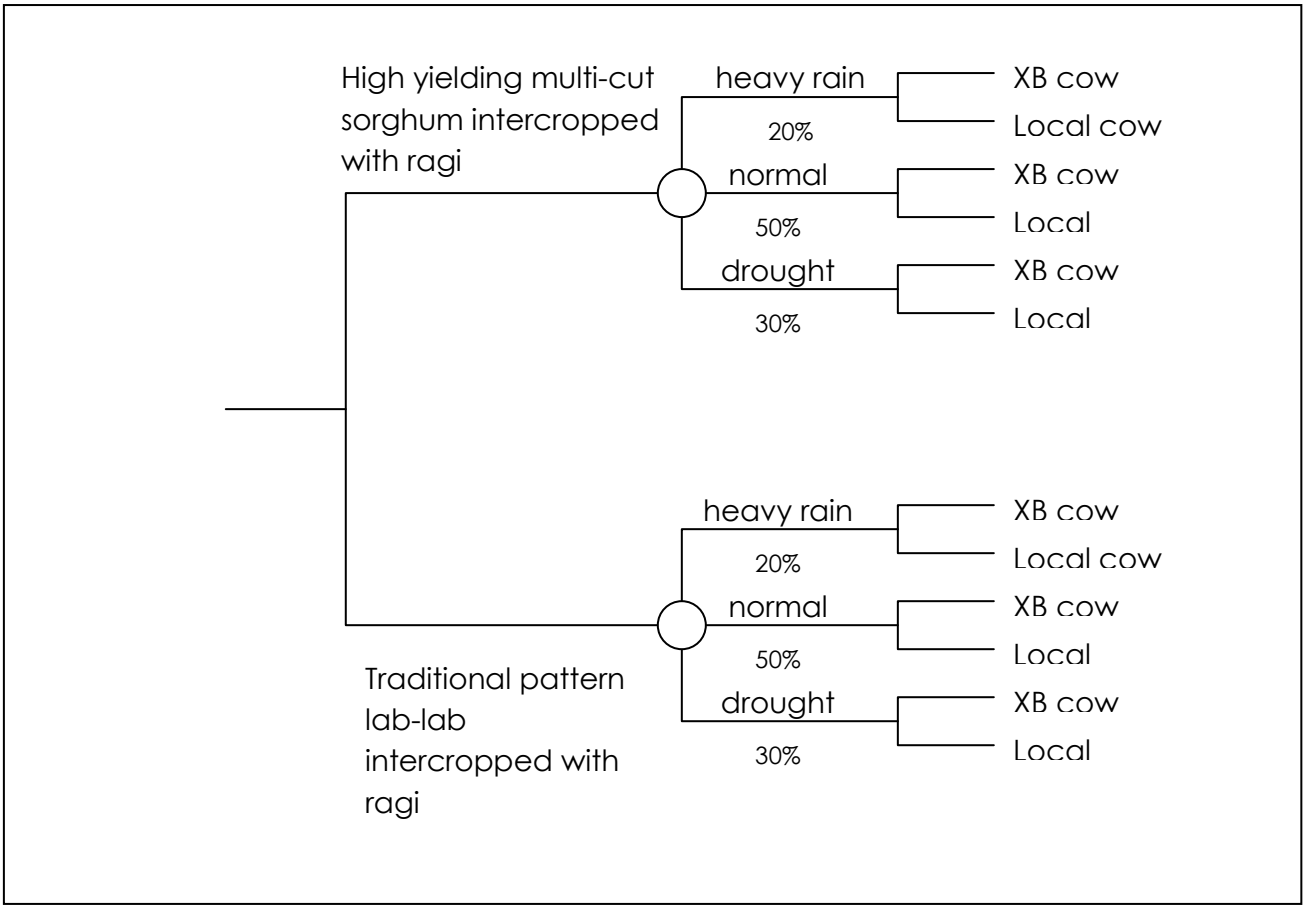



**Fig. 8. A simple structure for a decision analysis**

It was found that a simple “problem tree” can also help in linking major problems to possible causes and to a list of possible solutions. Note that a problem tree is not a “decision tree”, as discussed in the previous paragraph. An example of a problem tree to examine possible solutions to the objective of increasing low farm incomes is presented in **Fig. 9.** The root problem here is low farm income and its possible causes are identified, followed by possible research and extension issues.

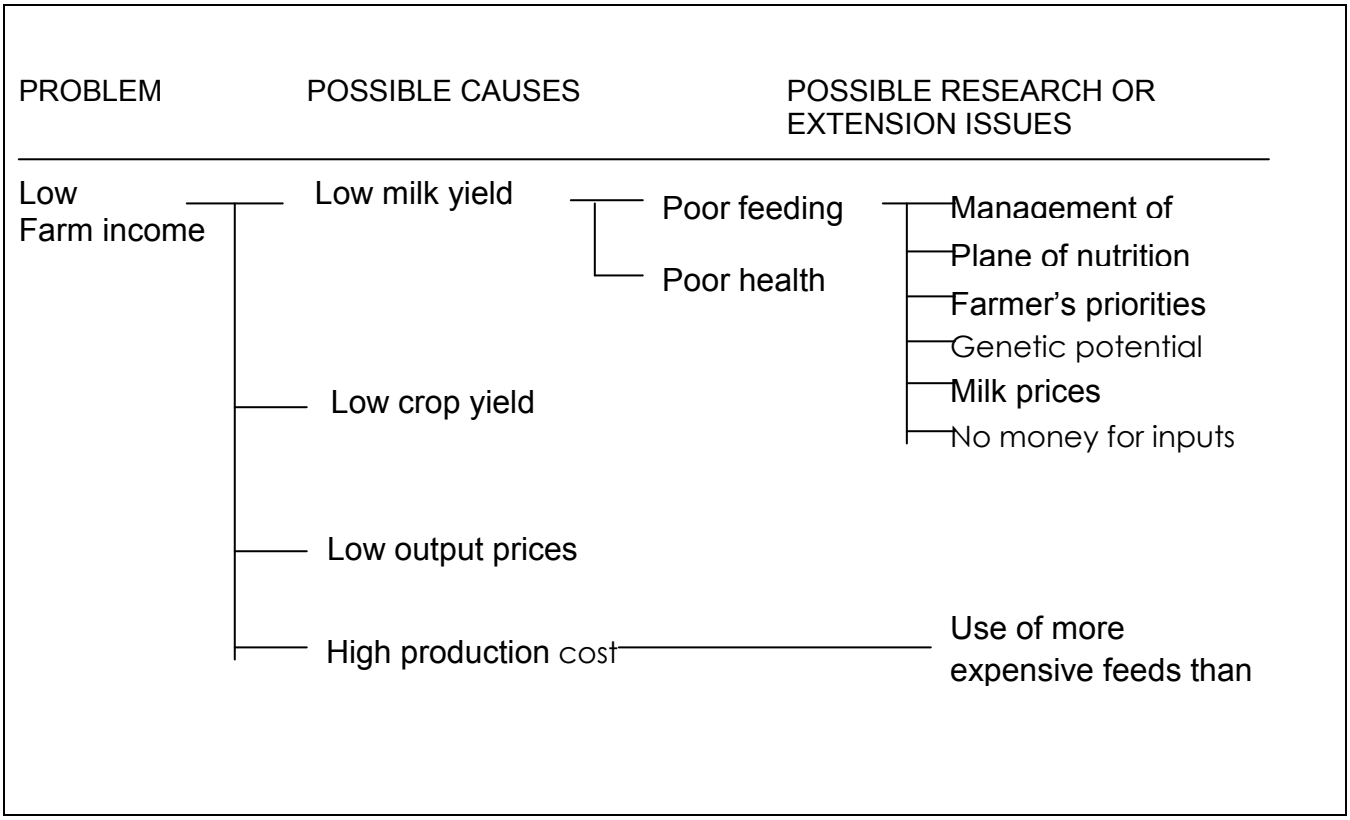
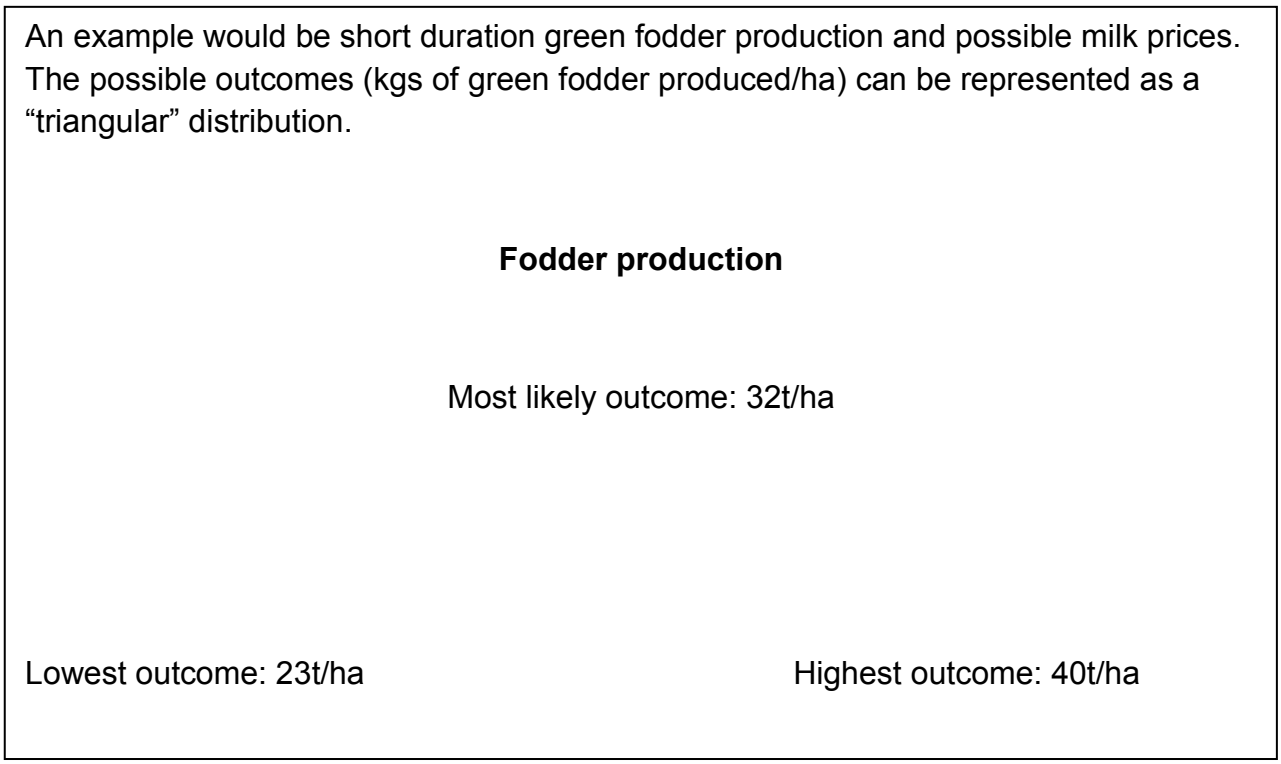



**Fig. 9. An example of a problem tree.**

Potential topics that may require improved technologies are then set out as a set of separate branches, leading finally to potential solutions to be subjected to a screening process, as described later in this chapter. As a special note to the outcome of this problem tree it can be mentioned that a mono disciplinary approach, whether from veterinary officers, animal breeders or nutritionists, is likely to miss the mark. Of all problems mentioned at the end of the tree branches only few really pertain to a simple discipline. Moreover, simple disciplines only play a minor role, e.g. only one out of the six constraints are on animal nutrition in the example of **Fig.10.**

**Risk analysis:** A procedure which is also fairly easy to use as a simple model to look at a range of possible outcomes for a changed farming practice is called as Risk Analysis. This requires estimates of the worst possible outcome, the most likely possible outcome, and the best possible outcome of a particular technology, each with its associated probabilities. One common method of dealing with the latter is to put the worst and best outcomes plus or minus one standard deviation from the mean. The mean parameter serves in that case as the most likely outcome, finally represented at the corners of two triangles. For most agricultural technologies, weather conditions will often provide much of the variability leading to these different outcomes. Prices can also be considered as a source of risk that must be considered by farmers. To look at possible combinations that farmers may face, the question of correlation between the budget parameters must be considered, i.e., does the "high or best" fodder production outcomes influence milk price?

An example would be short duration green fodder production and possible milk prices. The possible outcomes (kgs of green fodder produced/ha) can be represented as a "triangular" distribution.




(Source; Adopted from Cassidy *et al.*, 1970)

**Figure 10. An example of a risk analysis with the triangle approach**

If there is a good season in terms of climate and many farmers are growing green fodder Production of green fodder will expand, milk productions will rise and prices will fall. A more likely situation is where the green fodder technology is to be tried on a limited number of farms and high production on these new farms will not influence local milk prices. Possible outcome for this uncorrelated case is given in **Table 10,** based on the results of **Figure.10.**

**Table 10. Possible Outcomes in Fodder Technology based on Fig. 9**

| Fodder outcome | Milk outcomes | Outcome No. |
|---|---|---|
| Lowest | Lowest | 1 |
| Lowest | Most likely | 2 |
| Lowest | Highest | 3 |
| Most likely | Lowest | 4 |
| Most likely | Most likely | 5 |
| Most likely | Highest | 6 |
| Highest | Lowest | 7 |
| Highest | Most likely | 8 |
| Highest | Highest | 9 |

These values, when put into a production or budgeting model, produce nine different outcomes of output or profit/loss figures. Each combined outcome also has a probability attached to it, the product of the separate, uncorrelated probabilities. Again, farmers' risk aversion will eventually have to be factored into this type of analysis and a minimum acceptable level of risk may have to be determined for different classes of farms.

**Fit analysis:** An example of a fit approach, here applied to the case of urea treated straw, is presented in **Table-11** given below. It is also referred to as Factors Influencing Technology. The characteristics about how the technology performs and the cause-effect relationship between the technology and the characteristic of the farming system are listed in the **Table 11.**

**Screening of Technologies and Management Practices:** Screening means matching the available technologies with the needs of the livestock farmers. Screening helps in choosing appropriate technologies thereby reducing the efforts and costs in transferring the technologies which are otherwise not suitable to the livestock farmers or do not address their needs. The classic example is crossbreeding programme in India which has been implemented throughout the country assuming that it suits to all the regions of the country. But it is very clear now that it is successful in some areas where the situation is favourable to it and failure in areas where it does not fit in. The consequences of crossbreeding programme were highlighted by Rao et al 1995.

**Table 11: An example of a "Fit" exercise for urea treated straw, i.e. a listing of factors that determine the usefulness of this technology**

| **Characteristic** | **Best Fit Case** |
|---|---|
| Type of straw | works best with slender straws (rice, wheat, barley) |
| Availability of straw | good supplies are required relative to other feed |
| Type of animal | medium production capacity |
| Water availability | should be readily available |
| Green fodder availability | limited availability relative to straw |
| Cost and availability of urea | should be low cost and plentiful in supply |
| Cost and availability of (plastic) covering | low cost and good availability |
| Market price of milk | should be good enough to allow purchase of inputs like urea and polythene |
| Support service | should be good in initial stages of adoption |

Source: Jain et al 1995

Screening is really a summary of what technology or management practices can achieve in one, or a set of farming systems. It can consider not only nutritional parameters, but also farmers' perceptions and socio-economic aspects, not to forget gender issues. Screening is meant to help in:

- ex- ante evaluation of the likely productivity and acceptability of the innovation in a given farming system;
- saving of resources for technology generation and on-farm testing;
- identification of areas conducive to the introduction of an innovation;
- comparison of technologies that can solve a given problem.

Available animal technologies and management methods in livestock production can be screened by criteria such as:

- adaptability of the technology in the socio-economic situation where the target farmers are operating;
- availability of technical inputs and services such as medicines, feeds and markets;
- economic viability of the technology within acceptable risk levels;
- acceptability of technology according to cultural norms and values.

A simple example of a screening exercise is given in the **Table 12,** concerning the application of different animal breeding options.

**Table 12. Screening of Breeding Technologies based on Perceptions of Cattle Owners**

| **Characteristics** | **Selective Breeding of indigenous cows** | **Cross breeding of local cows** | **Grading up of local buffaloes** |
|---|---|---|---|
| Profitability | Low | Very high* | High |
| Observability of results | Very slow | Slow | Very slow |
| Simplicity | Simple | Not so simple** | Simple |
| Cultural Compatibility | High | Low | High |
| Disposal of unproductive animals through slaughter | Difficult | Difficult | Easy |
| Extent of risk | None | High | None |
| Management | Survive on poor quality feeds and fodders | Requires good quality feeds and fodders | Survive on poor quality feeds and fodders |

* provided there is a good infrastructure of support systems and marketing of milk or crossbred animals;

** even when artificial insemination (AI) is available, it may be not accessible; communication, dedicated AI service and good heat detection skills are essential

**Scoring/ Ranking:** Problems can be ranked using different criteria, according to their relative importance. The important issue here is to remember that the ranking can differ among interest groups, for example among farmers and extension workers or policy makers or even among gender groups.

An example of the perceptual differences among various stakeholders are presented in **table 11.**

**Participatory Technology Development (PTD)**

Participatory Technology Development (PTD) is an approach, which involves encouraging farmers and other stakeholders to engage in experiments in their own fields so that they can learn, adopt new technologies and spread them to other farmers. In its purest form PTD is a process in which:

i) problems for which solutions have been sought are identified and prioritized by farmers
ii) alternative solutions to be tested are defined by farmers
iii) design of experiment is decided by farmers
iv) the implementation is done by farmers
v) monitoring is decided and executed by farmers and
vi) evaluation is done by farmers.

Growing number of documented examples in recent years revealed that PTD is now accepted as a research approach to agriculture, animal husbandry and natural resource management (NRM). It has been recognized that research is effective in improving farmers' livelihood if farmers play a vital role in the process.

**Table 13. An Example of Perceptual Differences between Researchers and Farmers**

| Object | Researcher | Farmer | Extension Worker | Policy maker |
|---|---|---|---|---|
| Local cow is a source of: | Milk | Bull calves, dung | Milk | Milk |
| Utility of cross bred bullock as draught animal | Good | Not good, and it may be better to dispose of male cross-bred calves | Not convinced, but has to recommend it to the farmer | ? |
| Castration of bull calves at 1-2 years | Recommended for better growth of the animal | Consider it as a bad practice as it weakens the animal | ? | ? |
| Gram husk | Poor feed | Good fed supplement | ? | ? |
| Early weaning of calves | Recommended | Viewed as a bad practice since it weakens the calf | ? | ? |
| Nutritive value of paddy & wheat straw | No difference in the quality | Some like wheat straw better, other prefer paddy straw | ? | ? |
| Criteria for feed evaluation | TDN & CP | Cost of feed and its effect on growth & fat yield | Feed responses on milk production | Possibility to earn foreign exchange |
| Reason for non-adoption of technology | Farmers ignorance & or ineffective extension | Technology is not relevant | Technology is not relevant | Technology is not relevant Farmers ignorance & or ineffective extension |
| New grain varieties | Grain yield | Grain and straw yield | More grain and may be more straw | To feed the growing population |
| Objective of research | To increase biological efficiency of milk production | To increase farm income | To increase milk as well as draught capacity of the animal | To increase milk supply to feed the growing urban population |

Note: The readers may fill the gaps with question marks depending on their perceptions. It should be remembered that perceptions are perceptions, i.e. they may differ between observers.

Source: Rao, et al.1995.

**The objectives of PTD approach in livestock research are to:**

i) empower clients to develop and use livestock technologies
ii) develop appropriate livestock technologies suited to the farm holdings
iii) empower stakeholders, especially the marginalized ones, on their own decision making so that their capacity to make effective demands on research and extension organizations is strengthened
iv) improve the functional efficiency of formal research

**Benefits of PTD:** The PTD offers a wide range of benefits to the livestock farmers as the chances are bright for evolving technologies suitable to them. The benefits include:

i) Encouragement of farmer experimentation
ii) ITK of farmers can be gainfully tapped
iii) Harnessing of farmers' knowledge and creativity are harnessed to develop appropriate technology
iv) Farmers are motivated when their views are respected
v) Technologies are more rigorously tested under users' conditions.
vi) Technologies to suite diverse agro-ecological & socio-economic situations
vii) Technologies are more likely to be adopted
viii) Technologies are in users hands more rapidly and
ix) Complements station-based research

Despite its obvious advantages the livestock farmers consider PTD as a time consuming process with the involvement of risk in subjecting their animals for experimentation. Similarly, the researchers are also bogged down with the perceptions that the results could be spoiled by mismanagement of factors outside the researchers' control and failure of technologies in farmers' fields may be construed as inadequacies of scientists.

**Globalisation Issues and Livestock Extension Education**

International competitiveness in livestock products will be influenced considerably by the preparedness of individual countries to take advantage of the opportunities opened up by the agreements under Uruguay round. Supply and demand forecasts for milk and meat in India by both International Food Policy Research Institute (IFPRI) and Govt. of India indicate that there will be modest surplus even in 2020 in spite of increase in local demand due to population growth, growing urbanization, increasing affluence and changing life styles, enabling limited but significant international trade. Since the livestock production system in India is entirely labour intensive, relying on the use of family labour, the local competitiveness depends on low opportunity costs for labour, the value captured from non-food farm outputs like crops residues and manure and the opportunity for capital accumulation in the form of livestock. Beef and buffalo meat production in India is not purposive, but merely an outcome of the milk production system. Surplus male and unproductive animals end up as meat animals. Meat production in India, except in case of broiler industry and the meat from culled layers in organized farms, are all in the traditional

production systems with little investment.

The international competitiveness of Indian livestock products-particularly milk and milk products assessed on the basis of Nominal Protection Co-efficient (NPC) indicates that ghee is slightly competitive while milk powders are not. This calculation, however, does not take into account market distortions on account of overt and covert subsidies by the major exporting countries. Meat prices in India and their NPC indicate fairly high international competitiveness. However, they lose out on Sanitary and Phyto Sanitary (SPS) standards and have only limited markets confined to West, South and South East Asia.

The international competitiveness in livestock products will be influenced considerably by our preparedness to take advantage of the opportunities opened up by the new agreements under Uruguay round. Ensuring quality standards and freedom from annual epidemics are pre-conditions of the guaranteed market access. Small holder production system often faces difficulties in capturing the economics of scale in marketing, input supply and services delivery. Livestock extension education plays an important role in this context to make the livestock products quality specific and cost effective. The role of livestock extension education in this direction is:

- Training of farmers and entrepreneurs on export quality standards and phytosanitary requirements
- Training on Fair Average Quality Standards (FAQ) for livestock products
- Market intelligence through information technology and cyber extension
- Sensitization training to middle level extension functionaries to improve their technical and professional knowledge and skills
- Educating the farming community and the industry, the anticipated implications of the WTO agreement and lend a helping hand in building confidence and converting the challenges into opportunities in global trade.
- Conducting Livestock Extension Education programmes on Good Agricultural Practices (GAP), Good Laboratory Practices (GLP) Good Manufacturing Practices (GMP).
- Capacity building in the areas of understanding WTO, SPS, legal issues of SPS, food safety, risk analysis, disease risk analysis, diagnosis etc are the prime areas of importance for the livestock extension education system.

**Privatisation of Livestock Extension Services:**

In India, Livestock extension is carried out mostly by the Departments of Animal Husbandry and to some extent by the Milk Unions, State Veterinary/ Agricultural Universities (SAUs), Research institutions of ICAR, and NGOs. The animal husbandry information and other technical inputs and services are being provided to the livestock owners through public sector organisations. With the increase in the pressure on the land and other resources and emphasis on efficiency on the use of resources, public spending on animal husbandry extension services is being questioned. Recognizing the limitations of public extension services in meeting the wide ranging demands for agricultural technology, it was suggested to promote private and community driven extension to operate competitively with pubic

extension. The government expenditure on animal husbandry extension is justified in view of the fact that animal husbandry is one of the very important secondary occupations to a large population of poor cattle owners, which include small and marginal farmers and landless agricultural labourers. The livestock owners are being trained by different organizations by offering incentives to the trainees such as free board and lodging to encourage their participation in such training programmes.

The National Commission on Agriculture (NCA, 1976) recommended that cattle owners should be charged for AI in areas where it is popular. However, it is being done by collecting nominal charges by the Departments of Animal Husbandry, on cost basis by some of the Milk Producers' Cooperative Societies and NGOs like Bharatiya Agro Industries Research and Development Foundation (BAIF). Similarly, the Milk Unions and AHDs are supplying cattle feed and vaccines on subsidy to milk producers. Some of the Milk Unions have implemented welfare measures like free cattle insurance, scholarships for children of the milk producers and accident insurance cover for the milk producers etc. In the case of poultry, which is being run more on commercial lines compared to other livestock, the Animal Husbandry Extension services are more organized and the poultry farmers are charged for almost all the services, which include vaccination, de-beaking, post mortem, diagnosis and treatment of chicks.

Based on the study conducted on Privatizing Agricultural Extension in India, Rasheed and Sadamate (2000) suggested that the public sector should concentrate on organizing educational programmes for farmers, which are less attractive to the private agencies. The public sector should also take up the role as facilitator in the formation of farmers' groups, building linkages with other extension agencies and initiating paid consultancy services by maintaining a cadre of qualified staff at district and sub district levels and some of these services can later be entrusted to the farmers' groups. Private sector extension cannot completely substitute for public agencies in those circumstances where direct benefits do not assure to the firms involved, target populations are diffuse or remote, where infrastructure is inadequate and when production consists mainly of basic food grown by subsistence farmers. Research clearly indicated that investments in agricultural research and extension yield high returns. Ahuja and others (2000) concluded based on a study conducted in three states of India that there is a significant demand for the delivery of veterinary services at home and the cattle owners including the poor are willing to pay to receive these services.

The public extension service has still an important role to play in increasing the production of backyard poultry, which even today is the major contributor for egg and chicken production in the country. The Animal Husbandry Departments (AHDs) continue to provide free inputs and technical services such as vaccinations to the backyard poultry.

**Contract Farming**: Poultry production with layers and broilers has extended into contract farming wherein the poultry farmers agree to provide eggs or chicken of certain quality and adhere to the management practices indicated by an agency in return for an assured market. The agency is responsible for supply of chicks,

vaccinations, and health care, poultry feed and purchasing the output, chicken or eggs. The farmers' responsibility is to provide land, sheds and labour for maintenance. Consequently, the small-scale broiler and layer farms could not withstand the competition from the large commercial farmers and vanished from the scene. As a result poultry production is highly commercialized and the role of public extension has become limited in this setup.

Contract farming in poultry has been found successful in India due to the presence of strong backward linkages. The nature of contracting has provision of coping against production failure. Removing grower risk through buyback guarantee and also inputs such as chicks, feed and medicine has helped the poultry farmers raise quality chickens. Apparently, balanced contracts that benefit both parties in terms of assured markets, competitive price and guarantee against risk have resulted in the success of poultry contract farming. However, for smaller farmers, while contracting may provide an opportunity to rise above subsistence farming, the risk of diversifying is likely to be higher (Gulati et al. 2009). Studies also indicated that the contract broiler farming is exploitative to the small farmers as the contract is one sided and specifies standards for the output only to be supplied by the farmer only. No quality standards are prescribed for the inputs supplied by the integrator which include chick, feed and medicines (Selvi and Rao, 2009)

## Extension and Development Programmes

Development means development of men, the satisfaction of their basic needs – food, shelter, clothing and access to safe drinking water, sanitation, public transport, health and educational facilities (ILO, 1976). Under development means denial of basic needs to the people while enhancing the material returns to the dominant groups. Development will necessarily involve the use of physical, financial and human resources. The use of resources will depend on who controls the available resources and how decisions are made affecting their use.

**Human (Personal) Development:** Development in any meaningful sense must begin with and within the individuals. Unless motivation comes from within, efforts to promote change will not be sustainable by the individual. The individual will remain under the power of others. It is a process by which an individual develops self-respect and becomes more self confident, self reliant, cooperative and tolerant of others through becoming aware of his/her shortcomings as well as his/her potential for positive change.

**Economic Development:** It is a process by which people through their own individual and/or joint efforts boost production for direct consumption and have a surplus to sell for cash.

**Political Development:** If development is to truly benefit the people, then the political structure must be responsive to their needs and aspirations as well as protect their rights and their property. The people have to acquire political power in order to:

- participate in decision making at local level and to choose their own leaders.

- Plan and share power democratically.
- create and allocate communal resources equitably and efficiently among individual groups.

**Social Development:** It refers to those investments and services carried out or provided by a community for the mutual benefit to the people of that community whether as a village; a district or a nation. These services include health, education, water, energy, transport, communication.

**Building Development**

The relationship between social, economic and political development can be illustrated as two columns representing economic and political development and a girder representing social development where the girder is dependent upon the support of the two columns which in turn rest upon a foundation of personal (human) development **(Fig.11)**

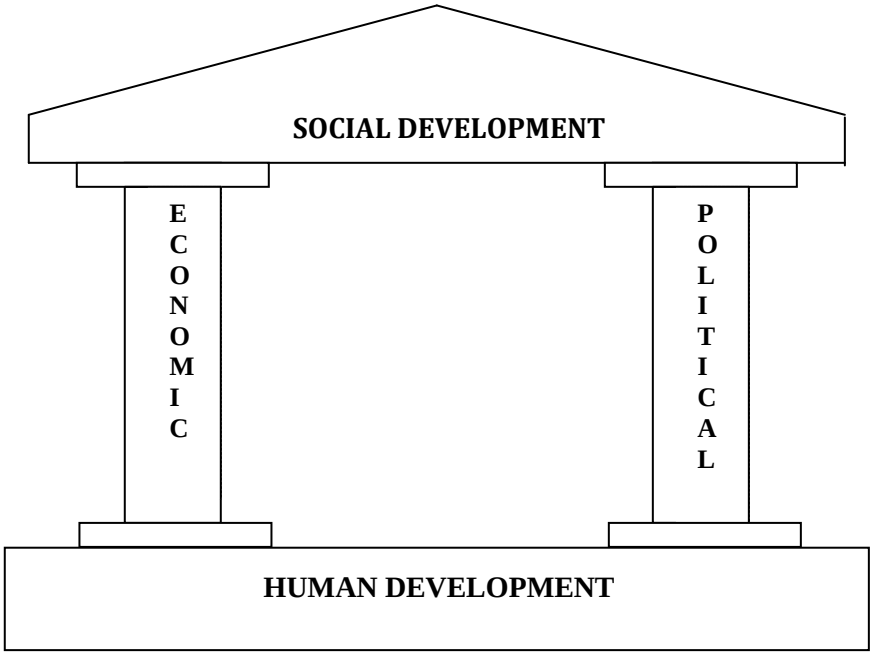



**Fig: 11. Building Development (Adopted from Stan Burkey, 1993)**

Development is a complex and slow moving process involving people on the one hand and the factors of production and organization on the other.

**Sustainable Development:**

The most comprehensive definition of Sustainable development was contained in the report of Brundtland (WCED, 1987) which states that sustainable development is development that meets the needs of the present without compromising the ability of future generations to meet their own needs. It contains within it two key concepts:

- the concept of needs, in particular the essential needs of the world's poor, to which overriding priority should be given; and
- the idea of limitations imposed by the state of technology and social organization on the environment's ability to meet present and future needs."

**Sustainable Agriculture Development:**

The phrase “sustainable agriculture” is open to many interpretations (Conway and Barbier, 1990)

- For agriculturalists it embodies a desire to consolidate and build upon the achievements of the green revolution. They equate sustainability with food sufficiency, and sustainable agriculture can embrace any means toward that end.
- For environmentalists, though, the means are crucial. Sustainable agriculture represents a way of providing sufficient food and fibre that complements and, indeed, enhances our natural resource endowment of forests, soils and wildlife. For them, sustainability means a responsibility for the environment – a stewardship of our natural resources.
- For economists, sustainability is a facet of efficiency, not short-run efficiency alone, but the use of scarce resources in such a fashion as to benefit both present and future generations.
- Finally, sociologists see sustainable agriculture as a reflection of social values. They define it as a development path that is consonant with traditional cultures and institutions.

They defined agriculture sustainability as the ability to maintain productivity, whether of a field or farm or nation, in the face of stress or shock. A stress may be increasing salinity, or erosion, or debt; each is a frequent, sometimes continuous, relatively small, predictable force having a large cumulative effect.

Livestock plays an important role in ameliorating the poverty as livestock not only provides income but also food security, financial security, employment and ultimately as a livelihood avenue. This is the reason why the Government of India has been embarking upon on livestock development programmes as a means to improve the livelihoods of poor people especially the land less agricultural labour and less land owners who depend on livestock for their livelihoods. Studies also clearly brought out that the lower the family income higher is the contribution of livestock income to family income from all sources.

**Livestock Extension and Development Programmes**

The National Agricultural System was evolved in India with an establishment of agricultural department at the Imperial and Provincial governments before Independence. Realizing the Country’s technological needs, the Pusa Research Institute was established at Pusa (Bihar) in 1903. The Royal Commission on Agriculture (RCA) was appointed in 1926 to examine and report on the condition of agricultural and rural economy in India and to make recommendations for the

improvement of agriculture and the promotion of the welfare and prosperity of rural people. The RCA, 1926 has made valuable recommendations which formed the basis of a coordinated research and effective agricultural administration. One of the important recommendations of the RCA was the creation of Imperial Council of Agricultural Research (ICAR), which was set up in 1929.

From the beginning of this century the livestock economy of our country has attracted widespread attention and several extension and development attempts have been made for its improvement. The British Administration has formed several committees to understand the features of livestock farming system and ways for its development. Among the various committees and their reports, the reports submitted by the Royal Commission on Agriculture (RCA) and W. A. Burns report on the Technological Possibilities of Agricultural Development in India (1944) are considered as significant. However, the pre-independence attempts on livestock development were limited in scale and geographical coverage. These attempts did not have any follow-up action and lack specificity in terms of programme planning and implementation. The above constraints in the livestock development have been done away through the introduction of planning in the post-independence period which is emphasized by a systematic and intensive approach.

The post independent extension education and development programmes launched by Government of India can be generally grouped into five categories. They are:

1. Community development programmes
2. Programmes for technology development
3. Programmes for development with social justice
4. Frontline extension programmes of ICAR
5. Agricultural Research and development programmes by ICAR and Govt. of India.

The list of programmes implemented under these five categories are given under **(Table 14).**

**Table 14. List of programmes implemented in India**

**Community Development**

| | | |
|---|---|---|
| 1952 | CDP | Community Development Programme |
| 1953 | NES | National Extension Service |
| 1954 | CDB | Community Development Block |
| 1957 | Panchayati Raj | Democratic Decentralization |

**Technological Development**

| | | |
|---|---|---|
| 1960 | IADP | Intensive Agricultural District Programme |
| 1964 | IAAP | Intensive Agricultural Area Programme |
| 1964-65 | ICDP | Intensive Cattle Development Project |
| 1966 | HYVP | High Yielding Variety Programme |

**Development with Social Justice**

| | | |
|---|---|---|
| 1970-71 | SFDA | Small Farmers' Development Agency |
| | MFAL | Marginal Farmers' and Agricultural Labourers Programme |
| | DPAP | Drought Prone Area Programme |
| 1972-73 | PPTD | Pilot Project for Tribal Development |
| 1974 | T&V | Training and Visit Programme |
| 1978-79 | IRDP | Integrated Rural Development Programme |
| 1979 | TRYSEM | Training of Rural Youth for Self-Employment |
| 1980 | NREP | National Rural Employment Programme |
| 1982 | DWCRA | Development of Women and Children in Rural Areas |
| 1983 | NAEP | National Agricultural Extension Project |
| 1986 | TMO | Technology Mission on Oilseeds |
| 1989 | JRY | Jawahar Rozgar Yojana |
| 1993 | EAS | Employment Assurance Scheme |
| 1994 | SFAC | Small Farmers Agri Business Consortium |
| 1999 | SGSY | Swarnajayanti Gram Swarozgar Yojana |

**ICAR Frontline Extension Programmes**

| | | |
|---|---|---|
| 1965 | NDP | National Demonstration Project |
| 1974 | KVK | Krishi Vigyan Kendra |
| 1975 | ORP | Operational Research Project |
| 1979 | LLP | Lab to Land Programme |
| 1995 | TAR-IVLP | Technology Assessment and Refinement – Institute Village Linkage Programme Agricultural Research and Development Programme |
| 1979 | NARP | National Agricultural Research Project |
| 1989 | TMDD | Technology Mission on Dairy Development |
| 1998 | NATP | National Agricultural Technology Project |
| 2007 | NAIP | National Agricultural Innovation Project |
| 2008 | NADP | National Agriculture Development Programme/Rashtriya Krishi Vikas Yojana (RKVY) |

The efforts of Animal Husbandry Extension dates back to 1952, when the Key Village Scheme was introduced in the country to improve the breeding and health of the animals. Later, a number of schemes or projects have been introduced to transfer the technologies and thereby increase the production of livestock.

**All India Key Village Scheme**

The Key Village Scheme (KVS) was a novel attempt made by independent India towards the development of cattle and buffaloes. The basic aim was to bring about rapid improvement in the production potentiality of milch animals through improved breeding, effective health care, and scientific management and organized marketing facilities.

The scheme was conceived as one of the most important programmes for livestock development in the country. Artificial Insemination (AI) was included as an integral part of the technical programme. It envisaged establishment of Key Village Blocks in breeding tracts of bovines and each block consisted of one AI centre and four key village units to cover about 10,000 breedable cows and buffaloes. By the end of Second Five Year Plan 612 KVS centres were functioning in the country and an official review report severely indicated the limited coverage (10 percent of total stock) of the scheme (Govt. of India, Ministry of Agriculture, 1962).

**Intensive Cattle Development Project (ICDP)**

When KVS did not yield the expected results the Government of India introduced another comprehensive project, Intensive Cattle Development Project (ICDP) almost on the similar lines of Intensive Agricultural District Programme (IADP) in the year 1963. The ICDP was started as a Special Development Programme during Third Five Year Plan. It was envisaged to locate the projects in the breeding tracts of indigenous breeds of cattle and buffaloes and in the milk sheds of large dairy projects. The establishment of ICDPs was linked with the dairy plants so as to enable the dairy plants to collect and process milk to their full capacities. Each ICDP was expected to cover one lakh breedable female bovine population and to provide necessary inputs and technical services. The ICDP was considered as the most determined effort to increase milk production and productivity of cows and buffaloes. However, the Programme Evaluation Organization (1970-71) in its evaluation report indicated that the ICDPs also did not succeed in accomplishing their objectives.

**Operation Flood**

The foundation for a viable modern and self- sustaining dairy industry based on cooperative concepts was laid in 1970 in the form of Operation Flood. The Government of India set up the Indian Dairy Corporation to handle the commercial transactions under the title “Indian World Food Programme (WFP) Projects”. The National Dairy Development Board (NDDB) implemented this biggest dairy development project in the world in three Phases, and in fact it has made a

tremendous impact on the dairy development scenario in the country.

**Phase I (1970 to 1981):** The basic objectives under this phase were to increase the capacity of dairy processing facilities, resettlement of city cattle in rural areas, development of basic transportation and storage network to facilitate regional and seasonal balancing of milk supply and demand, development of milk procurement systems in rural areas, to improve the productivity of animals, to assure the rural milk producers of a year round stable milk market and to establish 14 milch animal centres.

Under this project, WFP donated 1, 26,000 MT of Skim Milk Powder and 42,000 MT of Butter oil. Through sale of these commodities, funds to the tune of Rs.1164 millions were generated and were utilized for creating infrastructure facilities necessary for dairy development.

The major achievements in the first phase were increase in milk production from 21 m. tons in 1970 to 30 m. tons in 1979-80, reaching the target of 29 lakh litres per day in processing of milk for supply to the four metropolis, establishment of dairy cooperatives in 18 major milk shed areas and establishment of 14 milch animal centres and the Institute of Rural Management at Anand (IRMA).

**Phase II (1981 to 1985):** The objectives were to enable 10 million rural milk producer families to build a viable self sustaining dairy industry by mid 1985, to enable the milk producers to rear a National Milch Herd of 14 million crossbred cows and upgraded buffaloes during 1980s and to establish a National Milk Grid which will link the rural milk sheds to the major demand centres with urban population of about 150 million.

Some of the notable achievements were generation of funds amounting to Rs. 2323 million through sale of gift commodities up to November, 1984, expansion of handling capacities of four metro dairies from 31 lakh litres per day to 35 lakh litres per day by the end of October, 1984, increase in the number of village cooperatives to 43,000 covering 4.25 million milk producers, substantial increase in the production of milk powder, putting 622 road and 87 rail milk tankers into service under National Milk Grid and establishment of godowns with a capacity of 3000 tons to store dairy commodities.

**Phase III (1985 to 1996):** The gains obtained in the earlier phases were further consolidated in Phase III. Some of the significant achievements were;

- Increase in the production of milk leading to an increase in the per capita availability of milk to 193 grams per day in 1994 from 107 grams in 1975.
- Supply of milk to about 300 million consumers spread in 550 cities and towns at a reasonable price.
- Procuring milk daily from 10 million producers spread in 74,000 villages and earning an incremental income of about Rs.2500 crore from sale of milk.
- Establishment of a nationwide network of multi - tier milk producers' co-operative societies.
- Modernization and expansion of dairy industry.

- Self-sufficiency in milk and milk products thus putting an end to commercial imports of milk solids.
- Indigenous production of dairy equipments.

The Operation Flood Programme by and large differed from the ICDP that they laid emphasis on milk supply and marketing schemes and viewed dairy development as an instrument for rural development and social change. This is because of the realization of the fact that the growth of dairying requires apart from the increase in milk production, the linking of milk production centres with marketing centres to ensure the farmers and customers their fair deal and to create a sustainable strong base for the dairy development in the country. The Operation Flood part of the dairy development has clearly emphasized the social aspects of developing through the importance given for the establishment and growth of Village Milk Producers Cooperative Societies (VMPCSs) throughout the country followed by the initial success of Anand Milk Producers Union in uplifting the farmers. By the end of year 2008 the number of Village Milk Producers' Cooperative Societies established were 1,17,575 .These were federated into 170 Milk Unions and 15 State Milk Federations procuring on an average 21.5 million litres of milk per day (www.dahd.nic.in). By all means this is the biggest development project in the world and the credit goes to 12.4 million dairy farmers who are the members of the Milk Cooperative Societies and Dr.V. Kurien, the then Chairman of NDDB who is rightly recognized as the Father of White Revolution in the country.

**Dairy Cooperatives:** Efforts to develop dairying through rural organizations was made as early as 1917 when the first milk cooperative society was formed in Bengal, to supply milk to the society of Calcutta, followed by union provinces, Gujarat and Madras states. The Government of Bombay had initiated subsidized milk distribution system in 1943, which was later closed in 1947 after expending over Rs.3 crore on it. In the year 1945, the Government of India decided to take measures to safeguard the supply of hygienic milk to major cities. A novel beginning was made in Bombay and for the first time in India, milk produced in rural areas of Kaira district was collected in bulk, pasteurized and then transported by rail for distribution in Bombay. The Kaira District Milk Producers' Cooperative started with an initial collection of 250 litres is a name in itself in the history of cooperative movement in the country and is now more popularly known as AMUL (Anand Milk Union Limited).

The milk cooperatives under Operation Flood (OF) follow what is more commonly known as Anand pattern, which is nothing but a three tier system of cooperative organization. At the village level there are Primary Milk Producers' Cooperative Societies, which collect, test and supply milk to the Milk Producers Union at District level and these Unions process and market milk and milk products. The Unions are also responsible for milk enhancement programmes through supply of technical inputs and services to the milk producers in the villages. The Unions are amalgamated into Milk Producers' Federation at State level. At national level there is a National Cooperative Dairy Federation (NCDF). The entire co-operative organization is managed by representatives, elected by the milk producers from among the producers who are in fact the employers of this organization. The role of the government is to supervise, guide, encourage and where necessary to correct

the cooperatives when going wrong.

The basic philosophy of the Anand Pattern is “to combine India’s greatest asset, the power of its people, with professional management in a vertically integrated cooperative structure that establishes a direct linkage between those who produce the milk and those who consume it, whether as milk or milk products, eliminating all the middlemen.” (NDDB, 1997 - from a drop to a flood). Thus, the dairy development programme in the country has gone through a metamorphic change from the initial Key Village Scheme and Intensive Cattle Development Project aimed at the up-gradation of local cattle in selected tracts to a nationwide anti-poverty programme as an instrument of social security in the rural India.

**Technology Mission on Dairy Development**

To accelerate the phase of Dairy Development in the country, the Government of India launched Technology Mission on Dairy Development in August 1988. The Mission has assigned 29 need based research programme to research institute of ICAR, State Agricultural Universities and NDDB. It also emphasized the optimization of resource use for cattle improvement in terms of breeding farms, bull mother farms, semen freezing and artificial insemination facilities, veterinary health care facilities etc. available with the State animal husbandry departments and under Operation Flood. In addition, the research establishments under the Indian Council of Agricultural Research (ICAR) and State Agricultural Universities (SAUs) have also been linked up in the process to provide the research/ technological support.

**Gaushalas**

Gaushalas are the institutions to maintain the cattle, which are either donated by the people or thrown out by the farmers. These institutions are maintained basically to protect the cows and are in existence for the last two centuries. They are being maintained in different parts of the country on account of religious and economic considerations. However, they are mostly located in north India.

With the establishment of Central Council of Gosamvardhana in 1952, the gaushalas were reorganised. There are 1020 gaushalas with a cattle population of 1, 30,000 spread in 21 states of the country. Each gaushala on an average has about 151 acres of area under grazing and 63 acres of cultivable land. The gaushalas did not receive much attention from the Government because the impact made by these institutions on cattle development and milk production was not considered significant. However, remarkable progress was made by gaushalas located at Nasik, Urlikanchan, Amritsar, Indore and Ahmednagar. Many of the gaushalas though maintaining some pure bred cattle are implementing cross breeding programme to increase milk production.

**Special Livestock Breeding Programme (SLBP)**

Based on the recommendations of National Commission on Agriculture (NCA), (1976), Special Livestock Production Programme was launched in 1975-76. The

main objectives of the programme are

- to provide employment opportunities to the weaker sections of the rural poor and to supplement their income.
- to increase the production of livestock products like milk, eggs , wool etc.

The programme includes crossbred heifer rearing scheme and setting up of sheep, poultry and piggery production units. The expenditure on SLBP is to be shared on 50:50 basis between Central and State Governments and cent per cent by Central Government to union territories. Thirty per cent of the beneficiaries selected under the programme are to come from SC/ST communities. For setting up of sheep, poultry and piggery units subsidy is provided at the rate of 25 to small farmers and 33 1/3 to marginal farmers and agricultural labourers and 50% in case of tribal beneficiaries.

The scheme also aims at assisting the landless agricultural labourers, marginal and small farmers in improving the quality of crossbred heifer calves. The female calves in the age group of 4 to 10 months are included in the scheme. Balanced calf feed is supplied on subsidy to the owners of these selected calves up to 32 months or till the age at first calving whichever is earlier. The calves included in the scheme are also insured by the Department of Animal Husbandry. The purpose of supplying calf feed to reduce the age at first calving is defeated in many cases because the calf feed is offered by the beneficiaries to their cows for milk production rather than to their calves. In some cases the calf feed is being sold by the beneficiaries to the other cattle owners.

**National Agricultural Extension Project (NAEP)**

It was launched in 1983. The objective of NAEP was to bridge the gap between research and extension systems, so that the transfer of technology can take place at a much faster rate, resulting in higher production.

**Frontline Extension Programmes**

The involvement of ICAR in extension started with the formulation and implementation of several front line extension programmes such as National Demonstration (1966), Operational Research Project (1972), Krishi Vigyan Kendra (1974), Lab to Land Programme (1979), Frontline Demonstrations and Technology Assessment and Refinement (TAR) - Institution Village Linkage Programme (IVLP). National Agricultural Technology Project (NATP), Agricultural Technology Management Agency (ATMA), National Agricultural Innovation Project (NAIP) and Horticultural Mission. The frontline extension programmes of ICAR were designed to organize the demonstrations by scientists to show the production potentiality of modern agricultural technologies to identify its location specificity in the farmers' field.

**National Demonstration Project (NDP)** was implemented during the year 1965 to demonstrate the production potentialities of technology package on major crops to fully exploit these demonstrations for the purpose of training the farmers' and

extension workers. Further, it provided the scientists feedback of the problems faced by the farmers with respect to adoption of new technologies.

**Krishi Vigyan Kendra (KVK)** was initiated during 1974 for providing vocational training through work experience to the farmers and extension personnel. The KVK is an institutional approach to understand technology assessment through On-farm-testing and Frontline demonstration and technology dissemination through training and extension. The KVK is a need based, skill based vocational training institute. It is comprehensive in its activities, farm based support, inbuilt research extension linkage, participatory management, multidisciplinary team of scientists and mechanism for both feedback and feed forward.

**Operational Research Project (ORP)** was initiated in 1975 to identify technological as well as socio-economic constraints and to formulate and implement a combination of technology modules on area/watershed/target group basis. The performance of the new technology is to be tested on farmers' fields at operational level under the existing resources and socio-economic and cultural conditions to address the common agricultural problems affecting the existing farm production system on community basis.

**Lab to Land programme (LLP)** was implemented in 1979, by ICAR as a part of its Golden Jubilee celebrations. The aim of the programme is to assist the selected farm families for improving their farming systems and thereby generating more employment and income. The basic idea is to bring the scientists and farmers into a common forum and to introduce appropriate technologies facilitating the diversification of labour-use and creating supplementary sources of income in the fields of agriculture and allied enterprises.

**Technology Assessment and Refinement (TAR)- Institution Village Linkage Programme (IVLP).** In 1995, the ICAR launched this innovative programme and the objectives are to:

i) introduce technological interventions with emphasis on stability and sustainability along with productivity of small-farm production systems;
ii) introduce and integrate the appropriate technologies to sustain technological interventions and their integration to maintain productivity and profitability taking environmental issues into consideration in a comparatively well defined farm production system;
iii) introduce and integrate the appropriate technologies to increase the agricultural productivity with marketable surplus in commercial on and off farm production system;
iv) facilitate adoption of appropriate post harvest technologies for conservation and on-farm value addition of agricultural products, by-products and waste for greater economic dividend and national priorities;
v) facilitate adoption of appropriate technologies for removal of drudgery, increased efficiency and higher income of farm women;
vi) monitor socio-economic impact of the technological intervention for different farm production systems;

vii) identify extrapolation domains for new technology/technology modules based on environmental characterization at meso and mega level.

**National Agricultural Technology Project: (NATP)**

The National Agricultural Technology Project was launched by the "Indian Council of Agricultural Research (ICAR) on June 30, 1998, with the support of the World Bank, to strengthen and complement the existing resources and to augment the output of the National Agricultural Research System (NARS). The NATP implemented its objectives through Strategies for Organization and Management Reforms and Research. The Research comprised various modes of objective-based funding, namely, Teams of Excellence (ToE), Mission Mode (MM), Production Systems Research (PSR), Institution Village Linking Programme (IVLP) and Competitive Grants Programme (CGP). Another important component which was funded under NATP was Innovations in Technology Disseminations (ITD). Projects under ITD were executed by the Department of Agriculture and Co-operation (DAC), Government of India, and the ICAR. Production Systems Research (PSR) mode of funding divided Agro-ecological-Zones into five sub-modes, namely, Rainfed, Irrigated, Arid, Coastal, and Hill & Mountain. All five sub-modes were recognized as respective Agro-ecosystem Directorates and were empowered to source funds and administer & monitor the progress of the projects.

**NATP Glimpses:** NATP was the world's biggest World Bank assisted agriculture project worth Rs. 992 crores developed and executed by NARS. NATP lifespan was seven years, from 1998 to 2005. NATP was the first project in NARS to shift the focus from discipline oriented research to production system research.NATP was the first project in NARS to involve competitive funding, & have pluralistic approach to involve and fund partners from outside NARS. NATP successfully completed a whopping total of 852 projects

**National Agricultural Innovation Project (NAIP)**

The National Agricultural Innovation Project was launched in the year 2007 by ICAR. The overall objective of NAIP is to facilitate the accelerated and sustainable transformation of Indian agriculture in support of poverty alleviation and income generation through collaborative development and application of agricultural innovations by the public organizations in partnership with farmers groups, the private sector and other stakeholders. The specific objectives are to:

a) build the critical capacity of the ICAR as a catalyzing agent for management of change of the Indian NARS,
b) promote production to consumption systems research in priority areas/themes to enhance productivity, nutrition, profitability, income and employment,
c) improve livelihood security of rural people living in selected disadvantaged regions through innovation systems led by technology and encompassing the wider process of social and economic change covering all stakeholders , and

d) build capacity and undertake basic and strategic research in strategic areas to meet technology development challenges in the immediate and predictable future.

**National Agriculture Development Programme (NADP) or Rashtriya Krishi Vikas Yojana (RKVY)**

Concerned by the slow growth in the Agriculture and allied sectors, the National Development Council (NDC), resolved in 2007 that a special Additional Central Assistance Scheme (RKVY) be launched. The NDC resolved that agricultural development strategies must be reoriented to meet the needs of farmers and called upon the Central and State governments to evolve a strategy to rejuvenate agriculture. The NDC reaffirmed its commitment to achieve four percent annual growth in the agricultural sector during the XI Plan.

**Basic Features of the RKVY**

The RKVY aims at achieving 4% annual growth in the Agriculture sector during the XI Plan period, by ensuring a holistic development of Agriculture and allied sectors. The main objectives of the scheme are to:

1. incentivise the states so as to increase public investment in Agriculture and allied sectors;
2. provide flexibility and autonomy to states in the process of planning and executing agriculture and allied sectors schemes;
3. ensure the preparation of Agriculture plans of the districts and the states based on Agro-Climate conditions, availability of technology and natural resources;
4. ensure that the local needs/crops/priorities are better reflected in the Agricultural plans of the states;
5. achieve the goal of reducing the yield gaps in important crops, through focused interventions;
6. maximize returns to the farmers in Agriculture and allied sectors;
7. bring about quantifiable changes in the production and productivity of various components of Agriculture and allied sectors by addressing them in a holistic manner;

These guidelines are applicable to all the states and Union Territories that fulfill the eligibility conditions.

**ATMA (Agricultural Technology Management Agency)**

In the case of public sector extension, the major reform in recent years has been the establishment of a district level coordinating agency, the ATMA, in 24 pilot districts across with the World Bank support. Under ATMA, grass root level extension is mainly channelised through the involvement of Block level Technology Teams and Farmer advisory committees, farmer groups/ farmer interest groups and self help groups. ATMA is a district level autonomous agency entrusted with the role of agricultural technology management in the district.

ATMA is a registered society of key stakeholders in agricultural activities responsible for technology dissemination for sustainable agricultural development in the district. It is a focal point for integrating research and extension activities and decentralising day to day management of the public Agricultural Technology System (ATS).

The ATMA at district level would be increasingly responsible for all the technology dissemination activities in the district. It establishes linkages with all the line departments, research organisations, NGOs and agencies associated with agricultural development in the district. ATMA management committee comprises of the Project Director of ATMA as the Chairman and members are drawn from line department heads, NGOs and farmers' organization. The management committee carries out PRA, Strategic Research Extension Plan for the district, establishes Farmer Advisory Centres and co-ordinates the execution of annual work plan through participatory line departments such as ZRSs, KVKs, NGOs, FIGs/FOs and allied institutions. The ATMA creates Farmers Advisory Committees to provide feedback.

**SREP (Strategic Research and Extension Plan)**

It is the process of finding the best scenario for agricultural development and setting the best path to reach that destination by rigorous analysis and choices about goals, opportunities and threats, strengths and weaknesses with respect to agricultural development in a district.

- Goals-what is intended to be accomplished?
- Opportunities and threats- what is needed and feasible?
- Strengths and weaknesses-what is the capability of doing things?

SREP document provides the details of problems and technological needs for agricultural development in a district. Basic aim of SREP is to link the research and extension system with the farmers. It is a bottom up approach exercise carried out at the district level to identify the technological and training needs of the farmers. It speaks about extension and research priorities to be undertaken by the extension and research system based on the grass root analysis carried out by the SREP team. It is a comprehensive document prepared for the purpose of understanding the district agricultural scenario and to undertake need based research and extension programmes.

While the farmers require a wider range of support to address the emerging challenges, extension mainly functions as an agency for technology dissemination. Market extension has been a recent addition but it is understood and implemented mostly as provision of output price information in various markets and this is highly inadequate to address the challenges in marketing. Other extension support facilities created in the country include, farmer training centres at the district level; SAMETI (State Agricultural Management Extension and Training Institute) at the state level; EEI (Extension Education Institute) at the regional level; and MANAGE (National Institute for Agricultural Extension Management) at the national level.

## Evaluation or Impact Assessment

Extension programmes are investments where capital resources are expended to create functional units at gross root level from which we can expect to realize the benefits over an extended period of time. According to USDA, evaluation is the process of determining how well one is doing in what one is trying to do. Evaluation when applied to the field of extension may be defined as a process of systematic appraisal by which we determine the value, worth or consequences of the extension programme/activity. Livestock extension is at the interface between the demand and supply systems of livestock technology. Most of the evaluation study conducted in extension was of mostly comparison of production yield before and after the implementation of the programme. However, it must be understood that evaluation is not simply a measurement of achievements, which is usually done after a programme is executed.

A complete evaluation for extension is one which aims at the full length enumeration of both tangible and intangible costs and benefits involved. Both tangible costs and benefits are easy to identify but it is not so for intangible ones. Knowledge, once disseminated by the extension service and acquired by farmers, has a tangible measurable product only if applied (Orievel, 1983; Feder and Slade, 1985). The application of such knowledge by farmers is generally termed as adoption and is usually measured by adoption rates, that is, the proportion of farmers applying knowledge of a particular technology that they have acquired from extension agents. Economic evaluation is a part and parcel of all phases in an extension programme right from its initial planning to implementation and completion. The economic concept of extension is applied at all the three stages of the project that is i) at project selection, ii) during implementation and iii) after completion of the project

An extension project can be either selected or rejected once its cost and benefits are identified and valued. The realistic estimation of costs and benefits is a pre-requisite for the successful evaluation of an extension project at its selection stage. This is an important consideration for the donors while funding an extension project. Most of the extension projects suffer from incomplete identification usually resulting into over-estimation of benefits and under-estimation of costs ( Birkhaeuser, et al, 1991). The profitability of an extension programme should be verified through giving special attention to the identification of net costs and benefits of the technology to be transferred. In the preliminary stage, profitability should be estimated at the optimal input levels, with appropriate discount for risk. In addition farmers should be consulted to identify the inputs, such as cash, labour, training requirements that play a part on the decision to experiment with the new technology which is to be implemented through the existing extension system.

An evaluation that takes into account only the cash inputs (such as gross margin analysis) may be appropriate for certain type of technologies only (Amir and Knipscheer, 1989). The net cost and benefit in any extension programme includes both tangible and intangible costs. The social cost is anything the society pays/sacrifices save monetary contributions for the execution of an extension programme. Likewise the social benefits are those benefits other than its monetary

benefits derived from the outcome of the project on its execution. Mostly, the social cost and benefits are indirect in nature. The social cost which the society incurs on the execution of the programme cannot be ignored. Even though it is intangible, it is considered for the cost estimation because of the social value attached to it. The difficulties involved in measuring the social cost benefit are in the realm of anybody's imagination. Yet without the inclusion of these intangible costs the efforts to evaluate the extension largely remains non-functional.

The animal health services rendered by the State Departments of Animal Husbandry involve social costs in providing the subsidized services to the livestock owners. However, these services like vaccinations, diagnosis and treatment of animals, prevention and control of zoonotic diseases have far reaching social benefits in terms of getting quality livestock products and in the control of spread of diseases. Since economic cost-benefit analysis is one aspect of the whole which we have to measure for determining worth of an extension project, it is the responsibility of the extension professionals to undertake a complete evaluation in a holistic manner to do justice in this job. This helps to obtain a complete picture on project cost, output, outcome and impact created across the system.

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