

LIVESTOCK COMPONENT OF FARMING  
SYSTEMS RESEARCH

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## LIVESTOCK COMPONENT OF FARMING SYSTEMS RESEARCH

### Origin of Farming Systems Research (FSR)

FSR, an innovative approach to address the problems of resource-poor farmers in less developed countries (LDCs) is a product of 1970's. FSR envisages to appreciate the logic of the existing production systems. Its projects are predicated on the attempt to increase the welfare of small farmers (Norman and Gilbert, 1981). In practical fact, these attempts usually involve technical interventions which would increase farmers' cash incomes while increasing their dependency on agricultural input and output markets (Baker et al, 1983). FSR stemmed largely from the pioneering work of Collinson, International Maize and Wheat Improvement Centre (CIMMYT) of Mexico (Collinson, 1972), and that of Norman, Ahmedu Bello University of Nigeria (Norman and Jones, 1977).

### Relevance of FSR

FSR was developed because of the disappointing results of traditional agricultural research in influencing the productivity of peasant farming in LDCs. The recommendations of agricultural research are often not consistent with farmer circumstances, objectives and preferences. More often than not, their adoption within a complex farming system raises inseparable problems for the farmer. Hence the limited uptake of improved crop/livestock technology.

It follows that a method had to be found for guiding agricultural research in directions more appropriate and more relevant to reality

of the small farmer. This method is now known as FSR. It is farmer based, problem solving, comprehensive, inter-disciplinary, complementary, iterative, dynamic, and socially responsible (Shaner et al, 1982).

#### Objective and Scope of FSR

The primary objective of FSR is to improve the well being of individual farming families by increasing the productivity of their farming system, given the constraints imposed by resources and the environment. FSR consists of two thrusts towards increased productivity (Norman and Collinson, 1985). They are (a) development and dissemination of relevant improved technologies and practices, and (b) implementation of appropriate policy and support systems to create opportunities for improved production systems and to provide conditions conducive to the adoption of technologies already available.

#### Farming System Determinants

A system refers to any set of elements or components that are inter-related or interact among themselves. A farming system, therefore, is the result of interactions among several inter-dependent components. For achieving a specific farming system farm families allocate certain quality and quantity of basic inputs-- land, labour, capital and management--to which they have access, to three processes; crop, livestock and off-farming; in a manner which, given the knowledge they possess, will maximize attainment of goals they are striking for.

The total environment in which the farming family operates consists of technical and human elements (Clayton, 1983). The technical element includes physical factors such as soil, solar radiation, temperature, etc, and biological factors like crop/animal physiology, diseases, insect attack, etc. Usually it is the technical element that receives utmost attention from crop/animal scientists.

The human element is characterised by exogenous and endogenous factors. The exogenous factors, on which the farming households do not have control, are community structures, norms and beliefs, external institutions and support systems. The support systems like input distribution, veterinary health care, cattle insurance, and product marketing are often taken care of by the government.

The endogenous factors--land, labour, capital and management--are under the control of the individual farming households and are used to derive a farming system consistent with their goals subject to the limitations laid down by the technical elements and exogenous factors. The endogenous factors may be supplemented through the exogenous factors such as, capital through a credit programme, management via extension and training, etc.

#### Main Types of FSR

According to Norma et al (1980), FSR programmes are classified into two groups; (a) Up stream FSR, and (b) Down stream FSR.

a) Up stream FSR' seeks to generate prototype solutions which will facilitate major shifts in potential productivity of farming systems.

This requires more number of years as on-farm and off-farm trails are involved, but this aspect is considered by international agricultural research centres (long term).

b) 'Down stream FSR' or 'site specific FSR' programmes are designed to identify and test possible innovations which can be easily integrated into existing farming system.

Therefore, down stream FSR focuses a close interaction with farmers via on-farm trails and draws selectively upon the results from commodity, discipline oriented research or up stream programmes.

#### Livestock Component of FSR

Animals can live without man but man cannot live without animals. Animals serve man in a variety of ways. The infinite energy of the sun is assimilated by plant life which, in turn, is consumed by animals, thus converting the sun's energy into food and work--essential for human development. It is interesting to note that animals give Rs. 600 worth of products and services for every Indian (Ramaswamy, 1988).

However, to date, the work on FSR conducted in various international institutes is focussed by and large on crop systems. There are only a few institutions whose mandate is specific to livestock production within the systems perspective. For a country like India where majority of livestock are with small/marginal farmers and agricultural labours, animal agriculture research in the farming systems perspective becomes a priority to address its policies/programmes to the needs of small producers.

It has been documented that a majority of the beneficiaries of Integrated Rural Development Programme (IRDP) are drawn by and large from the milk/animal sector. The experience, however, has shown that the impact of the programme on productivity or asset creation is far from satisfactory. It is often complained that the milk animals changed hands and that the beneficiaries have not been able to generate incremental income for various reasons. While such claims may not be true in toto, they non the less, reflect the unintended effects of the policy that need to be taken into stride by policy makers. The farmers' livestock production which is a sub-system of the total farming system perhaps not been properly understood, and as a result the milk animal component, perceived to be the felt need of the poor, has been mooted without success. Instead an understanding of the poorman's livestock production within his total environment would have helped in programme direction and technology generation in a way that is consistant with the circumstances of the rural poor and would have helped the policy realise the avowed objectives.

The results of other animal husbandry activities taken up in the frame work of IRDP/SLPP were not much different from that of milk animal programme. The important features of animal agriculture system includes:

they make an important contribution to the household economy in the form of small, but very significant, amounts of first class protein and cash income,

the indigenous breeds/strains of stock are well adapted to this role, in that they are effective scavengers and disease resistant,

the input costs are minimal with some expenditure necessary for feed and with housing constructed out of materials (bamboo, paddy straw, palm leaves etc.) grown on farm, and

a significant labour input is required to for cutting and bringing fodder/straw, cleaning, grazing and for providing water.

An appreciation of the logic or rationale of the existing would then be an imperative in designing strategic interventions. The systems study will be all the more important while dealing with traditional cattle breeders like Bharwads and Rabaries in Gujarat and some of the adjoining areas. Livestock keeping is their main source of livelihood and before recommending or attempting any drastic changes a critical study of all the related aspects--socio-economic, technical, ecological etc.--is necessary.

#### Multiple Roles of Livestock

##### a) Livestock as a source of food

In a developing country like India, the role of livestock as food producers is perhaps less important than it is usually felt. It has been said that ten vegetarians can get all their requirements of food and nutrition from one acre of land, while one person would require one acre of land for sustaining on meat. In other words animal conversions are relatively inefficient and in a country like India where food is of prime concern at macro and micro levels, livestock as producers of food are less important, notwithstanding the superior quality of animal protein relative to the protein of vegetable origin.

### b) Livestock as a source of power

From the beginning of civilization draught animals have been making significant contribution to society. There are about 400 million draught animals in the world and market value of these animals and their associated infrastructural systems together may be around US\$ 100 billions (Ramaswamy, 1984). According to Winrock International (USA), animal power as a proportion of mechanical power is still over 80% in most of the third world countries and is as much as 95% in the Far East and South Asia.

India is having 90 million work animals which produces about 45 million HP energy and is valued at US\$ 2.4 billions. These animals plough two-thirds of the area cultivated and haul 25000 million tonne kms of freight saving six million tonnes of diesel oil, valued at Rs.2400 crores per year. The capital worth of this animal system is about Rs.15000 crores. The replacement of draught animal power by mechanisation may need an investment of Rs.10000 crores.

The average farm size in this country does not economically justify the use of tractors at the present levels of agricultural output. Further, with continuous hike in the price of fossil energy sources it is very likely that animal power hold a say for years to come. Thus draught animal power can be appropriate and sustainable technology for intensifying agricultural production and raising living standards of rural communities (Starkey, 1987).

### c) Livestock as a source of manure

Out of a total availability of 320 million tonnes of dried dung per



year only 80 million tonnes is collected and used as fuel in the rural areas. Energy value from the use of this quantity of dried dung is equivalent of over 21 million tonnes of petroleum which would cost about US\$ 4.6 billion per year (Ramakrishna, 1990). However, the value of livestock as a source of manure is not well appreciated by researchers as yet. In a subsistence agriculture, like ours, there is typical symbiosis between crops and animals, in that, the crop wastes are salvaged by the animals and the animal waste go as manure for crops. Also as a substitute for fuel wood, dung reduces pressure on forest resources particularly where dung is used in gobargas plants. The fuel value can be harnessed without affecting the manure value.

#### d) Livestock as a source of capital

Animals as a source of capital for the poorman is an important concept that should be appreciated by planners and administrators of development programmes. Deep in the countryside where the villages are not adequately served by banks and/or where the poor don't have the habit of banking, resort to store their money, in sheep and goat, pigs and poultry (Bernsten et al, 1983). When ever they need money: for purchasing inputs for agriculture, for liquidating a debt, or for performing a social obligation, the animals are sold.

#### e) Livestock as insurance against risk

In arid and semi-arid areas where agricultural failures are common, livestock is being kept to reduce risk of agricultural losses. As a sector, animal husbandry is more drought resistant than crop

agriculture. Thus in the drought-prone areas they help to diversify and stabilise the food supply and income base of the poor in the countryside.

f) Livestock in the context of environmental stability

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Environmental degradation is a serious problem in many developing countries. Due to demographic pressure rang lands, hill sides and forests are being increasingly put to crop production. Crop agriculture on these marginal lands exposes the household to a greater level of risk and also countributes to soil erosion which reduces, in the long run, the agricultural potential of the area. Livestock systems that are economically attractive halt and reverse this process by providing production alternatives that are economically stable (Pino and Martinez, 1981).

g) Livestock in the context of ecological preservation

In the low rainfall areas many of the plants consumed by grazing animals produce a hard coated seeds. Left on the ground, two or more years would elapse before the seeds are germinate. Passage of these seeds through animals guts leave them naked resulting in quicker germination during the following rainy season. Without this cycle the ecological system would deteriorate more rapidly than is already occuring in drought prone areas.

h) Livestock as producers of industrial importance

Other economic value of livestock include skins and hides, bones,

slaughter house by-products which include meat meal, blood meal, and bone meal plus the products like horns and hooves which have industrial potential. A lack of appreciation of their value and travail is part of the reason for their neglect.

Animals in some countries provide warmth during winter since cattle and other livestock in adjoining stable help to heat the farm dwelling. Livestock also provide companionship for humans particularly in urban environments. In developing rural areas young livestock such as puppies, kittens and chicks serve as companions and as a source of entertainment where there are few 'toys' available. Ceremonial events in many societies include the use of livestock. They may also represent wealth and status.

#### Typology of Livestock Systems in India

Natural resource endowment, historical coincidence and cultural values determine the role animals play in a given production system. Given the agro-ecological diversity and socio-cultural milieu, several systems can be deciphered in Indian context. Sometimes, even within a region diverse systems are likely to prevail. A simplistic classification of the livestock systems would be intensive and extensive. Intensive system is that where livestock are fed according to nutritional standards to achieve the production as per market requirements. The animals are usually stall fed and the feeding system is dominated by high energy/protein supplements. However, Indian farmers do not feed their animals at these 'scientific feeding rates' suggested by animal nutritionists. They allocate feed stuffs to animals according to the value of their outputs, giving priority to the

more productive animals (NDDB, 1980).

In the extensive system the land requirement per animal is high and is, at least in the Indian context, a no-cash-input avocation as in the case of sheep/goat or backyard poultry. Also majority of households keep one or two animals for whatever milk they produce, by being fed crop residues supplemented by natural herbage. Thus the value of labour spent by children and womenfolk on picking natural herbage and tending animals is the virtual cost of milk production (NDDB, 1980).

A more meaningful classification of production systems in the farming systems perspective would be (a) crop based system, b) animal based system, and (c) mixed farming system. A majority of farms in the country are crop based, either a food crop and/commercial crop is taken up on the farm and the by-products are fed to animals. Under this system usually a buffalo or a cow and few bullocks are kept to salvage the agricultural wastes and to take care of the draft and energy requirements of the farm. A limited amount of milk is produced for home consumption/sale.

Animal based farms include progressive dairy and poultry farms which may or may not be land linked; and more importantly, the smaller units of cattle or sheep kept by the landless to earn a supplementary income.

Mixed farming is characterised by, as name indicates, crops and animals. The crop component may include a fodder crop, usually taken up after the main crop, and the animals serve the dual role of food production and income generation. By and large livestock in this

country is maintained on mixed farming. The system is characterised by a sort of mutualism between animals and crops (Prasad and Rao, 1966).

In fact the traditional livestock system evolved out of the needs of the traditional agriculture like traction and manure. These needs did not favour selection for productivity, the use of purchased inputs, sale of animals at optimal age for commercial use or development of commercial market channels for high quality animal products. Thus there is a strong case for using FSR approach for research and development of livestock production in the country. It would not only help in generation of appropriate technology but would offer 'clues' for successfully managing the poverty alleviation programmes with crop/livestock components.

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