PN-AAM-623
ISN 27972

Farming Systems Research Group
Michigan State University

The Farming Systems Research Group at Michigan State University, supported by Title XII Strengthening Grant Funds from the U.S. Agency for International Development, and administered by the Institute of International Agriculture, has included Dr. Jay Artis, Department of Sociology; Dr. Robert J. Deans, Department of Animal Science; Dr. Merle Esmay (and Dr. Robert Wilkinson), Department of Agricultural Engineering; Dr. Eric Crawford, Department of Agricultural Economics; Dr. Russell Freed, Department of Crop and Soil Sciences (also representing Horticulture); Dr. Al Pearson, Department of Food Science and Human Nutrition; Dr. Tjaart Schillhorn van Veen, Department of Veterinary Medicine; with Dr. George Axinn, International Studies and Programs and Agricultural Economics, Chair, and Ms. Beverly Fleisher, graduate research assistant.

FARMING SYSTEMS RESEARCH AS IT RELATES TO THE ANIMAL SCIENCES

by Robert J. Deans

Working Paper No. 5

July, 1981

THE MICHIGAN STATE UNIVERSITY FARMING SYSTEMS RESEARCH GROUP

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Farming Systems Research As It Relates To the Animal Sciences

by
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This paper is written using the five subject topic guidelines as set by a group involved in reviewing Farming Systems Research.

1. <u>What is Farming Systems Research (FSR)?</u>

An accurate description of the relatively new acronym, FSR, is necessary if we are to define its scope of activity and appropriateness for the agricultural sector.

This paper treats "Farming Systems Research" as an approach to developing more appropriate knowledge of the field, or of the farm sector, than occurred with previous research. It treats the farm as a system and utilizes a multidisciplinary approach to setting research needs. By focusing on the agricultural system as understood by the farmer, FSR would reverse the source and flow of idea generation and change traditional approaches towards forming innovations for the farm system.

"Research", in the FSR sense, might most appropriately refer to the study of areas in which there are information gaps and unexplored linkages between the disciplines, rather than the study of an approach to studying farming systems. Furthermore, farming systems research should be distinguished from "extension" and diffusion of the generated research results into the broader agricultural sector.

Gaps exist in our knowledge of the field sector. These gaps exist in the information base available in the conventional disciplines as well as in an understanding of the linkages or interrelationships between discipline-based knowledge sets about farming systems. We must research the linkages between

plant, animal, soil and human components of farming systems if we are to create a workable interdisciplinary framework.

It seems doubtful that FSR will result in the creation of a new field of expertise or "labeled" academic discipline, or that any existing discipline will dominate. The specific characteristics of the sector or site itself will determine which discipline should carry a heavier role in guiding any research activity. We can expect that as scientists work in FSR they will develop a sense, feel or ability to do farming systems research as well as becoming more knowledgeable about the other disciplines involved.

The scope of farming systems research must encompass the broad range of types and sizes of farming systems which exist. In addition to developing expertise in "small" farm units, FSR must be capable of responding to the challenge of larger, more organizationally complex systems. This is necessitated by the fact that farms are components of a larger agricultural sector and that there is interaction of varying degrees between farms of different sizes and types. Interaction between large farms and much smaller subsistence-type units also take place in the market and through a joint labor pool. Of even more importance may be the avoidance of polarization which can occur when attention is directed toward just one component of the rural sector. The extension agent usually has to communicate more broadly.

A more specific analysis of FSR as it relates to the animal sciences raises the point of how to most accurately and effectively organize it. The following approach is suggested as being relevant to the animal sciences if they are to be effective in FSR.

Animal production systems can be grouped into three broad types:

A. The small farm system where the animal is a scavenger and is there because it can utilize the local plant residue and homestead wastes.

B. The pastoralist system where the old-world-type range lands constitute

the substrate and where the animal's existence is the major support of the human population. Land, ecology, seasonality, and animal group input/output functions are so different that those found in the small farm setting that they consitute a completely different technical, economic and socio-political system.

C. The specialized group-type animal production systems, such as dairy schemes, ranches, or swine production systems, in which mono-cropping is the supportive nutritional base.

In the subsequent discussion of this paper, reference will be made to each of these grouping systems.

2. FSR - Its Relation to Problem Solving in the Animal Sciences.

It is quite apparent that the creation of a thing called farming systems research, as applied to Group A (small farm) systems, would involve the animal sciences where they have feared, or not cared, to tread.

FSR can provide the stimulus needed to research low level animal performance parameters, of which we know little. There is a great need for investigation of the maintenance nutrient requirements of the indigenous animal and its relative response to nutrition and management inputs.

We need to know the "partitioning" efficiency of the indigenous or small-farm animals as it determines the requirements for the reproducing animal in comparison to the progeny, or output.

As we move into smaller farming systems in animal production we move away from mono-cropping to a much wider array of plant sources which animals must utilize as their nutritional base. Because we know little about the plant sources found in many eco-systems, there is a need to examine and establish the feeding and toxic values of these more unusual feedstuffs. Obviously most of the research on feeding animals has centered upon the value of more conventional mono-crops.

The Group C larger scale specialized farming systems with animals have different problems and bring a need for somewhat different information, in the

systems sense. The use of agricultural chemicals becomes more involved, bringing about the need for technical guidance on the animal and human health hazard potentials.

Animal performance is markedly affected by the environment. Agricultural engineering input on effective large group housing design becomes much more critical in the more specialized production system. This has been demonstrated by a livestock feeds project in Belize where agricultural engineering collaboration on environmental measurement and unit design has resulted in improved housing design for poultry units.

Research in design and function of small scale animal slaughter, storage and processing systems becomes an important component for systems of moderate scale animal output. The food science/livestock marketing expertise then becomes an important component of the regional or area development concern for conservation and distribution of the flow of animals from farm gate level into the consuming sector in a wholesome manner. The development of the excessively large scale, highly automated animal processing plants in the Sub-Sahelian sector of West Africa bears out the need to develop processing networks of appropriate design which are in balance with the system they are to serve.

The Group B pastoralist systems require study of seasonality effects, water-turnover-rate characteristics of animals, and species substitution to provide animals that can exist on browse and low water requirements. The need for information on reproductive cycling as it relates to low levels of nutrient supply or extremes in feed availability is important in such Group B systems.

It seems, in summary, that Farming Systems Research can stimulate work to be directed in the animal sciences toward more appropriate, previously under-emphasized areas.

3. <u>The State of FSR in the Animal Sciences</u>.

Information on the characteristics of small farmer animal systems has been

and continues to be gathered and analyzed in the Caribbean sector by Osuji (1979). This is being complemented by similar programs with cropping systems. The goal is the creation of various models which can then guide programs of more appropriate interventions.

Malyniez (1972) has characterized the small farmer system in New Guinea which utilizes the indigenous pig, and describes the various constraints the farmer has in utilizing local feedstuffs. This work points to the need for research on the requirements and responses of indigenous animals to higher feeding and management inputs.

Shillingford (1971) researched the cash limitation patterns existing in the small farms of Dominica and represented cash outlay patterns as an endpoint in research programs for small farmers who would use local copra meal as a feeding source for pigs. This has resulted in an extensive island-wide swine development project involving local farmer "committees".

Squire (1964) reviewed a series of development schemes in Surinam, Jamaica and Trinidad in which small model farms were established utilizing the dairy animal as a primary earning source. The economics of grassland production, its utilization by the dairy animal under varying human skill conditions, and the role of the farmer, his attitudes, and financial position were contrasted.

Odend'hal (1972) has published information on Indian cattle including demographic data, feed input, energy output factors, and energy values of dung in rural West Bengal. This work focuses on "low energy" human cultures, and, while lacking in completeness of animal output information, does provide estimates of caloric flows for animal power and animal dung yield which is important information for understanding the rural system in that region.

A more conceptual analysis of the role of livestock in programs of small farmers in Asia and the Far East has been written by Dhital of FAO. This stresses the importance that the integration of animals with the crop production sector

has in raising the income level and broadening the production base. "Compartmentalizing activities in livestock and crops cannot help increase productivity" and, according to this work, the various components of the production system must by integrated into farm production units. Dhital refers to studies in Karnal, India where crop-livestock integration at the small farm level is being studied. The need for (A) appropriate research on developing breeding animals suitable for local farm ruminants, (B) "barefoot," veterinarians, (C) developing feeding programs which utilize unusual feedstuffs, (D) researching management systems which fit a local systems capability to sustain and (E) consideration of the motivational system are all described. This does suggest certain lines of approach.

Systems analysis and reviews of pastorialist-type schemes have involved ranching association or group concepts with Fulani, (Gooch: 1979) and Masai, (Deans et al.: 1969). In each case actual group or association formation had occurred and the pastoralist system was considered to include animal, plant, land and socio-economic factors. The Masai project is an example of the inclusion of a social scientist in a team of technically oriented specialists.

A number of analyses of the pastoralist in social-ecological contests exist (Barry et al.: 1977, and Brandstrom et al.: 1979). Simulation models (Manetsch et al.: 1971) have been developed which point to needs for information critical to more complete understanding of this pastoralist system. Such factors as livestock death rate and points of reproduction failure or animals on low planes of nutrition have evolved as requiring research.

4. Basic Principles, Concepts, Generalizations in the Animal Sciences About FSR.

"Systems" is now a buzz word in the animal sciences, but for the mos it has involved the tracking of energy flows and cost linkages. The invc of the animal sciences in systems research with the very small farm has no

frequently occurred, probably because the animal is often viewed by the animal scientist as a "fifth wheel" in these types of agricultural units. The animal in these type of systems scavenges and is maintained on residues from various small plot croppings or on household wastes. Even though the animal plays a very important role in these types of farms, what animal scientist wants to be identified with a thing like that?

As our awareness grows of the role of the animal as a competitor for humans in the food chain, and as the cost factor of fossil fuel requirements for various types of animal systems becomes more critical, animal scientists, and in fact the animal production and marketing sector itself, is becoming concerned about looking to alternative, low energy ways to manage and maintain animals. The animal production sector is broadening its concept of "What it always wanted to know about animals and their production systems but was afraid to ask."

Another factor which is changing the scope of thought and research in the animal industries is the concept of considering the animal as a means of utilizing wastes, both as a means of alleviating a disposal problem and in increasing food production. The feeding of sewage, wood pulp waste, waste paper (the ultimate in rewards for a document like this), and the recycling of animal manures all are forcing the animal scientist to be aware of the technical linkages which must be formed with other disciplines in such research/development schemes. This is definitely moving the animal scientists into a more creative posture or attitude towards more unconventional roles for animals, both on farm and off.

As funds now flow into various institutions for "development" purposes, we now see writings about such relevant subjects as: (A) genetic capabilities of the indigenous animal, (B) requirements of energy and other input/output flows for animal power, (C) the goat as a utilizer of browse plants for meat and milk, (D) the capybara as a protein source, etc.

It seems unfortunate in one sense that these weren't seen earlier in their own right as being important by the animal scientist. The fact that such a broadening of interest now exists will stimulate the interest in farming systems research in the animal sciences.

In "C" type animal production schemes, farming systems research is being catalyzed by farm activity inventory systems such as Tel Farm and Tel Plan. However, the involvement of the animal production specialist is usually limited to providing inputs in the animal production component itself. The structure of such farm management schemes favors a farming systems research approach, but it will likely continue to be a multidisciplinary approach with little forming of real systems study by the disciplines---at least the way it is now structured and administered.

In group "B", pastoralist systems, the human element subsists largely on the animal. Thus the animal plays a central role in this system. It is in this type of system that farming systems research really means something to the animal scientist, as the environmental, human, and animal components are all so closely linked.

It is in Group "A" type animal schemes that farming research is least developed, and in which it may be most challenging to work. The single animal existing on a wide base of nutrient sources functioning as a scavenger or bank presents a technical challenge. This has attracted interest in finding ways to measure all the inputs involved to change its rate of growth or reproduction. Doing this requires setting up groups under controlled conditions, which create atypical small farm situations.

Evaluation endpoints may have a strong influence on farming systems research programs in the animal sciences. If we target endpoints which involve a rather wide array of components, such as human food protein production per $1000 cash

outlay, we involve the family system itself. There are many other examples of the effect evaluation endpoints have on stimulating the FSR approach.

5. Needs for Other Disciplines for Analysis and Program Formulating.

What is needed in a very broad sense is an ability to communicate on lines of mutually agreed upon importance. The specific need may be a function of the particular system involved but it may not always be a need for information about animals which the animal specialist alone can perceive.

An experience on a team of technically oriented people to which a social scientist was added, illustrated how cross-fertilization of ideas in the identification of needs could occur. The orientation of this social scientist in working with pastoralists provided a challenge to the technical expert to prioritize his technical recommendations and to be willing to see recommendations which did not mandate a complete variable control.

In this case the awareness of the target group itself, (the Masai), of a broad array of technologies was evident, even though they were couched in different terms or means of expression. Concepts of water-turnover-rate became critical in any basic discussion of this system, and both the pastoralist and technical people knew it. It became necessary for each member of this team to point out areas of concern to the other and, in fact, to challenge the technical recommendation of that particular expert.

It is obvious that the animal production discipline needs access to the social scientist for knowledge of methods of describing and evaluating human systems, to the economist for methods and measures of financial and economic flows, and to other technologies in which soil/plant nutrient relationships are involved.

Above all will be the experience with farming and the ability to relate to the farmer or rancher himself.

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