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Production Management Research
for Farm Decision-Making
The Livestock Enterprises

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Production Management Research for Farm Decision-Making

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Farmers and extension specialists are increasingly concerned about the effect of various processes, techniques, and practices on a particular enterprise. This increase in the relative importance of "how to produce" decisions stems from the continued rapid influx of new production systems.

While process or "enterprise production management" problems have become more important, research emphasis and procedures often have not been adequate. Farmers, farm suppliers, and educators seek more definitive answers than have historically been available. Many studies of enterprise costs have been made, ignoring the process. The greatest need, however, is for the study of alternative processes for a given enterprise. Further, the investigation of processes can be more effective.

Some criteria for effective enterprise production management research with illustrations follow.

Criteria for Effective Enterprise Production Management Research

1. Problem Identification

Since this research is production problem oriented, one of the most crucial criteria for effectiveness is the ability to identify the most important and most relevant problems which are and will be facing producers. To accomplish this researchers must be interested in the particular production process and must have good communications with other researchers, extension specialists, and farmers in addition to being competent economists. Researchers must anticipate change, for if their work is to be useful it must be current.

1/ Journal paper   Purdue University, AES, August 1964.

2/ I am grateful to W. H. M. Morris and L. S. Hardin for helpful production management research ideas.

For example, a swine management research group at Purdue is presently comparing alternative growing-finishing housing including (1) pole type open-front buildings, (2) enclosed slotted dunging alley buildings, (3) enclosed totally slotted floor buildings, (4) enclosed concrete floor buildings, and (5) portable houses on pasture. Immediate plans call for a comparative evaluation of structures and equipment for all phases of the swine life cycle. Plans for the future include the study of many other swine management problems.

The present emphasis on buildings is the result of wide observation of research and practices both in the United States and Europe. After observing many swine management problems, the following criteria were used to establish priorities. The importance of production management problems increases as (1) the potential effect on average costs or returns increases, (2) the amount and time of investment increases, (3) the possible effect on the size-cost relationship increases, and (4) the potential effect on the relative amounts of capital and labor increases. The slotted floor controlled environment buildings rank high in all of these.

2. Interdisciplinary Approach

Agricultural production management problems have their roots in several disciplines. Lack of multi-discipline attack on such problems may produce fragmentary results, too scanty for economic analysis. Narrow studies by different departments on the same production problem have often resulted in different conclusions, with extension specialists in various disciplines making divergent recommendations.

Most production management studies can benefit from a multi-discipline approach. This cooperation of disciplines must take place at the initial

planning stage so that the problem is clearly defined and various participants in the research can set procedures for measuring the variables considered to be important. The product of such planning is a research result which is (1) sufficiently comprehensive to be of value for farmer decision-making, and (2) understood by and acceptable to all disciplines.

For example, in one phase of the Purdue swine management project, researchers from Agricultural Economics, Agricultural Engineering, Veterinary Sciences, Animal Sciences, and Statistics considered variables which should be measured and methods for measuring these variables in the evaluation of the growing-finishing houses previously mentioned. They concluded that the effect of housing on the following variables should be measured: (1) environment (temperature, humidity), (2) feed conversion, (3) rate of gain, (4) carcass characteristics (dressing per cent, ham and loin yield, length, backfat, muscle color, muscle firmness, muscle pH, tenderness), (5) disease incidence (lung infection, leg defects, ulcers, other), (6) cannibalism, (7) death loss, (8) building-use cost, (9) building investment, (10) labor required, and (11) other costs, (bedding, electricity, veterinary, etc.). These categories are not mutually exclusive; they allow the physical scientists to obtain the information they need for their purposes and they also provide the information to form and test hypotheses of "why" certain results are obtained. Extension specialists in the various cooperating departments have been presenting the results on all of these factors as well as cost and return budgets for the various houses. All extension specialists have found the results to be acceptable.

It is logical for the agricultural economist to help coordinate such research since he should have the breadth of view of measures which are needed to make an economic analysis. Substantial financial support by the Agricultural Economics Department may be required. In many instances, other disciplines are asked to measure or help measure variables which they would not have considered for their own purposes. If they are to accept this task they will likely expect staff and financial support from Agricultural Economics.

Also, the agricultural economist must be willing to broaden the research to include measures of variables which he may not need for his own analysis. Hence, the multi-discipline approach may actually increase the Agricultural Economics research cost. However, because of the many kinds of research results being generated simultaneously, the total cost of studying a particular problem is probably lowered while a far more comprehensive and useful research result is generated.

The interaction of several disciplines tends to generate both researcher and administrator enthusiasm. Our experience has been similar to a Michigan State interdisciplinary fertilizer study as we also have observed that "when representatives from various fields of work join forces and agree on a mutually advantageous program to serve agriculture, such a program receives high priority in the minds of administrators charged with using research resources efficiently". 1/

3. Multiple Source Data Collection

Accurate data ~~are~~ all important. There are three possibilities for obtaining data: surveys, production experiments, and synthesis. 2/ Each of

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- 1/ Glenn L. Johnson, "Interdisciplinary Considerations in Designing Experiments to Study Profitability of Fertilizer Use", Methodological Procedures in the Economic Analysis of Fertilizer Use Data, Edited by E. L. Baum, Earl C. Heady, and J. Blackmore, Iowa State College Press, 1956, Chapter 2, Page 22.
- 2/ Production experiments are defined as farm simulation with control over non-random variables. Conditions are made as similar as possible to the production process which is expected to be optimum for commercial production. For example, the swine growing-finishing buildings previously discussed were constructed with a capacity which is commonly used, about 100 hogs per building. The experiment was managed in a manner thought to be economically optimum (time and method of cleaning pens, time and method of feeding, type of ration).

these has particular advantages and limitations and therefore, depending on the problem, one, two, or all three methods may be used. 1/

Production experiments enable the control of non-random variables. In comparing buildings in the Purdue experiment, breeding, ration, pig size, season, and management practices were controlled for the various houses. Thus, the effect of housing systems alone was measured.

Valid comparisons of such factors as feed conversion and rate of gain from farm observations would be difficult or impossible because a number of uncontrolled variables (breeding, ration, season, practices, etc.) are confounded with housing system, and the variation due to these factors makes it very difficult to isolate the effect of housing.

While control is an advantage it may also be a disadvantage since the interaction of controlled variables held constant with housing effect is not determined. To measure the interaction of controlled variables might require a production experiment so complex that it would be impractical. Hence, farm surveys may be used to give insight into the effect of variation in factors held constant in the production experiment.

The production experiment on swine growing-finishing facilities indicated that death loss and cannibalism experienced in the fully slotted floor building resulted in a higher cost than other buildings. The analysis indicated that if these cannibalism problems could be controlled, this type of house would likely be competitive. A survey of farmers showed that with certain practices and certain breeds, some excellent managers were able to control this death loss, hence, the slotted floor house can be competitive with the conventional open-front house and slotted dunging alley house with special practices and conditions. Farm surveys may not only provide insight

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1/ See Thomas Travel and R. J. Hildreth "Relative Roles of Survey and Experiment in Farm Management Research", Journal of Farm Economics, Vol. XXXIX, 1957, p.1445.

into the effect of known practices, but may also identify innovations which farmers have developed to meet problems.

Farm surveys may provide more accurate estimates of variables such as labor used, rate of building depreciation, and prices because a greater number of observations can be secured for each practice or system being compared.

Many production management problems are concerned with the evaluation of new technologies. Farmers need information about the effect of these technologies before they are common on farms. The production management experiment or synthesis are the only ways that many of these technologies can be evaluated at a relevant time as there are few, if any, farms to survey.

In addition to solving problems about existing management systems, production experiments allow researchers to create new management systems. An interdisciplinary contribution of ideas to such evaluation will greatly increase the odds of these systems being physically and economically feasible.

* Also, it may not be possible to obtain the comprehensive type of data (described in the previous section) from farm survey because the technical help necessary is not sufficient to make measurement on large numbers of farms, and it may be impractical to secure this data from farm production. In the swine growing-finishing experiment, recording devices were used to determine temperature and humidity. These instruments are costly and require careful supervision. Veterinarians made semi-weekly checks on production experiment hogs. It would be very costly to make these observations on a large number of farms. Carcass evaluation required a cooperating hog slaughter plant and a crew present at slaughter time. Many farmers would not be willing to sell to a given market, and it would be impossible to have the carcass evaluation crew available each time cooperating farmers shipped hogs.

For certain types of problems or aspects of a particular problem, data may be constructed by the researchers from (1) related experiments or surveys, (2) specifications by the manufacturers of an input, or (3) scientific knowledge and theory. The chief advantage of this method is a saving of time and money. As an example, one system of housing growing-finishing hogs is being used by farmers but this system was not directly included in the swine experiment. This system includes pasture and portable housing in the summer and portable housing with a concrete slab in the winter. Information was collected for pasture in the summer and the pole building in the winter. The portable housing was assumed to be similar to the pole building, and data recorded on the pole buildings was used to synthesise the portable housing, concrete, pasture system.

Certain problems may be solved with synthesised data as the only source of information. Synthesised data may be very effective in some cases but can lead to error in others. Certain events may occur in practice while they may not be expected from theory.

Building manufacturers predicted substantial gains in feed conversion from the enclosed insulated slotted floor house. They advertised this gain and sold many houses on expected improvement in feed conversion. They based their prediction on estimates of (1) the temperature in the house, considering insulation, ventilation, and heat generation by the hogs, and (2) the effect of temperature on feed conversion. Results of both the production experiment and farm survey do not support the predicted improvement in feed conversion. Hypothesis of "why" are presently being formulated and tested.

Many other examples could be provided about the complimentary relationship of production experiments, farm surveys, and synthesis for obtaining needed data.

4. Timeliness

A useful production management research program requires early identification of the problem and rapid follow-up in initiating the research, analyzing the data, and publishing the results. The research need is created by changing technology; long delays in obtaining results can greatly reduce their value since farmers will have already solved the problem through trial and error or other new technologies will have changed the problem. Research must be initiated before the problem is generally recognized.

Timeliness requires imaginative researchers, close to the subject area and far sighted in predicting when a technology is likely to have impact. In addition, there must be an administrative structure which enables the rapid initiation of research. If several months are required to approve a project statement, several more to obtain a working force and initiate the research, several more to analyze the data, and several more to publish the results, the effectiveness of the program will be reduced.

We are attempting to include all of the production management research for a given enterprise under a single comprehensive long-term project. Work plans for a specific problem can be initiated quickly.

Even when conditions allow rapid initiation of research, some time will elapse between identification of the problem and beginning of the experiment or survey. During this time the problem may change, thus it is extremely important that flexibility be maintained so that the research can be adjusted to the most relevant current need.

Some full-time research technicians or assistants may be needed to move data collection and analysis quickly.

5. Interpretation of Results

If the results of production management research are to be most useful to farmers, they must be put in the perspective of impact on farms with various resources and goals. The results of the swine growing-finishing experiment showed very similar costs and returns for hogs on (1) pasture, (2) conventional pole-type confinement, and (3) enclosed insulated house with a slotted dunging alley. Yet the pasture and conventional systems required a building and equipment investment per hog of \$15.00 compared to \$44.00 for the enclosed house. The costs of labor, bedding, and feed were higher for pasture and low cost confinement while the annual use cost of buildings was higher in enclosed buildings.

Hence, there are three growing-finishing housing systems which are economically competitive and the one which should be chosen depends on the particular farm situation -- the labor supply, capital supply, land type, optimum intensity of the hog program, likely tenure of the hog program, the ability of the manager, and the goals of the manager. The cost and returns figures alone are of limited use; the results need to be set in the perspective of the total farm business.

Summary and Conclusions

In summary, perhaps the most important things which can be done to meet the need for more effective production management research would be:

- a. Emphasize and recognize the growing importance of the process.
- b. Encourage some researchers to develop complete knowledge of the production of certain products and to be aware of evolving technologies.
- c. Make greater use of production experiments for obtaining data but also use parallel farm surveys. This requires interdisciplinary

cooperation if the experiments are to be possible, well planned and low cost. Farm surveys can also benefit from interdisciplinary cooperation.

- d. Develop attitudes and procedures which enable quick evaluation of new processes and methods.

Enterprise production management problems are of such importance that farmers must have answers. Evaluation of alternative production systems is too expensive for individual farmers to undertake on a trial and error basis. They, therefore, look to the Agricultural Colleges and Experiment Stations for objective evaluation of alternative systems. Failure to give meaningful attention to such problems might result in the establishment of a new institution to meet the farmers' needs. This would be costly to society, for within our present institutional structure are resources which can be used for the imaginative creation and effective evaluation of advanced production systems. Effective enterprise production management research will not only accelerate the adoption of new technology, but will also reduce economic losses resulting from the trial and error method of evaluation.