



**AgEcon** SEARCH  
RESEARCH IN AGRICULTURAL & APPLIED ECONOMICS

*The World's Largest Open Access Agricultural & Applied Economics Digital Library*

**This document is discoverable and free to researchers across the globe due to the work of AgEcon Search.**

**Help ensure our sustainability.**

Give to AgEcon Search

AgEcon Search

<http://ageconsearch.umn.edu>

[aesearch@umn.edu](mailto:aesearch@umn.edu)

*Papers downloaded from **AgEcon Search** may be used for non-commercial purposes and personal study only. No other use, including posting to another Internet site, is permitted without permission from the copyright owner (not AgEcon Search), or as allowed under the provisions of Fair Use, U.S. Copyright Act, Title 17 U.S.C.*

2-50  
Production Economics Paper No. 6217  
Purdue University  
October 8, 1962

ECONOMICS OF ENTERPRISE SPECIALIZATION: LIVESTOCK FEEDING

Ludwig M. Eisgruber

Prepared for presentation at the Joint Meeting: North-Central Farm  
Management Committees on Research and Extension, Chicago, Illinois,  
October 2, 1962.

## ECONOMICS OF ENTERPRISE SPECIALIZATION: LIVESTOCK FEEDING

### Information Required and Available for Educational Work\*

Ludwig M. Eisgruber  
Purdue University\*\*

Although the term specialization, at first glance, seems to have a perfectly clear meaning, it may be interpreted in at least two ways. First, specialization may be taken to mean the production of one and only one product, or it may be interpreted as a definite emphasis on one or a small number of enterprises in combination with or without a number of less important enterprises. The approach to an examination of the question of specialization and the conclusions growing out of such an investigation may differ significantly depending on which of the above interpretations of the term enterprise specialization is chosen, since such concepts as enterprise complementarity and utilization of fixed and/or discrete resources play a minor role or are neglected completely if the first definition is chosen, while they are of prime importance for the second definition.

It is our opinion that the less restrictive definition of "definite emphasis on one or a small number of enterprises in combination with or without a number of less important enterprises" is the more relevant one, and we have, therefore, chosen this definition for the following discussion.

---

\* Prepared for presentation at the Joint Meeting: North-Central Farm Management Committees on Research and Extension, Chicago, Illinois, October 2, 1962.

\*\* The review of an early draft of this paper by J. E. Kadlec and E. W. Kehrberg is gratefully acknowledged.



Since a meaningful determination of available and required information can only be accomplished relative to some conceptual framework, I will first enumerate and describe, in qualitative terms, the factors relevant in a study of enterprise specialization. Available information will be discussed next, followed by suggestions for required information.

#### Factors Determining Enterprise Specialization

1. Economies of Size: One of the most readily understandable and most frequently stated principles in favor of specialization is that of economies of size. Both production and marketing economies of size are important in this context. It is, of course, recognized that diseconomies could conceivably occur. Yet, the generally accepted judgement is that the size of enterprise where diseconomies begin is far from being reached in agricultural production.
2. Technology of Production: Closely related to the question of economies of size is that of technologies of production. As a matter of fact, one of the most important causes cited for a declining unit cost curve as the size of the enterprise increases is the increased possibility of using cost reducing techniques of production. Aside from contributing to a reduction of incidence from parasites and disease, these cost reducing techniques of production consist largely of a substitution of capital for labor. Such a process does, however, raise questions which will be considered under "fixed factor problem" and "resource availability".
3. Management: Particularly in more recent discussions of the question of enterprise specialization, the question of managerial ability required to manage large enterprises has played an important role.

It is generally recognized that advanced techniques of production, while cost reducing, also require considerable management ability. While it appears easier to accumulate useful knowledge for one enterprise than for many, there comes a point in the expansion of an enterprise where the demands on the manager become so high and errors so costly to the entrepreneur that a lower degree of specialization becomes economically optimal.

4. Riskiness and Uncertainty in Specialization: Like management, riskiness and uncertainty due to fluctuations in yields (both crop and livestock), prices, institutional and technological changes are considered an impediment towards enterprise specialization. Historically, incomes from any one enterprise have fluctuated widely. There is no reason to believe that this will change significantly in the relevant future. Such fluctuation is not only distasteful to the farm entrepreneur, but it may endanger the continuing life of the farm business. Since incomes from various enterprises do not fluctuate together, and since low (or negative) correlation of enterprise returns stabilizes total farm returns, a diversified farm plan may be chosen at the expense of higher expected returns with specialized operations.

5. Complementarity of Enterprises: While generally an important section in the theory of the firm and farm management courses (at least in the discussion of soil fertility and fertilization), the question of the shape of the opportunity contour for various farm enterprises receives little attention. However, knowledge of the



forms of these opportunity contours is of value in deciding on the degree of specialization unless it can be assumed or it is established that these contours are such that they give a boundary solution, i.e. indicate complete specialization as the optimal solution.

6. Most Efficient Utilization of Available Resources (fixed factor problem): A farm operator, in making decisions with respect to the farm business, finds himself in a situation where he makes decisions relating to a going concern with already committed and sometimes large discrete units of resources. It is, of course, possible that these resources are fully utilized if enterprise specialization is chosen. Frequently, however, some of the resources already committed will be poorly utilized or may lie entirely idle unless a farm organization consisting of more than one enterprise is chosen. The unit cost curves (which include charges for the fixed factors) for the smaller sized but larger number of enterprises may be higher than they would be if a single but larger enterprise had been selected. But in a particular decision situation fixed assets may have a relevant cost equal to zero. Hence, a more diversified farm organization is more profitable than a highly specialized one, despite of a theoretical or empirical long-run average cost curve which indicates economies of size.

7. Resource Availability: In many instances some of the important fixed factors referred to in (6), e.g. labor can be utilized effectively in specialized enterprises if the enterprise can be expanded to a large enough size. However, such expansion may not be

possible because of capital limitation and the customary farm transfer contracts.

While some of the above described factors are standard items in discussions of the feasibility and advisability of enterprise specialization, others are never mentioned explicitly. It is hoped that the above brief description of the latter group of factors together with some of the empirical evidence mentioned later is sufficient to indicate their relevance to the subject under discussion.

It might be argued that the factors and concepts discussed above should have been forged into a more rigorous framework, and/or such concepts as Tintner's "risk preference function" etc. should have been introduced. However, such an undertaking might have resulted in a treatise somewhat more esoteric than is optimal for today's discussion.

#### Available Information

While the situation where additional information would no longer be helpful are rare, there is actually a considerable amount of information available relating to the question of livestock enterprise specialization.

Although one might argue about timeliness of information and methodology of preparing the information, there is a relatively large number of production economies of size studies (e.g. 1, 3, 6, 12, 14, 20, 21, 22, 23, 24, 27, 29, 32, 36, 37, 43, 44, 45, 54). There are differences in methodology, but there is a surprising degree of consistency among these studies, regardless of whether they pertain to the hog, poultry, dairy, beef, or lamb enterprise, at least to the extent that unit costs decrease rapidly as very small enterprises are expanded. However, unit cost curves



level off at rather small enterprise sizes, indicating only nominal, if any, economies beyond that point. There are a few studies (1, 6, 12, 29, 32) which indicate possible diseconomies of size, thus cautioning against too much optimism with respect to ever continuing production economies of size.

Marketing economies of size are frequently used as argument for large enterprises or enterprise specialization. While such an argument seems logically sound, there is little empirical evidence specifically designed to lend weight to it. The relatively small amount of information available again suggests some caution, since the hypothesis of marketing economies of size seems to be substantiated by some studies (e.g. 12) but not by others (e.g. 6).

The importance of both technology and management are faithfully recognized in economies of size studies. Little more is generally done after this recognition is duly rendered. The few studies (Purcell et. al., 43; Kadlec et. al., 29; Amick, 1) which have rather successfully isolated technology, technical skill, and management indicate the importance of these factors on unit costs. But they also play down the importance of size per se. Neither of the immediately above mentioned studies claims to have isolated anything else but an inseparable mixture of technological and managerial factors.

There are a few specifically technological studies on management systems and materials handling which are valuable in a discussion of size and specialization (e.g. 2, 4, 11, 35, 39, 51) and a large number of potentially valuable studies outside the agricultural economics profession



(for a discussion of the problems in using most of these studies for solving some economic problems see 34). When it comes to an explicit consideration of management in relation to size and specialization, no published studies are known to us. This is undoubtedly due to our inability to measure, or even formulate an operational concept of, management. While the tenant indices developed by D. W. Thomas et. al. are extremely useful in their own right, we expect that results from studies carried out at Minnesota and Ohio, where specific emphasis is placed on managerial ability for a type of farm or enterprise, will probably be more useful in solving problems of specialization. The information presently available on characteristics of innovators (e.g. 7, 40) is related to the subject.

The results of empirical investigation of the influence of specialization (or, conversely, diversification) on the riskiness of outcomes tend to minimize the importance of risk as a most important consideration in livestock enterprise specialization. While some studies tend to bear out theoretical expectations 1/, the conclusions drawn from these studies are qualified because of lack of necessary data, limitations in methodology, environmental changes, etc. Other studies of the same subject indicate that three- and four-enterprise combinations reduce income variability very little beyond adjustments attained with two enterprises (c.f. 9) and, under certain circumstances, neither expected income nor income variance change appreciable regardless of whether the same size

---

1/ Namely that a given amount of resources utilized in a diversified rather than a specialized farm organization results in decreased risk according

to: 
$$\sigma_T^2 = \sum_{i=1}^K q_i^2 \sigma_i^2 + 2 \sum_{i=1}^{K-1} \sum_{j>i}^K r_{ij} q_i q_j \sigma_i \sigma_j .$$

farm is organized as a specialized hog farm, a specialized beef farm, or with any combination of the two (c.f. 50). At least one study (c.f. 48) concludes that specialization of the livestock enterprise will have better results, in terms of income stabilization, than diversification.

There is little specific information relating enterprise specialization to enterprise complementarity, the fixed factor problem, and resource availability. But there are a number of studies which demonstrate that these concepts have relevance. Rhoads, et. al. (46) showed that on a Central Indiana farm labor income was higher for a combination hog-beef enterprise than for either a specialized hog or beef farm. Optimal use of labor and capital requirements that did "not appear excessive" were cited as the reasons. Bottum (8), in an application of canonical correlation to the estimation of opportunity contours found that the relation of the (fluctuating) price ratios between enterprises to their opportunity contours is such that, for certain livestock enterprises and in the long run, probably any point on the opportunity contour represents an equally profitable enterprise combination (or specialization, if a boundary solution is chosen). Consequently, there must be other factors, such as asset fixity and resource limitations which determine the enterprise combination. Heady et. al. (19) and more explicitly Kadlec et. al. (29) have shown that enterprises which are frequently considered to be of minor importance may be highly complementary to livestock enterprises and they may cause costs of livestock feeding to go up if limiting.

#### Required Information

The brief review of available information presented above suggests,



as it stands, a number of aspects of livestock enterprise specialization for which information is needed both for on-campus and off-campus teaching. Rather than enumerating these aspects again, the following suggestions for needed work and thought are confined to four broad areas.

The first of these four areas pertains to a development of a concept of specialization that is broader than risk and economies of size. In the past, discussions, research, and research reports on enterprise specialization appear very definitely limited to these two considerations. It is hoped that the preceding discussion demonstrated sufficiently that other relationships are important, possibly more important than economies of size and risk.

The second suggestion pertains to the factor management. Considerable effort is already being expended in this area. The progress is commensurate with the difficulty of the subject. It is possible that the development of an operational concept of technology, skills, and managerial ability with subsequent specification and measurement of skills would solve much of the problem presently labeled "managerial ability" in the context of enterprise specialization. The possibly more difficult job of quantifying managerial ability proper would then be an additional step.

The remaining two areas where additional information is required are closely related. These two areas are the problem of fixed assets and dynamic planning. To be realistic, any education with respect to farm organization must recognize the position of the farm operator at the point of planning. This is, in the majority of the cases, one where fixed assets play an important role. Likewise, predictable or possible changes in the



situation must be taken into account. Such changes may refer to the farmer's life cycle as well as to his environment. The question of the cost of flexibility will have to be examined. While it is conceivable that a particular degree of specialization or diversification may be achieved by a flexible as well as inflexible plant, it is less clear what the impact of a flexible versus inflexible plant is on investment demands, cost, management requirements, form of investment, and possible adjustments. It is generally accepted that these important factors, yet our knowledge of their impact particularly on enterprise specialization and the use of such knowledge in education is conspicuous by its absence.

The above review and discussion is by design not one to give a clear "yes" or "no" to the question of livestock enterprise specialization. Instead, it was preferred to adhere to the complexity of rude reality under the assumption that in education it is preferable to look for principles and concepts rather than easy answers which tend to become obsolete rapidly.

#### Bibliography

1. R. Amick, The Influence of Size of Enterprise on the Cost of Producing Hogs in the Coastal Plains of Georgia, unpublished Ph.D. thesis, Purdue University, 1961.
2. R. N. Van Arsdall, Self-Feeding Silage to Beef Cattle From Horizontal Silos, Illinois Agricultural Experiment Station Bulletin 642, 1959.
3. J. Bailey, What Size Laying Flock, Cornell Agricultural Experiment Station Bulletin 1052, 1957.
4. R. Baker and E. O. Heady, Economy of Innovations in Dairy Farming and Adjustments to Increase Resource Returns, Iowa Agricultural Experiment Station Bulletin 478, 1960.

5. R. H. Bauman, Comparative Costs of Portable and Permanent Structures in Swine Production and the Effect of Intensity of Use on Costs, Cooperative Extension Service, Purdue University Mimeo, EC-149, July 1957.
6. R. H. Bauman, L. M. Eisgruber, R. E. Partenheimer, P. A. Powlen, Economies of Size and Economic Efficiency in the Hog Enterprise, Purdue Agricultural Experiment Station Bulletin 699, 1961.
7. J. M. Bohlen, et. al., Adapters of New Farm Ideas, North-Central Regional Extension Publication 13, October 1961.
8. J. S. Bottum, A Production Function Analysis of the Agricultural Adjustment Problem, unpublished Ph.D. thesis, Purdue University, 1963.
9. W. G. Brown and E. O. Heady, Economic Instability and Choices Involving Income and Risk in Livestock and Poultry Production, Iowa Agricultural Experiment Station Bulletin 431, 1955.
10. M. Burkes, Formal and Informal Insurance as Adjustments to Risk and Uncertainty in Farming, unpublished M.S. thesis, Purdue University, 1960.
11. V. W. Davis, R. N. Van Arsdall, J. E. Wills, Management and Cost of Field-Shelling and Artificial Drying of Corn in Illinois, Illinois Agricultural Experiment Station Bulletin 638, 1959.
12. L. M. Eisgruber, E. W. Kehrberg, J. W. Sicer, Effect of Flock Size on Egg Production Costs and Returns, Purdue Agricultural Experiment Station Bulletin 686, 1959.
13. L. M. Eisgruber, J. Nielson, Decision-Making Models in Farm Management, paper presented at a seminar on the Management Factor in Agriculture conducted by the Basic Managerial Subcommittee of NCR-4, Chicago, Illinois, March 1962.
14. J. C. Elrod and J. R. Russel, An Economic Analysis of Grade A Dairy Farming in Georgia, Georgia Agricultural Experiment Station Bulletin N.S. 71, 1959.
15. R. Greve, J. S. Plaxico, W. F. Lagrove, Production and Income Variability of Alternative Farm Enterprises in Northwest Oklahoma, Oklahoma Agricultural Experiment Station Bulletin B-563, 1960.
16. C. B. Haver, Economic Aspects of Hog Production in North Dakota, North Dakota Agricultural Experiment Station Bulletin 391, 1954.
17. E. O. Heady, Diversification in Resource Allocation and Minimization of Income Variability, JOURNAL OF FARM ECONOMICS, Volume 34, pages 482 to 496, 1952.



18. E. O. Heady, E. W. Kehrberg, E. H. Jebe, Economic Instability and Choices Involving Income and Risk in Primary or Crop Production, Iowa Agricultural Experiment Station Bulletin 404, 1954.
19. E. O. Heady and R. O. Olsen, Substitution Relationships, Resource Requirements, and Income Variability in the Utilization of Forage Crops, Iowa Agricultural Experiment Station Bulletin 390, 1952.
20. R. Helfenstine, Equipment Costs of Different Size Cattle Feed Lots, Cooperative Extension Service, South Dakota State College, F.S.-59.
21. J. Hopkin, Economies of Size in the Cattle Feeding Industry of California, JOURNAL OF FARM ECONOMICS, Volume 40, pages 417 to 429, 1958.
22. A. K. House, Factors Affecting Cost of Milk Production in the Louisville, Kentucky Milkshed, unpublished M.S. thesis, Purdue University, 1962.
23. H. B. Howell, Economies of Scale in Livestock Production, JOURNAL OF FARM ECONOMICS Proceedings, pages 1,229 to 1,236, December 1961.
24. M. R. Janssen, Beef Cow Herd Costs and Returns, Purdue Agricultural Experiment Station Bulletin 725, 1961.
25. H. R. Jensen and W. B. Sundquist, Resource Productivity and Income for a Sample of West Kentucky Farms, Kentucky Agricultural Experiment Station Bulletin 630, pages 27 to 31, 1955.
26. G. L. Johnson et. al. (eds.), A Study of Managerial Processes of Midwestern Farmers, Iowa State University Press, Ames, 1961.
27. R. G. Johnson and T. R. Nodland, Labor Used in Cattle Feeding, Minnesota Agricultural Experiment Station Bulletin 451, March 1961.
28. G. G. Judge and E. R. Swanson, Adjustments in Size of Beef and Hog Enterprises: A Markov Process Analysis, ILLINOIS AGRICULTURAL ECONOMICS, Volume 2, No. 2, July 1962.
29. J. E. Kadlec and A. K. House, The Effect of Technical Efficiency on Optimum Size, JOURNAL OF FARM ECONOMICS Proceedings, December 1962.
30. E. W. Kehrberg, A. Kassier, J. S. Bottum, L. M. Eisgruber, E. R. Eisgruber, Multi-Product Versus Single-Product Production Functions, Purdue Agricultural Experiment Station Bulletin in progress.
31. F. Knight, Risk, Uncertainty, and Profit, Houghton Mifflin, Boston, 1921.



32. J. C. Kohout and J. C. Headley, The Relation of Cost and Farm Size on Western Illinois Livestock Farms, ILLINOIS AGRICULTURAL ECONOMICS, Volume 2, No. 2, July 1962.
33. E. J. Long and K. H. Parson, How Family Labor Affects Wisconsin Farming, Wisconsin Agricultural Experiment Station Bulletin 167, 1950.
34. V. Miles, E. W. Kehrberg, W. J. Pigden, V. S. Logan, Economics of Calf Production, CANADIAN JOURNAL OF AGRICULTURAL ECONOMICS, Volume 9, No. 1.
35. C. V. Moore, E. T. Shaudys, J. H. Sitterly, Cost of Storing and Feeding Chopped and Bailed Hay, Ohio Research Bulletin 854, 1960.
36. L. J. Moran, Non-Feed Costs of Arizona Cattle Feeding, Arizona Agricultural Experiment Station Bulletin 138, 1959.
37. L. J. Moran and W. R. Green, Arizona Milk Production Costs, Arizona Agricultural Experiment Station Bulletin 141, 1960.
38. W.H.M. Morris, Specialization on Central Indiana Farms, paper presented at the CIOSTA Congress, Seelisberg, Switzerland, September 1962.
39. W.H.M. Morris and T. W. Robinson, The Economics of Disposal of Hog Manure in Confinement Systems, AMERICAN SOCIETY OF AGRICULTURAL ENGINEERS, Paper 61-422, 1961.
40. NCM-14, Trends in the Poultry Industry -- Effects on the Midwest, North-Central Regional Publication 73, Wisconsin, 1955.
41. R. Nicholson and E. W. Kehrberg, Organization of a Central Indiana Specialized Hog and Beef Farm Under Various Prices, Purdue Agricultural Experiment Station Bulletin in progress.
42. K. H. Parson and E. O. Waples, Keeping the Farm in the Family, Wisconsin Agricultural Experiment Station Bulletin 157, 1945.
43. J. C. Purcell, J. R. Russel, J. C. Elrod, Analysis of Factors Affecting Costs of Producing Grade A Milk in Georgia, Georgia Agricultural Experiment Station Bulletin N.S. 21, 1960.
44. R. J. Rades and G. C. Pulver, Large Milking Operations in Wisconsin, Wisconsin Agricultural Experiment Station Bulletin 556, June 1962.
45. R. M. Reeser and R. H. Baker, Costs and Returns in Feeding Lambs, Ohio, 1957-1958 Season, Ohio Agricultural Experiment Station Bulletin 884, 1961.

46. R. R. Rhoades, J. O. Dunbar, E. W. Kehrberg, Farm Organization Planning for a Central Indiana Specialized Hog and Beef Farm With the Aid of an Electronic Computer, Purdue Agricultural Experiment Station Bulletin in progress.
47. E. M. Rogers, Characteristics of Agricultural Innovators and Other Adopter Categories, Ohio Agricultural Experiment Station Bulletin 882, 1961.
48. R. Schickele, Livestock As Income Stabilizer, NORTH DAKOTA BIMONTHLY BULLETIN, Volume 12, No. 6, pages 198 to 203, 1950.
49. T. W. Schultz, Agriculture in an Unstable Economy, McGraw Hill, particularly Chapter 10, 1945.
50. L. L. Schuman, An Analysis of Farm Price and Farm Price and Farm Production Variability and Their Impact on Farm Organization in Central Indiana, unpublished M.S. thesis, Purdue University, 1963.
51. E. T. Shaudys, J. H. Sitterly, J. A. Studebaker, Costs of Storing Grass Legume Silage, Ohio Research Bulletin 853, 1960.
52. S. D. Staniforth, Combatting Uncertainty in Agricultural Production, JOURNAL OF FARM ECONOMICS, Volume 36, pages 87 to 97, 1954.
53. W. B. Sundquist, L. M. Day, H. R. Jensen, Profitable Adjustments in Farming in Central Minnesota, Minnesota Agricultural Experiment Station Bulletin 460, April 1962.
54. R. C. Suter and S. H. Washburn, Feeder Cattle Systems of Management, Purdue Agricultural Experiment Station Bulletin in progress.