



**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.*

# Determinants of Farm Size and Structure

Proceedings of the program sponsored by the NC-181 Committee on Determinants of Farm Size and Structure in North Central Areas of the United States, held January 7, 8, 9, and 10, 1989, in Tucson, Arizona.

---

*Rasmussen/Agricultural Structure and the Well Being of Society Revisited*

*Stanton/Changes in Farm Size and Structure in American Agriculture in the Twentieth Century*

*Hallam/Empirical Studies of Size and Structure in Agricultural*

*Helmers, El-Osta and Azzam/Economies of Size in Multi-Output Farms: A Mixed Integer Programming Approach*

*Sonka and Khoju/Empirical Studies of Firm Viability, Profitability, and Growth*

*Johnson/Firm Level Agricultural Data Collected and Managed by the Federal Government*

*Casler/Use of State Farm Record Data for Studying Determinants of Farm Size*

*Batte and Schnitkey/Emerging Technologies and Their Impact on American Agriculture: Information Technologies*

*Meyers and Westhoff/Commodity Program Reform and the Structure of U.S. Agriculture*

*Janssen and Johnson/Farmland Leasing and Land Tenure in South Dakota and Nebraska - Empirical Findings Emphasizing Current Situation and Changes between 1951-1986*

*Johnson and Grabanski/Technology Adoption and Farm Size*

*Casler/Managerial Factors that Affect New York Dairy Farm Profitability*

*Fox and Dickson/Farm Growth in the Ontario Dairy Industry: A Skeptical Look at Gibrat's Law*

*Robison/Distinctiveness in the Design and Choice of Durable Assets under Risk*

Iowa State University  
Ames, Iowa 50011  
December 1989

## USE OF STATE FARM RECORD DATA FOR STUDYING DETERMINANTS OF FARM SIZE

George L. Casler<sup>1</sup>

Agricultural economists in many states collect and analyze data from individual farm records. Much of this effort is primarily related to extension farm management programs but in some cases the data is the basis for research studies. This paper is primarily concerned with the use of this firm level data as a basis for studying issues of farm size and structure.

The history of farm record data collection as part of an extension-type effort varies greatly among states. Some states appear never to have been involved in such activity while others have been continuously involved for several decades. A few states (universities) have started new data collection efforts in recent years but perhaps more significantly several (Purdue, Ohio State, Wisconsin) largely discontinued such efforts after 1983. However, Purdue restarted their efforts in 1987. Some of the farm record efforts have been in close cooperation with independent and largely farmer-financed farm management associations. The largest of these efforts is in Illinois. A combination of farm management fieldmen and college staff summarized and analyzed nearly 7,350 records for 1987. It is probably fair to state that the farm records and analysis programs in most states are a blend of education and service to the farmers involved and a source of information to be used in extension programs with other farmers and in teaching programs at various universities and colleges. While the data have been used for research, probably in no state was that the original purpose for collecting the data.

Use of this farm record data for research purposes lies on a somewhat shaky foundation: in no state are the records collected on a random sample basis. Rather, data is collected from farmers who voluntarily agree to participate in these educational-service programs. Nevertheless, researchers have used the data for a variety of studies, many of which relate to the relationship between various management factors or variables such as farm size and measures of net returns from operating the business. A purist could argue that the non-random sample negates or at least seriously impairs the validity of the results. However, many researchers argue or apparently believe that, even though the records, on the average, come from farms that are above average in size and are operated by above average managers, the results are useful and that the conclusions probably wouldn't be much different if the record data came from a random sample of farms of the same farm type.

With the exception of a few states such as Illinois, the number of farm records available in any one year may be small enough that valid analysis is limited, particularly

---

<sup>1</sup>Professor, Department of Agricultural Economics, New York State College of Agriculture and Life Sciences, Cornell University.

if the researcher wants to study farms of a particular type on similar soil resources. In addition, because farmers do not necessarily participate on a continuous basis, numbers become even more limited if the desire is to study the same farms over a period of years. The numbers situation leads to the question of combining farms from several states to study issues such as net returns by farm size. An immediate problem of such a data combination is that each state (really the data collectors therein) has its own idea of how the data should be collected and analyzed. For example, the measures of net returns and the way they are calculated are extremely variable among states. Whether such differences could be resolved, so that every state uses the same procedures in the future is questionable.

The inconsistencies among states appear in several items such as methods of: (1) asset valuation, (2) calculating depreciation, (3) calculating interest on assets and production expenses, (4) handling inventory changes, (5) handling accounts receivable and payable, (6) handling appreciation of assets and (7) calculating the value of operator's labor and management and non-operator family labor. In addition, some states publish data for the total farm business, including the landlord's share while others publish only the data for the operator's share. Most of these inconsistencies are the apparent result of the notions of economists in the various states about these issues. It is clear that we have agreed upon neither what to measure nor how to measure it. Methods of charging depreciation, interest and operator and family labor and methods of asset valuation for several states are shown in Table 1.

The matter of publishing the data for the total business, including the operator and landlord shares vs. publishing only the operator share appears to be a particular problem and is related partly to the prevalence of tenant operators in some states. Illinois has chosen to publish in the annual Summary of Illinois Farm Business Records the combined operator-landlord shares, although this is not clearly pointed out in the bulletin. The operator's share is published for only one item which is net farm income. Operator and landlord shares are published in a separate publication (Scott) which is much less widely distributed. Minnesota and Indiana publish only the operator's share. Missouri has chosen to publish in a two column format, the numbers for the operator and for the total business, with the difference being the landlord's share. This writer suggests that when a "management return" or "labor and management return" is being computed, the computation should be for the person who is managing the business and that in most cases it is the operator. However, in some share rental situations it is possible that the landlord or his representative exerts substantial (or even total) managerial control over the business. The Missouri procedure appears to solve the reporting problem by publishing both the operator share and total business -- the choice of which is the important data is left to the reader.

### **The Importance of Imputed Costs**

It is important to point out the methods used to calculate imputed costs (depreciation, interest on equity or total assets and value of operator labor and management) have a large impact on measures of profitability because these items make up a large proportion of total costs. For example, in the case of 1987 Illinois northern

and central grain farms, in computing management returns (\$12,326 on average) the imputed charges for interest on non-land capital (\$16,284), land charge-net rent (\$56,818) and operator labor (approximately \$15,354) total \$88,456 or 85 percent as much as all other costs including depreciation. If depreciation, which is also an imputed or at least allocated cost, is included with imputed costs, the total of the imputed costs is 1.28 times all other costs, not including depreciation. Thus, in the computation of management returns in this example the imputed costs are nearly as important, or if depreciation is included, more important than the costs that can be accurately measured. If interest on land (land charge-net rent) was charged at four percent rather than five percent, the average management return would be \$23,684 rather than \$12,326. If the interest charge was six percent rather than five percent the average management return would be \$968.

The intent here is not to say that Illinois is doing something wrong -- it is only to illustrate the importance of the imputed costs in some of the profitability calculations. Similar examples could be drawn from the calculations made in other states. (What is the appropriate interest charge on land? Clearly the interest rate on mortgage loans in most cases is above five percent.)

Perhaps there is one consolation if such data are being used to study farm size issues: if the procedures are used consistently on all farms being studied, the level of imputed charges may not affect the relationships between farm size and profitability.

## Interest

Some states use interest actually paid (and interest on equity at a standard rate) for some of the profitability calculations while others use a standard charge on all capital, regardless of whether it is equity or debt.

The example below illustrates the varying interest charges that result, depending (A) on the level of debt and equity and (B) on using a standard charge on all capital.

### A. Debt and equity

Example: \$500,000 assets  
"Net" before interest = \$60,000

	<u>100% equity</u>		<u>100% debt</u>
	\$60,000		\$60,000
Interest on \$500,000: @ 5% real =	<u>25,000</u>	@ 10% paid =	<u>50,000</u>
Net farm income	\$35,000		\$10,000

### B. Standard interest charge on all capital rather than interest paid plus interest on equity.

Example: \$500,000 @ 8% = \$40,000

In (A) for a farmer with 100% equity, the interest charge is \$25,000 but \$50,000 if the farmer has all debt. In (B), with a standard charge of 8%, the interest is \$40,000.

### Depreciation

The method used to calculate depreciation can affect the net income and other measures of profitability. The two common methods of depreciation used in farm record systems are (1) income tax and (2) net figure derived from (beginning inventory + purchases) - (ending inventory + sales) with inventories being at market value. A variation on the second method is to use a standard percentage, such as 10 percent, of beginning + new. One might think that distortion of income caused by the use of income tax rapid depreciation would be only temporary and minor -- depreciation can be taken only once. For example, five year rapid depreciation under the accelerated cost recovery system (ACRS) would lead to a high depreciation charge in the early 1980's but this would be offset by no depreciation on these items once the five year period is over. However, particularly in an inflationary period it is likely that use of income tax depreciation, whether rapid or straight line, will result in a higher depreciation charge than using a market value approach.

An example which illustrates the depreciation charges calculated by different methods is shown below, using the 1987 Cornell dairy farm business summary data:

A. Average machinery depreciation from income tax = \$15,488

B. Decline in market value

Example:

Beginning	103,088	End	108,157
+ New	17,124	+ Sales	576
	120,212		108,733
Depr. = 120,212 - 108,733 = 11,479			

C. Standard percentage of market value

Example:

120,212 x 10% = 12,021

### Contrast of The Methods of Two States

The data from the 1987 New York dairy farm business summary are used in Tables 2 and 3 to illustrate the differing procedures and results obtained by using the procedures of two states. Table 2 is the 1987 NYDFBS data while Table 3 is the same data, but subjected to the Illinois procedure.

While there are several differences in the two systems, only a few will be discussed here. In calculating Net Farm Income, Cornell includes interest paid as an expense but Illinois does not. In calculating Labor and Management Income, Cornell uses interest paid and five percent real interest on equity while Illinois uses 5% on land and 10% on all other capital. Cornell separates appreciation on land, machinery and livestock in making the profitability calculations. Net farm income and return on capital are calculated with and without appreciation. It is likely that appreciation is not included in the Illinois calculations but neither is it shown separately.

### **Tentative Conclusions**

Anyone who would like to combine data from two or more states to study issues of farm size is faced with a rather formidable task. In addition to obtaining permission to use the data, a researcher would be faced with the task of reformulating data to make it consistent in terms of charges for items such as depreciation, interest, operator labor and family labor. Some of this may be rather difficult because the necessary data may not exist in the record files.

Considering the non-random character of the data along with the inconsistencies among systems, perhaps researchers should seek another source of data.

Table 1. Methods used for depreciation, asset valuation, interest charges and unpaid labor charges, Corn Belt States and New York

	Illinois 1987	Iowa 1986	Michigan 1986	Minnesota and Indiana	Missouri 1986	New York 1987
No. of farms	7350	?	449		302	426
Depreciation						
Real estate	tax	?		Indirect	tax	tax
Machinery	tax	10% of C.V.	tax?	Indirect	tax	tax
Dairy and Breeding Livestock	tax		tax?	Indirect	?	Indirect
Interest						
Interest paid	No	Yes	for NFI	Yes	Yes	Yes
Interest on equity	No	6%	xx	6%	xx	5% real
Interest on total						
Land	5%*	No	8.5%	No	8%	No
Other	10%**	No	8.5%	No	8%	No
Asset valuation						
Land	Market	?	Market (agr.)	Market	Market	Market +
Buildings	Cost-	?	Cost-	Market	Cost-	Market +
Equipment	tax depr.	Market	tax depr.	Market	tax depr.	Market +
Dairy and Breeding Livestock	?	?	?	?	Market Trend	Market +
Labor						
Operator	1225/mo.	1200/mo.	5.00/hr.		?	***
Family	1225/mo.	700/mo.	5.00/hr.		?	650/mo.

\* Land charge-net rent, revised annually based on average landlord net rents received.

\*\* Revised annually.

+ Market values are used in calculating interest on equity. Year-to-year changes in market values of real estate, equipment and livestock are labelled appreciation and excluded from the calculation of labor and management income.

\*\*\* For calculating return on investment, each farmer estimates the value of his labor and management.



Table 2. Calculation of Measures of Net Income, Average for 1987  
New York Dairy Farm Business Summary

		<u>Without Appreciation</u>	<u>With Appreciation</u>
Total Accrual Receipts		248,818	271,673
Total Operating Expense	188,335		
Expansion livestock	1,710		
Machinery depreciation	15,488		
Building depreciation	8,093		
Total Accrual Expenses		<u>213,626</u>	<u>213,626</u>
Net Farm Income		35,192	58,047
Less: Unpaid family labor		<u>1,582</u>	<u>1,582</u>
Return to operator labor, management and equity		33,610	55,465
Less: Real interest @ 5% on 380,697 equity		<u>19,035</u>	
Labor and management income		14,575	
Labor and management income per operator		11,042	
-----			
Return to operator labor, management and equity		33,610	56,465
- Value of operator labor and management (1.32 operators)		<u>25,552</u>	<u>25,552</u>
Return on equity capital		8,058	30,913
+ Interest paid		<u>17,132</u>	<u>17,132</u>
Return on total capital		25,190	48,045
Rate of return on equity capital (380,697)		2.1%	8.1%
Rate of return on total capital (594,714)		4.2%	8.1%

Table 3. Calculation of Measures of Net Income, Illinois System Using 1987 New York Data.

Value of farm production	195,015
- Total operating expense, except feed and interest	119,110
- Depreciation	<u>23,581</u>
Net farm income	52,324
- Unpaid family labor @ \$1,225/mo.	2,977
- Interest on all capital (land @ 5%, all other @ 10%)	<u>52,427</u> *
Labor and Management Income	-3,080
- Value of operator labor (15.84 mos. @ \$1,225)	<u>19,404</u>
Management Return	-22,484
-----	
Net farm income	52,324
- Operator and family labor @ \$1,225/mo.	<u>22,381</u>
Capital and management earnings	29,943
( Total investment (594,714)	
Rate earned on investment	5.0%

\* An assumption was made that one-half the real estate on the average NY dairy farm is land.

Note: In the Illinois system the calculations include the landlord's as well as the operator's share.

### References

- Brodek, Virginia. "Michigan Farm Business Analysis Summary - All Types of Farms, 1985." Agricultural Economics Report Number 486. Department of Agricultural Economics, Michigan State University, East Lansing, February, 1987.
- Hein, Norlin A. "Missouri Farm Business Summary: 1986." University of Missouri-Columbia, Extension Division, FM 8790, 1987.
- Olsen, Kent D., et al. "Southwestern Minnesota Farm Business Management Association: 1987 Annual Report." Economic Report ER88- 4. Department of Agricultural and Applied Economics, Institute of Agriculture, St. Paul, Minnesota, April, 1988.
- Scott, John T. "Operator and Landlord Shares, 1986." Department of Agricultural Economics, University of Illinois at Urbana-Champaign.
- Smith, Stuart F., Wayne A. Knoblauch and Linda D. Putnam. "Dairy Farm Management Business Summary: New York, 1987." A.E. Res. 88-8. Department of Agricultural Economics, Cornell University Agricultural Experiment Station. New York State College of Agriculture and Life Sciences, Cornell University, Ithaca, New York, July, 1988.
- "1986 62nd Annual Summary of Illinois Farm Business Records." Circular 1276. University of Illinois at Urbana-Champaign, College of Agriculture, Cooperative Extension Service, August, 1987.
- "1986 Iowa Farm Costs and Returns." Iowa State University Cooperative Extension Service, FM-1789, October, 1987.