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**WHAT'S A FARM?  
AN ECONOMIC EVALUATION**

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What's A Farm  
An Economic Evaluation

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**Abstract**

Critics suggest the Census definition of a farm is subjective and too inclusive. This paper reviews the evolution of the current definition, proposes alternative objective minimum economic performance criteria, and examines the impact of these alternatives on common indicators used to monitor the farm sector's economic performance.

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## Past Census Definitions

The initial Census of Agriculture was conducted in 1840. Unlike the 22 that have followed, no limitation was placed on what qualified as a farm. These 22 Censuses have employed nine different limitations (Table 1).

Each limitation embodied some form of minimum economic performance. Over time, there have been three major changes in minimum performance.

1. Acreage has been eliminated as a criterion. Specialization and intensification of farming, exemplified by confinement live-stock feeding and greenhouses, has meant that a high level of farm output can be obtained from only a few acres.
2. Ag sales has replaced ag production. Ag production includes the value of farm production consumed on the farm as well as value of commodities sold off the farm. This change mirrors the decline in on-farm consumption's share of gross farm income--from 8.9 percent during 1945-47 to 0.6 percent during 1984-86 (U.S. Department of Agriculture (USDA), December 1987).
3. Minimum sales needed to qualify as a farm has increased, reflecting increasing productivity and inflation.

Historical retrospect, especially the increasing minimum value of ag production and sales, suggests that changes in the Census definition have apparently been partly driven by the need to readjust the level of minimum economic performance to reflect changes in farming. These changes have tended to result in the old definition resulting in too

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The Census of Agriculture, 1987 version, is upon us. As with many, probably most, previous Censuses, the survey is being conducted as a debate rages over the appropriate definition of a farm. The current definition, first used in the 1974 Census, essentially identifies a farm as an entity that sold, or normally would have sold, at least \$1000 of agricultural products during the census year (U.S. Department of Commerce, May 1978). Critics contend this definition is too low, and, therefore, includes too many farms which exist primarily for non-business reasons.

This article briefly reviews past Census definitions and concern with the current definition. Production and finance theory is employed to evaluate this concern. Specifically, the level of gross farm sales plus inventory change that corresponds to various economic shutdown points is identified. The shutdown points are (1) cash costs of production minus interest paid; (2) cash costs of production interest plus depreciation minus interest paid; and (3) cash costs of production plus depreciation plus an implied income return on assets minus interest paid. These shutdown points correspond to progressively longer time periods before a farm must resort to outside funds, either through borrowing or nonfarm income, to continue its operations. The analysis suggests the gross cash farm sales currently associated with these levels of sustainability are at least \$2500, \$10,000, and \$40,000, respectively. Thus, support is lent to the concern that the current Census definition includes too many farms that exist for reasons other than business.

many entities that depended on farming for too little economic sustenance being classified as farms (Table 1). The same concern is being raised again, i.e., the current definition includes as farms too many entities that derive too little, if any, economic sustenance from the farm. An economic evaluation of this argument is presented in the next section.

#### Evaluation of the Current \$1000 Sales Limit

Three different standards of minimum economic performance were used to evaluate the current Census definition. The standards involved comparing whether the farm's gross cash receipts plus net inventory change covered (1) cash costs of production minus interest paid, (2) cash cost of production plus depreciation minus interest paid, and (3) cash cost of production plus depreciation plus an implied income return on assets minus interest paid. These standards require an increasing level of income and, in general, correspond to a progressively longer period of time in which the farm can be self-sustaining without the infusion of outside or borrowed funds. Interest expense is excluded from all three standards to insure that all farms, regardless of capital structure, are treated the same with respect to the shutdown point.

The ability to cover cash costs minus interest paid is the minimum level of short-run self-sustainability for the farm as a business. This approximates the variable cost shutdown point in production economic theory. Failure to cover this shutdown point means that the farm business does not generate sufficient gross income to even cover annual

operating expenses for variable inputs, let alone make a contribution to paying for fixed inputs.

The second standard is whether gross farm cash income plus inventory change covers the following: cash costs plus depreciation minus interest paid. It corresponds to the farm's ability to internally generate enough income to pay for both variable and depreciable fixed inputs. Failure to cover these costs implies that the farm business requires outside income to replace depreciable fixed inputs and, in essence, corresponds to the concept of living off depreciation.

The third standard is whether gross farm cash income plus inventory change covers the following: cash costs plus depreciation plus an imputed income return to assets minus interest paid. This standard corresponds with the farm's ability to generate enough income to pay for variable and all capital inputs. The residual is a returns to unpaid labor and management. The imputed opportunity cost for capital is 4%, which equals the long run real rate of income return to farm capital (Colling and Irwin). Earned rather than total opportunity cost (income plus real capital appreciation) was used because only earned income was used when determining per farm income, not earned plus real capital appreciation.

#### Data

The only national data available to analyze these shutdown points are data presented in U.S. Department of Agriculture's annual "Economic Indicators of the Farm Sector." However, the data are available only for farm sales categories. Because the relationship between farm income

and costs can differ significantly for individual farms in a given sales class, an individual farm may meet (fall below) a shutdown point whether or not the average for all farms in its sales class meets (falls below) the shutdown point. Evaluation of the extent of these intra-category aberrations requires farm-specific data.

The analysis was conducted for 1979 (the first year data are available), 1982 (a Census year), and 1986 (the latest year data are available). Choice of years was dictated by the availability of data and the fact that USDA sales data are compiled using the Census of Agriculture as a benchmark. Thus, data for census years are considered a more accurate representation of the underlying distribution of farm characteristics than are data for non-census years.

### Results

During all three years, U.S. farms with sales less than \$5,000 did not, on average, cover cash costs minus interest paid (Table 2) while farms with sales less than \$10,000 were unable, on average, to cover cash costs plus depreciation minus interest paid (Table 3). When capital costs, charged at 4%, were added to non-interest cash and depreciation costs (Table 4), farm gross sales in excess of \$100,000 were needed, on average, during 1979 and 1982 before any income was available for unpaid labor and management. In 1986, the comparable point was \$40,000 in gross sales. Whether the decline is permanent depends on whether 1986 farm income was abnormally high or asset values, upon which opportunity costs were charged, were abnormally low. To further place these shutdown points in perspective, in each year

analyzed, gross farm income had to substantially exceed \$100,000 before residual income equalled or exceeded medium U.S. household income.

Because farm income per farm is positively skewed as farm sales increase, categorical data is being used. Given the well-known skewness of farm numbers toward smaller sales, the respective break-even points probably occur somewhere between \$2,500 and \$4,999, \$5,000 and \$9,999, and \$20,000 and \$39,999 using 1986 data or \$40,000 and \$99,999 using 1979 and 1982 data. The implication for selected farm sector statistics of using the lower number in these four ranges as the minimum sales level is explored for 1986 (Table 5). Using the \$2,500 minimum, number of farms declines 26 percent while total assets decline six percent. Increasing minimum farm size to \$5,000 would result in a 40 percent decline in farm numbers, a 10 percent decline in total assets, and five percent decline in total expenses. Using \$20,000 as the minimum reduced the number of farms by 63 percent, total assets by 21 percent, and total expenses by 11 percent. Note, for all three alternative definitions, net farm income and net cash income are higher than for the current \$1,000 minimum gross sales.

As a sidelight, level of assets needed to generate sufficient income to cover various levels of production expenses can also be estimated. This calculation provides an investment perspective on minimum farm size. In 1986, the average level of assets per farm for the sales class which contained the shutdown point increased from \$100,000 to \$120,000 to \$270,000 as the level of minimum economic performance increased.

## Summary, Conclusion and Implications

A commonly-cited source of information on the farm sector is the Census of Agriculture. Its definition of a farm has historically embodied a form of minimum economic performance, and, therefore, has changed as the economics of farm production have changed. Currently, considerable debate exists over whether the current definition includes as farms too many entities that exist for other than business reasons. Support for this argument is found in that, on average, at least \$2,500 in sales has been needed to cover the variable costs of producing a farm's commodities during 1979, 1982, and 1986. This is the minimum level of sales for a farm to be self-sustaining on a production cycle to production cycle basis in the immediate short run. From an economic production viewpoint, it is difficult to justify why a farm which does not even meet this most basic of shutdown points qualifies for minimum economic performance.

Use of a more inclusive shutdown point would have substantial additional impact on farm numbers but would also have significant impact on farm expenses and assets. Such reductions are unlikely to be politically acceptable to a variety of groups. Thus, when viewed from the historically liberal interpretation of minimum economic performance used by the Census and from the perspective of economic production theory, this analysis suggests increasing the minimum gross sales level to \$2,500.

Finally, whether or not one of these criterion is used to establish the Census definition, use of an objective economic criterion to define a farm would greatly enhance comparability of Census data collected over

time as well as with that collected for other businesses. In addition, it may truncate the continuous debate over the Census's definition of a farm.

Table 1. Census Definition of a Farm, U.S., 1850 - 1987<sup>a</sup>

<u>Census Year</u>	<u>Farms 3 Acres or More</u> ----- Minimum Value Requirement -----	<u>Farms Under 3 Acres</u>
1850, 1860	\$100 (Ag Production <sup>c</sup> )	\$100 (Ag Production <sup>b</sup> )
1870, 1880, 1890	Any Ag Operation	\$500 (Ag Sales)
1900	Any ag operation as long as it required the continuous services of at least 1 person.	Any ag operation as long as it required the continuous services of at least 1 person.
1910, 1920, 1925, 1930, 1935, 1940	Any Ag Operation	\$250 (Ag Production <sup>c</sup> )
1945	If 3 acres+ of cropland or pasture, any ag operation. Under 3 acres of cropland and pasture, \$150 of ag production.	\$250 (Ag Production)
1950, 1954	\$150 (Ag Production)	\$150 (Ag Sales)
-----		
	<u>Farms 10 Acres or More</u>	<u>Farms Under 10 Acres</u>
1959, 1964, 1969	\$50 (Ag Sales)	\$250 (Ag Sales)
1974, 1978, 1982 1987	\$1,000 (Ag Sales)	\$1,000 (Ag Sales)

- a. Table modified from one prepared by Dr. Tom Stout, Ohio State University.
- b. Ag production includes ag products consumed on the farm as well as sold.
- c. For 1910 and 1920, minimum value not applicable if farm required services of at least 1 person.

**SOURCES:**

Census of Agriculture, 1974 and 1982.

"A Preview of the 1987 Census of Agriculture."

Table 2. Estimated Gross Farm Cash Income Plus Inventory Change  
 Minus Cash Expenses Plus Interest Paid  
 by Gross Farm Sales, U.S.  
 1979, 1982, and 1986

Gross Farm Sales	1979	1982	1986
- - - \$ - - -	- - -	Average \$ Per Farm	- - -
less than 2,500	-1,360	-979	-744
2,500 - 4,999	-335	-716	-578
5,000 - 9,999	2,474	1,423	1,896
10,000 - 19,999	4,644	3,709	4,889
20,000 - 39,999	10,582	10,381	13,730
40,000 - 99,999	27,547	27,091	33,276
100,000 - 249,999	63,122	69,272	83,294
250,000 - 499,999	131,988	117,871	193,121
500,000 or more	666,835	662,126	819,516

a. Excludes operator households.

SOURCES:

Farmer, Linda. Personal Communication.

Economic Indicators of the Farm Sector, Income and Balance Sheet  
 Statistics, 1981.

Economic Indicators of the Farm Sector, National Financial Summary,  
 1985, 1986.

Table 3. Estimated Gross Farm Cash Income Plus Inventory Change  
 Minus Cash Farm Expenses Minus Depreciation  
 Plus Interest Paid<sup>a</sup>, by Gross Farm Sales  
 U.S., 1979, 1982, 1986

Gross Farm Sales	1979	1982	1986
- - - \$ - - -	- - - Average \$ Per Farm - - -		
less than 2,500	-2,633	-2,743	-2,253
2,500 - 4,999	-2,239	-3,500	-3,015
5,000 - 9,999	-751	-2,203	-1,328
10,000 - 19,999	1,106	-1,472	183
20,000 - 39,999	8,148	2,422	6,473
40,000 - 99,999	17,835	13,044	19,979
100,000 - 249,999	48,433	44,970	59,696
250,000 - 499,999	112,531	122,272	153,265
500,000 or more	663,416	549,800	716,757

a. Excludes operator households.

SOURCES:

Farmer, Linda. Personal Communication.

Economic Indicators of the Farm Sector, Income and Balance Sheet Statistics, 1981.

Economic Indicators of the Farm Sector, National Financial Summary, 1985, 1986.

**Table 4. Estimated Gross Farm Cash Income Plus Inventory Change  
 Minus Cash Farm Expenses Minus Capital Charge  
 Minus Depreciation Plus Interest Paid  
 by Gross Farm Sales<sup>a</sup>, U.S., 1979, 1982, 1986.**

Gross Farm Sales	1979	1982	1986
-- \$ --	-- Average \$ Per Farm --		
less than 2,500	-5,377	-6,267 <sup>b</sup>	-6,375 <sup>c</sup>
2,500 - 4,999	-6,314	-8,287 <sup>b</sup>	-8,675 <sup>c</sup>
5,000 - 9,999	-6,139	-8,407	-7,552
10,000 - 19,999	-6,446	-10,400	-8,126
20,000 - 39,999	-3,852	-11,279	-5,507
40,000 - 99,999	-4,177	-9,842	4,454
100,000 - 249,999	1,209 <sup>c</sup>	3,646	25,263
250,000 - 499,999	63,044	47,748	91,486
500,000+	509,046	376,754	577,752

- a. Excludes operator households.
- b. Estimated by pro-rating total assets using distribution between reported class sizes for 1979.
- c. Estimated by pro-rating total assets using distribution between reported class sizes for 1982.

SOURCES:

Farmer, Linda. Personal Communication.

Economic Indicators of the Farm Sector, Income and Balance Sheet Statistics, 1981.

Economic Indicators of the Farm Sector, National Financial Summary, 1985, 1986.

**Table 5. Effects of Minimum Sales Level on Selected Farm Sector Statistics, U.S., 1986**

Farm Sector Statistic	Minimum Sales Level			
	\$1,000	\$2,500	\$5,000	\$20,000
Number of Farms (million)	2.2	1.6	1.3	.8
Total Assets (\$ billion)	692.0	652.0 <sup>a</sup>	621.0	548.0
Gross Cash Income (\$ billion)	152.0	150.5	149.2	146.7
Total Expenses (\$ billion)	116.5	113.3	110.8	103.3
Net Farm Income (\$ billion)	40.8	41.2	41.7	41.7
Net Cash Income (\$ billion)	52.0	52.8	53.3	52.5

**SOURCES:**

- a. Estimated by pro-rating total assets and debts using distribution between reported class sizes for 1979.

Economic Indicators of the Farm Sector, National Financial Summary, 1986.

## REFERENCES

- Colling, Phil L. and Scott H. Irwin. "Has the Farm Asset Market Been Too Volatile." Department of Agricultural Economics and Rural Sociology, The Ohio State University. Unpublished manuscript. January 1988.
- Farmer, Linda. Personal Communication. United States Department of Agriculture, Economic Research Service. November, 1987.
- U.S. Department of Agriculture, Economic Research Service. Economic Indicators of the Farm Sector, Income and Balance Sheet Statistics, 1981. ECIFS 1-1. August 1982.
- U.S. Department of Agriculture, Economic Research Service. Economic Indicators of the Farm Sector, National Financial Summary, 1985. ECIFS 5-2. November 1986.
- U.S. Department of Agriculture, Economic Research Service. Economic Indicators of the Farm Sector, National Financial Summary, 1986. ECIFS 6-2. December 1987.
- U.S. Department of Commerce, Bureau of the Census. 1974 Census of Agriculture - Statistics by Subjects - General Information: Procedures for Collection, Processing, and Classification. Volume 2, Part 1. May 1978.
- U.S. Department of Commerce, Bureau of the Census. 1982 Census of Agriculture: United States - Summary and State Data. AC82-A-51. Volume 1, Part 51. October 1984.
- U.S. Department of Commerce, Bureau of the Census. "A Preview of the 1987 Census of Agriculture."