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**CLASSIFICATION AND INTEGRATION
OF SECTOR ACCOUNTS IN AGRICULTURE**

by

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CLASSIFICATION AND INTEGRATION OF SECTOR ACCOUNTS IN AGRICULTURE

Most people, if asked about the status of agricultural data systems in the United States, would be surprised that the question was asked. The range and diversity of agricultural statistics seems overwhelming to most observers. Yet, despite the many good things that can be said about the continuing improvements that have been made to expand coverage, reduce the possibilities for bias and respond to requests from data users, some fundamental problems need solution (1). The basic unit of account, farms, requires reexamination with respect to definition, classification, and integration with other sector accounts used to describe the U.S. economy (5). The dearth of information about physical inputs of labor employed in production agriculture and other natural resource-based sectors also requires careful scrutiny (2). As more and more land and natural resources are held by individuals and corporations with no direct connection to production agriculture, the relationships of these owners and users of resources with those in agriculture deserves some consistent attention. Rates of structural change in ownership and use may increase. Landlord-tenant relationships seem likely to grow in importance.

Sector Accounts on A Value Added Base

The decision to take the Census of Agriculture at the same time and year as the Census of Manufactures was made in part to enhance the integration of these agricultural statistics with all the other sector accounts for food and fiber. Providing a basis for determining both gross and net value added in the collection of financial

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and physical data for individual units of account will allow further analysis and study of integrated sectors like poultry meat, fed beef, and processed fruit or nuts (11). Many of the sector accounts now published by USDA (8) embody most of the components of U.S. Department of Commerce (USDC) procedures for calculating value added for agriculture as established by National Income and Product Accounts (NIPA) standards. The annual Farm Costs and Returns Surveys (FCRS) and the agricultural census records on commercial production units taken every five years can be enumerated so that approximations of value added can be calculated. This paper argues that it is necessary to make a commitment to build a database, which over time accommodates common definitions of units of account, and which will allow integration of information collected by several agencies of the government (5, 9, 11).

Classification Issues and Improved Public Understanding

Historically, the farm has been the basic unit of account for agricultural statistics. The definition of what constitutes a farm has undergone nine changes since the first agricultural census in 1840 (3). Most of the changes in definition have been associated with the minimum size requirement measured either in terms of acres of land or value of agricultural sales. In practice, the definition has consistently sought to include any and all operations that could possibly be considered something more than a garden plot, where production was primarily for family consumption. This is not unique to the United States. Most developed countries have followed the same practice. There were 6.8 million farms counted by the European Community in 1984 (EC-10) of which 2.7 million required one or more

worker equivalents annually to carry on farm operations. The other 4.1 million were part-time or residential units.

The practice of defining and counting as many farms as possible is not inherently wrong as long as users of statistics understand the unit of account and how to interpret averages and other values calculated on this base. To say that there were 2.24 million farms in the U.S. in 1982 with an average of 440 acres valued at \$784 per acre (1982 Census Highlights) suggests a somewhat more uniform distribution of commercial enterprises than existed in fact. When classified by value of products sold, the 1982 census distribution breaks out as follows (3):

Agricultural Sales	Number of farms	Percent of farms	Percent of total sales
	(thousands)		
under \$10,000	1096	48.9	2.7
10,000- 39,999	508	22.7	8.2
40,000- 99,999	333	14.9	16.5
100,000-249,999	215	9.6	25.0
250,000 and over	87	3.9	47.6

Almost half of these units of account (farms) sold less than \$10,000 of agricultural products accounting for less than 3 percent of national sales; those with sales of less than \$2,500 accounted for 23.9 percent of the farms but only 0.4 percent of total sales.

The importance of establishing some kind of permanent classification system to divide units of account (farms) into meaningful groups is implicit when trying to understand a size classification of units like the one above. There are a large number of units where the primary source of family income must come from nonfarm sources. Essentially 90 percent of agricultural production in the

U.S. comes from the 650,000 largest farms; even among these an important number of families obtain more income from off-farm sources than from farming.

Earlier Economic Classifications

In the period from 1950-1969, the Census of Agriculture grouped farms into economic classes (3). In 1950, there was first a division into "commercial" and "other" farms. The commercial farms were further subdivided into six economic classes, primarily on the basis of the value of farm products sold (Table 1). The "other" category was divided into three groups: (1) part-time, where the operator had 100 or more days of off-farm work and where the income of family members from off-farm sources was greater than the value of farm products sold; (2) residential, where the value of farm products sold was less than \$250; and (3) abnormal, where all the institutional and experimental farms that did not fit any of the other classifications were placed. Out of the 5.38 million farms in 1950, 3.71 million (68.9 percent) were classified as commercial, 11.9 percent as part-time, and 19.2 percent as residential.

In the 20 years between the Censuses of 1950 and 1969, the number of units of account (farms) fell from 5.38 million to 2.73 million, a decline of almost 50 percent. Structural change was rapid and far reaching. In 1969 the designation, "commercial," was dropped (Table 2). There were still six economic classes based primarily on value of farm products sold. The smallest, Class 6, with \$50-2,499 of sales, included only those operators who were under 65 years of age and did not work off the farm more than 100

days. The three "other" categories were: (1) part-time, sales of \$50-2,499, operator under 65 years who worked off-farm more than 100 days; (2) part-retirement, sales of \$50-2,499, and operator who is 65 or more; and (3) abnormal, consisting of institutional and experimental farms and all others not fitting into regular classifications.

Table 1.

DISTRIBUTION OF FARMS BY ECONOMIC CLASS
Census of Agriculture, United States, 1950

Class	Criteria used:		Number of farms
	Value of farm products sold	Other	
<u>Commercial:</u>			
I	\$25,000 and over	None	103,231
II	10,000 - 24,999	None	381,151
III	5,000 - 9,999	None	721,211
IV	2,500 - 4,999	None	882,302
V	1,200 - 2,499	None	901,316
VI	250 - 1,199	Less than 100 days of work off farm by operator; income of family members from off-farm sources less than value of farm products sold.	717,201
			3,706,412
<u>Other:</u>			
Part-time	\$250 - 1,199	100 days or more of off-farm work by operator; income of family members from off-farm sources greater than value of farm products sold	639,230
Residential	Less than \$250	None	1,029,392
Abnormal	Not a criterion	Institutional farms, experimental farms, grazing associations, etc.	4,215
			1,672,838
Total number			5,379,250

Source: U.S. Census of Agriculture, Volume II, 1950, pp. 1109-10.

Table 2.

DISTRIBUTION OF FARMS BY ECONOMIC CLASS
Census of Agriculture, United States, 1969

Class	Value of farm products sold	Criteria used:		Number of farms
			Other	
<u>Commercial:</u>				
1	\$40,000 and over	None		221,690
2	20,000 - 39,999	None		330,992
3	10,000 - 19,999	None		395,472
4	5,000 - 9,999	None		390,425
5	2,500 - 4,999	Less than \$2,500 sales if normally would have had sales in excess of \$2,500 (crop failure, new farms, large inventories).		395,104
6	50 - 2,499	Operator under 65 years of age and did not work off-farm more than 100 days.		192,564
Part-time	50 - 2,499	Operator under 65 years, worked off-farm more than 100 days.		574,546
Part retirement	50 - 2,499	Operator who is over 65 years of age.		227,346
Abnormal	Not a criterion	Institutional, experimental and research farms, and Indian reservations.		<u>2,111</u>
Total number				2,730,250

Source: U.S. Census of Agriculture, 1969, Volume II, Chapter 7, p. 7.

In the census years following 1969, formal economic classes were no longer designated. A number of summary tables were prepared in 1974 and again in 1978 separating farms with sales under \$2500 from those with sales of \$2500 or more. In 1982, a similar set of summary tables were developed for farms with sales of \$10,000 or more.

The USDA (8) in its annual summary statistics for agriculture has classified farms into eight size categories during the 1980s on the basis of value of agricultural sales. These categories have been standardized in concert with Census and the Office of Management and Budgets (OMB). For comparisons of changes in size groupings across time, the impact of inflation must be recognized. A farm selling \$250,000 of agricultural products in 1972 is roughly equivalent to one with agricultural sales of \$500,000 in 1982.

This review of procedures used in our national statistics to classify farms emphasizes that value of agricultural sales has been the primary basis used to make frequency distributions. Formal designation of "economic classes" was abandoned in 1974, perhaps in large measure because of the problems of making valid comparisons between census years in times of rapid inflation. Days of work off-farm by the operator, age, and majority source of family income were other criteria used in official classifications.

The need to divide farms into some consistent and meaningful groups using criteria that can be maintained over time remains. Such classification devices must be easily understood by users of these statistics and relatively easy to enumerate correctly. Buttel and Gertler (4) proposed a typology of small farm businesses in 1982 which also used sales, age, and off-farm earnings of family members to provide eight different groupings with such interesting descriptors as "hobby farmer," "homesteader," "disengaging farmer," etc. Census benchmark data bounded their explorations and the number of categories was relatively large.

Farming as Principal Source of Family Income or Resources Sufficient to Provide Such Income

One approach to the classification of farms into meaningful categories is to group them by their potential or actual output. This was fundamental to the approach taken by the Census in 1950. The three basic groups designated as: (1) commercial (full-time), (2) part-time, and (3) residential, provided a generic way to group farms logically. These three general descriptors describe a range of situations with which most people can identify. Establishing the dividing lines between these three groups in a manner which is logically consistent over time remains a significant challenge if agreement on the designations can be obtained.

Separating Commercial or Full-time Units From the Rest

Value of agricultural sales and days of work by the operator on the farm have been the primary mechanisms used to designate commercial or full-time farms from the rest. Both of these classifiers have inherent difficulties. As new technology is adopted and as price levels change, any minimum level of agricultural sales will have to be revised. Moreover, different sectors within farming have quite different levels of value added associated with a given amount of products sold. Ideally some physical units associated with output or inputs would provide a more stable classifier.

The use of days worked off the farm by the operator is a response to that need. The historic problem with these data, in the Census at least, has been the implicit assumption that when the "operator" did not report working off the farm that in fact he was

gainfully employed with that time in farming. But the amount of productive activity reported in terms of crops and livestock often indicated semi-retirement or much less than full-time, farm employment. Worker equivalents in terms of hours or weeks or months of labor provided by operators, unpaid family members and hired labor have not been consistently enumerated by the USDA or Census except in the annual Farm Costs and Returns Survey of the 1980s. Thus, one approach to designating full-time or commercial enterprises from the rest would be in terms of worker equivalents. Some minimum number of months of labor used in farming operations from all sources, set somewhere close to 10-12 months, is one approach.

The ability of the farm business to provide a family with 50 percent or more of family income has also been used as a criterion to separate full-time, commercial units from the rest. This is a results-oriented standard. It provides a direct question which most operators can answer to make the classification. It does provide for some problems where the farming business is of sufficient size or productive potential that most operators could support a family, when the family has substantial outside income. The farm owned and operated by a Rockefeller or a rich industrialist in terms of the resources in use and its output should be counted with other full-time operations. In a case like this, the use of a minimum worker equivalent (10-12 months from all sources) as a criterion has some clear advantages, if the intent is to include all units that have the potential to be the primary source of family income.

Value Added Measures

One possibility that could be developed, other than the value of farm products sold, is a standardized measure of value added related to each of the different productive enterprises. This is conceptually something like the farm management measure, productive man work units, which was calculated as a measure of size of business for so many years in survey and other business analyses. The European Community now uses this kind of measure in all of its basic studies on the structure of agricultural holdings and economic results for individual member countries. A Community typology for agricultural holdings was established in the 1970s. There are nine economic size classes of holdings measured in European Size Units (ESU); one ESU is equal to 1000 ECU^{1/} of Standard Gross Margin for the 1980 reference period. Standard Gross Margin (SGM) is gross farm income less all variable costs. Overhead costs, depreciation, wages, rent and interest are not deducted. SGM is calculated for every productive enterprise in each defined agricultural region of every country under average conditions and updated every two years by member countries of the EC. These standardized values are then applied to each crop and livestock unit following procedures outlined in Community Legislation, most recently updated in 1985 (6). An example of the calculations for SGM made in West Germany by KTBL is provided in Table 3.

^{1/} 1.00 ECU (European Currency Unit) was approximately equal to \$1.00 U.S. in 1982; in 1988, 1.00 ECU is approximately equal to \$1.20 U.S.

Table 3. WINTER WHEAT: CALCULATION OF STANDARD GROSS MARGIN
Distribution of Farms, West Germany, 1983-1984

Description	Distribution of farms				
	(1) Lowest 15%	(2) Next 20%	(3) Middle 30%	(4) Next 20%	(5) Highest 15%
<u>Output per hectare (kg):</u>					
Crop sold	2880	3280	3640	3990	4400
Crop used on farm and other	1490	1690	1880	2050	2260
Total yield, kg	4370	4970	5520	6040	6660
<u>Prices per kg:</u>					
Crop sold	0.525	0.525	0.525	0.525	0.525
Crop used on farm	0.51	0.51	0.51	0.51	0.51
<u>Gross revenue per hectare:</u>					
			- DM -		
Crop sold	1512	1722	1911	2095	2311
Crop used on farm and other	744	844	939	1023	1128
Total revenue per ha.	2256	2566	2850	3118	3439
<u>Variable costs per hectare:</u>					
Seed	151	151	151	151	151
Fertilizer	376	401	422	465	503
Pesticides	165	185	205	235	260
Machinery	309	309	315	320	326
Other	47	53	58	63	69
Total variable costs	1048	1099	1151	1234	1309
Standard Gross Margin, DM (standard deckungsbeitrag)					
	1208	1467	1699	1884	2130
Standard Gross Margin, ECU					
	503	611	708	785	888

Source: KTBL, Daten für die Betriebskalkulation in der Landwirtschaft, 1984.

Farms are classified in EC reports by economic size of farm, type of farm, and farm net value added per annual work unit (7). The third category, based on net value added and reported in ECUs, is a measure of profitability or productivity per worker in current

financial terms. Annual Work Units^{2/}, Livestock Units, and Utilized Agricultural Area (UAA) are regularly reported in summary tables for any distributions describing production agriculture. An example of the use of these measures is abstracted from a recent summary report from the Farm Accountancy Data Network (Table 4). An overview of the methodology used to calculate farm net value added is provided in the table.

The summary procedures developed and adopted by the European Community provide a set of interesting approaches to the process of making realistic comparisons across countries and divergent agriculture through time. The use of standardized gross margin as a way of placing agricultural enterprises on a common base has two conceptual advantages: (1) it moves toward a value added concept instead of total sales; and (2) it provides a mechanism to reduce or remove price effects when the standardized measures are calculated. Over time, a system like the ESU (European Size Unit) could become as familiar and understandable as the standard classes for agricultural sales, e.g., \$40,000-99,999. The emphasis accorded labor inputs in all of the summary work is also worthy of greater consideration in potential adaptations made in the U.S.

^{2/} One AWU (Annual Work Unit) is equivalent to 12 months of full-time person equivalents working on the farm including operator, family, hired or day labor.

Table 4. STANDARD ACCOUNTING SUMMARY FOR COMMERCIAL FARMS
Farm Accountancy Data Network, EC10, 1983-84

Description	Average for all farms
Farms represented	2,715,580
Sample farms	38,807
Economic size, ESU	12.8
Labor input, AWU	1.8
Unpaid labor input, FW	1.6
Utilized agricultural area, ha.	26.2
Total livestock units, LU	27.2
<hr/>	
<u>Output</u>	<u>ECU*</u>
Crops and crop products	20,992
Livestock and livestock products	24,872
Other output	943
(A) Total	<u>46,807</u>
<u>Inputs</u>	
Variable costs, crops	6,020
Variable costs, livestock	11,860
Overhead costs	7,050
Depreciation	5,131
Total	<u>30,061</u>
Less adjustments for grants	- 284
(B) Input sub total	<u>29,777</u>
(C) Farm Net Value Added (A) - (B)	17,030
<u>Value Added Components</u>	
Wages paid	2,365
Rent paid	1,278
Interest paid	1,898
(D) Cash expenses in value added	<u>5,541</u>
(E) Investment grants, subsidies, and adjustments	268
(F) Family farm income (C) - (D) + (E)	11,757
Farm Net Value Added/AW	9,415
Family Farm Income/FWU	7,517

* 1.00 ECU is approximately equal to \$1.00 U.S. in 1982.

Source: Commission of the EC, FADN Farm Accounts Results 1982/83-1983/84.

Structural Characteristics of Large Production Units

The nature of the linkages among production units (units of account) is growing more complex in a number of segments of production agriculture. In the broiler industry, there are a number of units of account, typically counted as farms, where the birds are provided to the operator, feed and other inputs are delivered without direct charge, and many of the production decisions are made by a contractor-integrator, rather than the nominal farm operator. The "farmer" provides labor, land, and buildings in some cases, as well as some operating capital, and receives some margin or payment per unit of output for his efforts. The value of the inputs provided by the integrator and the value of the output when taken by the integrator may be difficult to determine consistently. The nature of the business relationship between the farm operator and the contractor is difficult to record using any standard reporting format.

Data on the terms of the linkage and the number of contracts or arrangements with individual producing units needs to be obtained from the contractor in a systematic way. Many of the questions about quantity and value of feed inputs are most appropriately answered by the contractor if that is where the records are maintained. The nature of these linkages, moreover, need to be documented and related to the appropriate economic census which now reports on the processing activities of the contractor. Now that the economic censuses are conducted in the same year, the opportunity to integrate information about production and processing in a systematic matter is available. An effort to work with major

contractors in the livestock industry in developing acceptable and consistent reporting forms provides the possibility of more reliable data and greater understanding of these business relationships and actual operations. If a workable system were developed for reporting in the broiler and fed beef sectors, the procedures might then be adapted for other contracting and integrated agricultural processors.

Information is now collected by the Census of Agriculture in Sections 20 and 21 of the farm questionnaire about the type of organization and corporate structure for that unit. The questions and format are designed to obtain data from units of account where operating and organizing decisions are made by a single entity. If there were 50 farms owned by a corporate entity, each operated by a manager who had responsibility for crop and livestock management decisions, each of the 50 appears as a separate farm or unit of account in the national statistics. The linkages among these units in terms of capital, overall supervision and decision making authority, aggregates of sales, or government payments accruing to these units as a group are not readily identified even on a national scale where specific identities could be suppressed. Here is another area in which further thought and scrutiny should be given to the ways in which we describe and classify production units. At the very least, some means of identifying the establishments, now designated as farms, which are parts of larger units, designated as firms in the Census of Manufactures, would give a more accurate picture of the structure of agriculture and its change through time.

Summary Comments

This paper has tried to argue that there are conceptually three important, separable components of production agriculture that should be recognized regularly in our national statistics. One consists of rural residences and properties, which in total constitute increasingly larger land areas in the United States, that are primarily used for private purposes and recreation. Agricultural production on these units is small to minimal. Some crop and livestock production exists on these properties but the labor input required is small, in aggregate less than two months per year. Family income arises principally from off-farm sources and is used to support farm operations in most cases.

A second group of establishments or farms would include part-time farming operations. The basis of differentiating these from residential farms on one side and full-time commercial establishments on the other could be in units of labor required either in standard units or those actually used. A range between 2 and 12 months of worker equivalents is proposed. Another alternative could be a system similar to the ESM where standardized gross margins could be applied to the number of all productive enterprises found on the establishment. A research project providing comparisons between gross sales, labor units and size units based on standard gross margins would provide a basis for evaluating these and other criteria for separating the part-time farming sector from the other two.

The final grouping would include full-time commercial establishments which used 12 months or more of worker equivalents in

farming and ostensibly were of sufficient size to provide the primary source of one family's income in most years. This category would include all units, regardless of the primary source of family income, if they had the productive capacity to be a full-time farm in normal circumstances. An important subset of this class would be the large farms with multiple units. These would not be viewed as a distinct category, but subject to separate identification and analysis within the full-time farming group.

The details of the names for the three classes proposed and the methods used to differentiate them from each other will require substantial thought and careful study by the many interested agencies as well as production agriculture. The amount of detailed production data collected from the residential farms could and should be less than for the part-time and full-time categories. In terms of census information, more space might be given to the use of lands not used for crops and livestock on the residential farms. In fact, consideration might well be given to collecting information from this relatively large number of rural land owners by some kind of regular sample survey program rather than continuing to include it as a part of the census every five years. Such a decision might then encourage more of the Census of Agriculture resources to be concentrated on the commercial, part-time and full-time establishments and their linkages to the other sectors of processing and manufacture in the food and agriculture sector.

REFERENCES

1. AAEA Committee on Economic Statistics. "Our Obsolete Data Systems: New Directions and Opportunities," Amer. J. Agr. Econ., 54(1972), pp. 867-880.
2. Bonnen, James T. "Improving Information on Agriculture and Rural Life," Amer. J. Agr. Econ., 57(1975), pp. 753-763.
3. Bureau of the Census, U.S. Department of Commerce. Census of Agriculture 1950, 1969, 1982.
4. Buttel, Frederick H. and Michael E. Gertler. "Small Farm Businesses: A Typology of Farm, Operator, and Family Characteristics with Implications for Public Research and Extension Policy," J. Northeastern Agr. Econ. Council, 11(1982), pp. 35-44.
5. Carlin, Thomas A. and Charles R. Handy. "Concepts of the Agricultural Economy and Economic Accounting," Amer. J. Agr. Econ., 56(1974), pp. 964-976.
6. Commission of the European Communities. "A Community Typology for Agricultural Holdings," Official Journal of the European Communities: Legislation, L220, 17 August 1985.
7. Commission of the European Communities. The Farm Accountancy Data Network: Farm Accounts Results 1982/83--1983/84, 150 pp.
8. Johnson, James and staff, Agriculture and Rural Economy Division. Economic Indicators of the Farm Sector: National Financial Summary, 1986, ERS, USDA, ECIFS 6-2, December 1987.
9. Lee, Chinkook, Gerald Schluter, William Edmondson, and Darryl Wills. "Measuring the Size of the U.S. Food and Fiber System," Agr. Econ. Report 566, ERS, USDA, March 1987.
10. Newman, Mark, Tom Fulton, and L. Glaser. "A Comparison of Agriculture in the United States and the European Community," ERS Staff Report AGES 870521, USDA, June 1987.
11. Nicol, Kenneth J. "Farm Sector Data: Presentation and Improvement," Amer. J. Agr. Econ., 63(1981), pp. 353-360.
12. Smith, Blair L., George W. Norton and J. Havlicek, Jr. "Impacts of Public Research Expenditures on Agricultural Value-Added in the U.S. and the Northeast," J. Northeastern Agr. Econ. Council, 12(1983), pp. 109-114.
13. Stanton, B. F. "Farm Numbers and Their Implications for Economic Analysis," J. Northeastern Agr. Econ. Council, 11(1982), pp. 7-18.