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Diversity in U.S. Agriculture

A New Delineation by Farming Characteristics

Judith E. Sommer
Fred K. Hines

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Diversity in U.S. Agriculture: A New Delineation by Farming Characteristics.
Judith E. Sommer and Fred K. Hines. Agriculture and Rural Economy Division,
Economic Research Service, U.S. Department of Agriculture. Agricultural Economic
Report No. 646.

Abstract

Cluster analysis groups 2,972 farming-defined counties into 12 clusters that reveal patterns of agricultural production across America. The authors of this report describe the 12 clusters that are relatively homogeneous with respect to three dimensions: farm enterprise, farm resources, and farm-nonfarm linkages. Minimizing diversity within a cluster allows analysis of a specific economic force or public policy change on clusters with specific characteristics or comparison of differential effects of shocks across various clusters. Such a delineation offers a starting point for assessing regional differences in the effects of alternative public policies on the farm sector.

Keywords: Cluster analysis, agricultural diversity, farm policy, regional effects.

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Summary

Cluster analysis groups 2,972 farming-defined counties into 12 clusters that reveal patterns of agricultural production across America. The authors of this report describe the 12 clusters that are relatively homogeneous with respect to three dimensions: farm enterprise, farm resources, and farm-nonfarm linkages. Reducing diversity within a cluster allows analysis of a specific economic force or public policy change on clusters with specific characteristics or comparison of differential effects of shocks across various clusters. Such a delineation offers a starting point for assessing regional differences in the effects of alternative public policies on the farm sector.

The U.S. agricultural sector is sometimes discussed as if it were a monolithic entity, massive, solid, and uniform. Although farming has become more concentrated as farm numbers have declined, U.S. agriculture still varies widely in farm size, scale, resource use, product mix, and interaction with the nonfarm sector. An appreciation of the diversity in agriculture can further our understanding of regional differences in the economic performance of the U.S. farm sector and the economic well-being of the farm population.

This study uses cluster analysis to group counties by 19 enterprise variables, 5 resource variables, and 3 farm-nonfarm interaction variables. The clustering procedure measures differences between counties across all 27 variables and sequentially groups counties that are most alike. The authors determined that 12 farming-defined county clusters provided a workable delineation with an appropriate degree of specificity and regionalization for meaningful economic analysis.

Cluster analysis groups counties to minimize variation within individual clusters. Variation among clusters illustrates the diversity of U.S. agriculture. Using within-cluster similarities or across-cluster differences allows more meaningful analysis of a specific economic force or public policy change. Considering the attributes of farms within a cluster or comparing attributes among clusters can help explain differences in response to economic forces. In either case, awareness of agricultural diversity offers greater insight into the complexity of assessing the effects of farm problems and programs on various types of farms within the farm sector.

Diversity in U.S. Agriculture

A New Delineation by Farming Characteristics

Judith E. Sommer

Fred K. Hines*

Introduction

The U.S. agricultural sector is sometimes discussed as if it were a monolithic entity, massive, solid, and uniform. Although farming has become more concentrated as farm numbers have declined, U.S. agriculture still varies widely in farm size, scale, resource use, product mix, and interaction with the nonfarm sector. Much of this variation in farming stems from differences in climate, soil type, topography, and demographic characteristics, and therefore does not follow political geographic borders.

The Census of Agriculture defines a farm very liberally as a place which sold or could have sold \$1,000 or more of agricultural products in the prior year. Thus, farms in the United States range from small operations with few assets and income that cannot support a household to multimillion-dollar businesses controlling hundreds, even thousands, of acres and employing large numbers of workers in multiple enterprises. Some farms specialize in a single primary product, while others produce an assortment of products. Some farm operators make a living from their labor on the farm, while others depend heavily on nonfarm jobs and income. Some farmers make production decisions based on sales to nearby urban markets, while others react to supply and demand conditions in the global economy.

This report explores patterns of counties (the smallest geographical unit for which farm sector data are available) that emerge when characteristics of the agricultural sector are examined without regard to State lines or farm production region boundaries. These patterns reflect both the diversity within

agriculture and the complementarity between different aspects of agricultural production such as commodity and farm size. For example, counties where sales of fruit, vegetables, and nursery products are important often have large numbers of small farms (fewer than 10 acres), whereas counties where sales of cattle and sheep predominate often have many farms larger than 500 acres. A further example is the enterprise mix of corn, soybeans, and hogs; this combination is typical of the Corn Belt, but it also appears in counties in other parts of the country.

An appreciation of the patterns of diversity in agriculture can further our understanding of regional differences in the economic performance of the U.S. farm sector and the economic well-being of the farm population. By identifying farming-defined groups of counties and, conversely, separating areas from neighbors that are significantly different with respect to farming, we can select multicounty units appropriate for studying the potential effectiveness of alternative agricultural and economic policies. Explicitly recognizing the heterogeneity of farming without imposing a regional structure greater than a county allows the characteristics of the farm sector itself to determine the area most suitable for a particular investigation.

Early Studies of U.S. Farming Patterns

Studies to identify patterns in U.S. farming were an important part of the early work of social scientists at the U.S. Department of Agriculture (USDA) and at land-grant institutions. Among the earliest examples is W. J. Spillman's "Types of Farming in the United States," published in 1908 [8].¹ Similar works followed in 1915 and 1921 [6, 2].

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¹Italicized numbers in brackets identify literature cited in the References at the end of this report.

Data from the 1930 Census of Agriculture formed the basis for F. F. Elliot's monograph on types of U.S. farming, the most comprehensive study up to that time [4].

Also during the 1930's, several State agricultural experiment stations conducted State studies on types of farming either alone or in cooperation with USDA's Bureau of Agricultural Economics (BAE) [10]. These studies laid the groundwork for later research to delineate detailed farming subregions. A USDA effort directed by Elliot aggregated 514 types of farming areas into 12 major regions and 100 subregions [9]. The process culminated in 1950 with the BAE publication *Generalized Types of Farming in the United States* [10].

The goal of classifying U.S. regions by type of farm was to be able to integrate farming characteristics with the physical and demographic features of the environment that affected agricultural development and which would continue to affect individual farming operations and the local farm sector. This comprehensive approach was used by Donald Bogue and Calvin Beale in their 1961 delineation of U.S. economic areas [3]. Although that approach remains highly relevant to understanding the current and prospective performance of the U.S. farm sector, integrated regional-level analyses of the characteristics of farming have recently lagged, however, in favor of approaches emphasizing the diversity of agriculture at the national level.

Nevertheless, we revisit the idea of delineating farming subregions to develop a scheme for selecting meaningful study areas to use when exploring the potential spatial effects of alternative farm and rural policies. We used data from the 1987 Census of Agriculture, the 1980 Census of Population, and unpublished 1986 employment estimates from the Bureau of Economic Analysis (BEA) in a computerized county-level cluster analysis to identify county groups that are relatively homogeneous in terms of characteristics that describe or influence agriculture. An analysis based on such homogeneous groups offers a logical starting point for assessing regional differences in the effect of alternative public policies on the farm sector.

Data and Method

The units of analysis in this study are all U.S. counties in the 48 contiguous States having at least 50 farms in both 1982 and 1987 and county-level data available for both total market value of sales and acres in farms. Each county is described by 27 variables related to the farm sector (app. table 1). We used cluster analysis to combine counties into groups that are homogeneous in three dimensions: farm enterprise, farm resources, and farm-nonfarm sector interaction. Data on farm enterprise and farm resources are from the 1987 *Census of Agriculture*. Data on farm-nonfarm sector interaction are from the 1980 Census of Population and from unpublished 1986 BEA data. Farm enterprise is described by the percentage of total farm sales from each of 19 farm commodities in 1987. Farm resources are measured by five variables: two farm acreage variables (percentage of farms with fewer than 10 acres and percentage of farms with 500 acres or more), two sales class variables (percentage of total sales from farms with sales of less than \$40,000 and percentage of sales from farms with sales of \$100,000 or more), and cropland as a percentage of total farmland. Three variables determine farm-nonfarm sector interaction: the percentage of farm operators working 100 days or more off the farm, the percentage of farm household income from farming, and the percentage of total employment in the county employed on the farm. We then transformed the variables into a standard normal distribution (called Z-scores) with zero mean and unit variance to give all variables equal weight in the cluster analysis. Because the number of enterprise variables (19) outnumbered the resources variables (5) and the farm-nonfarm interaction variables (3), the enterprise mix still dominated the cluster procedure.

In agglomerative, hierarchical clustering, each observation is first considered a cluster by itself. Then, the two closest clusters are merged to form a new cluster. Merging of the two closest clusters is repeated until only a single cluster is left. Thus, after the first two counties join to form a multicounty cluster, new clusters form when a county combines with another county, a county combines with a multicounty cluster formed at an earlier stage, or two multicounty clusters combine.

We used Ward's minimum variance method for clustering in our analysis [5]. That procedure combines clusters in the order that minimizes the increase in the sum of the within-cluster deviation (distance) from the cluster means across all the variables. The distance measure used in Ward's method is squared Euclidean distance (that is, the sum of the squared differences between values of each clustering variable).

In step one, distances are calculated for all possible pairs of observations (2,972 counties) and the two with the least distance (greatest similarity) become a cluster. For example, our first cluster included Kossuth and Pocahontas Counties, Iowa. In step two, distances are recalculated, where necessary, using the mean values of the newly formed cluster, and the next two closest observations are joined. Dawson and Franklin Counties, Georgia, combined at the second stage. The recalculation and merging process continues until step 2,971, when all counties become one cluster.

Choosing a Set of Clusters

Cluster analysis provides some numerical information at each step of the clustering procedure, but it does not have a definitive measure to determine when clustering has gone far enough. That is, cluster analysis does not tell us the ideal number of clusters to use for a particular research project. We, therefore, must turn to subjective measures. For example, how many logical patterns do we think exist in agriculture, and how many clusters can we reasonably expect to deal with? Because heterogeneity obviously increases as the number of clusters decreases, how many groups should we have to attain specificity and regionalization at the same time?

To help us decide on the appropriate number of clusters, we looked at the characteristics of groups in the 15-cluster set and explored the consequences as we merged them sequentially down to 7 clusters. Figure 1 illustrates the progression of the clustering procedure as the 15 clusters combine into 7. The clusters which exist at the 15-cluster step were named by using the dominant mean Z-score as shown in appendix table 2. For example, the first cluster in the 15-cluster set is named corn, soybeans, and hogs, because of the high Z-scores for those enterprise variables. This cluster also has a high Z-score for the percentage of farmland

acres used as cropland. These higher than average Z-scores indicate that corn, soybeans, and hogs are far more important to the counties of this cluster than to the counties of other clusters and, therefore, that these variables were the force behind these counties forming a cluster. The corn, soybeans, and hogs cluster remained unchanged as the clustering procedure continued.

Looking at the enterprise combinations as the clusters merged and applying our knowledge of the farm sector in evaluating the map of the clusters (fig. 2), we decided that 12 clusters provided meaningful county delineations for examining differential policy effects except for an anomaly in the dairy cluster.

Redistribution of the Counties of the Original Dairy Cluster

The geographic distribution and diversity of farm enterprises in the 456 counties of the original dairy cluster did not satisfy our agricultural intuition. To investigate the development of this cluster, we traced back to the eight subgroups from which it was formed. We found that some of the early clusters combined because the value for many of the enterprise variables was zero. Because similarity is measured as the least distance between two observations across all variables, and the distance between zero and zero is zero, distances between counties with little diversity (many zero values) tend to be small and they cluster.

Using the Z-scores calculated for all counties in our analysis, we computed mean Z-scores for the eight subgroups of the original dairy cluster (app. table 3). Four subgroups (231 counties) were clearly dairy. The remaining four subgroups were compared with the other 11 clusters in our analysis and were reassigned to the most appropriate cluster.

Characteristics of 12 Multicounty Clusters

Cluster 1: Corn, Soybeans, and Hogs

Sales of corn, soybeans, and hogs make up 64 percent of total farm sales in cluster 1 compared with 22 percent for the United States (app. table 4). The counties in cluster 1 also account for almost 75 percent of U.S. sales of the three commodities. A vast majority of the cluster 1 counties are in the Corn Belt.

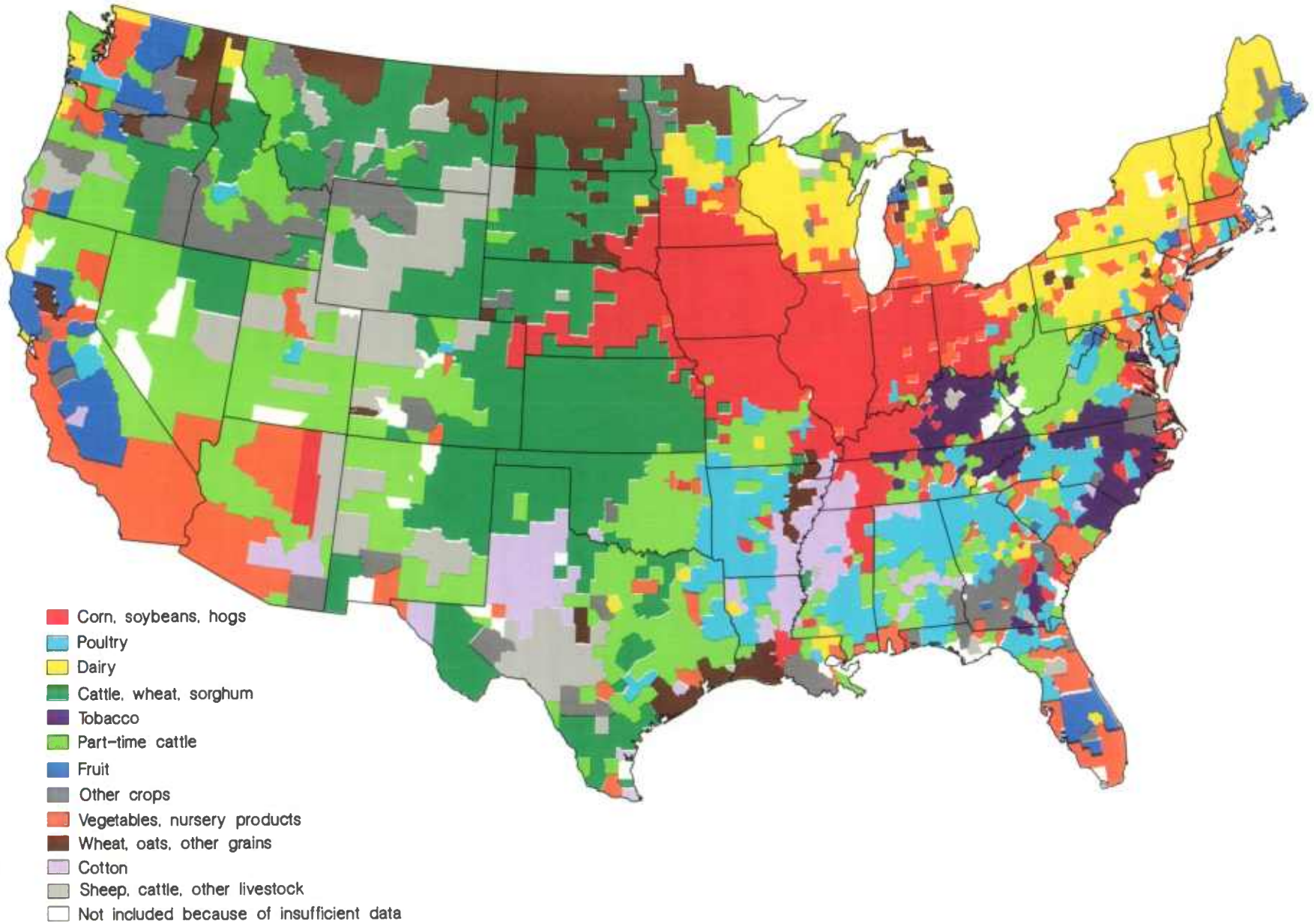
Figure 1

Consolidating 15 clusters into 7 illustrates progression of cluster analysis¹

	Number of clusters								
	15	14	13	12	11	10	9	8	7
Corn, soybeans, and hogs									
Poultry									
Tobacco									
Dairy									
Other crops									
Cattle and wheat									
Sorghum									
Small grains									
Wheat, oats, and other grains									
Cotton									
Sheep and cattle									
Other livestock									
Part-time cattle									
Vegetables and nursery products									
Fruit									

¹ See Z-scores for 15 clusters in appendix table 2.

Figure 2
Twelve multicity clusters show patterns of agricultural diversity



Average farm size in terms of acres (316 acres) is somewhat less than the U.S. average (461 acres), but the average per farm investment in land and buildings is about equal to the U.S. average (app. table 5). Over 75 percent of all farmland is cropland in cluster 1 compared with less than 50 percent for the Nation. About 30 percent of all commercial fertilizer and agricultural chemicals used on U.S. farms are used in cluster 1, reflecting the intensity of corn and soybean production (app. table 6). More than 60 percent of nonmetro counties in cluster 1 lost population in the 1980's for an overall nonmetro population decrease of 0.8 percent, compared with a U.S. nonmetro gain of 4.5 percent (app. table 7).

Cluster 2: Poultry

By far, the dominant feature of cluster 2 is poultry. Poultry sales account for 66 percent of agricultural sales in these counties, and 68 percent of total U.S. poultry and poultry products originate here. The average farm in these counties is much smaller than the U.S. average, but farm sales are near the U.S. figure. Almost 50 percent of total farm expenses in cluster 2 are for feed, but these counties account for a very small percentage of sales of corn and soybeans, the main ingredients in livestock feed. The farms in cluster 2 probably import most feedstuffs from other clusters. Because of the regional nature and labor intensity of poultry processing, farm processing and marketing in cluster 2 provided 1.5 jobs for every job in the farm production sector (app. table 8).

Cluster 3: Dairy

Dairy is the most important commodity in cluster 3, accounting for more than 55 percent of total farm sales, while a complementary commodity, cattle and calves, is second at 14.1 percent. More than 40 percent of all U.S. dairy sales are from counties in this cluster, and nearly 25 percent of all sales of oats. Although 65 percent of the farmland in this cluster is used for crop production, the purchase of feed is still farm operators' largest expense (24 percent of total expenses). The percentage of farmers who live on their farms is highest at 88 percent in the dairy cluster counties (app. table 9). Half of these farm operators have no income from off-farm employment. Most of the cluster 3 counties are in the Northeast and Lake States.

Cluster 4: Cattle, Wheat, and Sorghum

In cluster 4 counties, cattle and wheat are major enterprises and farm-nonfarm interaction is weak. Farm households in this cluster depend on the farm sector for much of their income, and a large part of the counties' employment is in agriculture. Most of these counties are in the Great Plains and Rocky Mountain States. Cattle sales make up 68 percent of farm sales in cluster 4, and sales from wheat make up another 10 percent. Sorghum is also important to some of these counties in the central and southern Great Plains. Farms in this cattle-wheat-sorghum cluster are substantially larger than in all the other clusters except one. Forty-three percent of the farms in this cluster have more than 500 acres, compared with 18 percent for the United States, and the per acre value of land and buildings is far below the U.S. average. Sales per farm are 44 percent higher than the U.S. average, but sales per acre are much lower.

Cluster 5: Tobacco

Tobacco farms with small acreages and sales of less than \$40,000 and large numbers of part-time operators are the dominant features of counties in cluster 5. These counties are concentrated in Kentucky, Tennessee, southern Virginia, and the Carolinas. Average farm acres (136) and sales per farm (\$22,650) are the smallest among the 12 cluster groupings. More than 65 percent of all farms in this cluster have sales of less than \$10,000, and they account for 11 percent of the cluster's total agricultural sales. Tobacco accounts for 38 percent of farm sales followed in importance by cattle (17 percent) and dairy (12 percent). Almost 70 percent of U.S. tobacco sales are from this cluster.

Cluster 6: Part-time Cattle

In cluster 6, cattle and hay sales are important, and most farming operations have part-time operators and sales below \$40,000. In these counties, many farm operators do not depend on farming as a source of employment, but rely on nonfarm sources for large shares of their income. Average sales per farm in these counties was \$26,410 in 1987, only 40 percent of the U.S. farm average. Almost 60 percent of the farm operators in this cluster list a nonfarm occupation as their principal occupation.

Cluster 7: Fruit

Fruit production is the most distinguishing characteristic of farming in cluster 7. Fruit sales make up 47 percent of farm sales in these counties compared with only 5 percent for the Nation as a whole. Sixty percent of U.S. fruit sales come from this group of counties. The cluster has a high percentage of farms with fewer than 10 acres (20 percent), but sales per farm (\$140,108) and net cash returns per farm (\$30,782) are far higher than all the other clusters and more than twice the U.S. average. Contract and hired farm labor account for 28 percent of total farm expenses.

The organizational structure of farm units in cluster 7 indicates a departure from the tradition of individual or sole proprietorship. In this cluster, 13 percent of farms are held in the form of partnership (compared with 10 percent for the United States) and 8 percent as corporations (compared with 3 percent for the United States).

Cluster 8: Other Crops

Counties in cluster 8 have a relatively large percentage of sales from "other crops." "Other crops" includes diverse commodities such as small grains (other than wheat), field seeds, popcorn, and sunflowers. Sales of these crops could not be assigned to a more specific census category. Cluster 8 counties have relatively large percentages of large farms, in terms of acres and sales, a smaller than average percentage of farms with sales under \$10,000, and a high percentage of full-time operators. Although this group of counties is heterogeneous with respect to enterprise, counties in cluster 8 form well-differentiated subclusters in various parts of the country because of the production of regional crops such as peanuts in southern Georgia, southern Virginia, and North Carolina; sugarcane in southern Louisiana; sugar beets in the Red River Valley area of Minnesota and North Dakota; and potatoes and sugar beets in the Snake River area of Idaho.

Cluster 9: Vegetables and Nursery Products

In the counties of cluster 9, vegetables and nursery products are important, many farms have fewer than 10 acres, a high proportion of total farm sales is accounted for by farms with sales over \$250,000, and there are many part-time farm operators. Most of

these counties are part of or adjacent to metro areas, with many located in the Northeast, Florida, and the Pacific States. Sales per farm in these counties averaged \$83,276, with 38 percent of sales from nursery products and vegetables. These counties also have a significant percentage of sales from dairy (15 percent), cattle (11 percent), and fruit (10 percent).

Cluster 10: Wheat, Oats, and Other Grains

The most distinctive feature of cluster 10 is the relative importance of sales of wheat, oats, and other grains. Crops in the "other grains" category relevant to this cluster are barley and rice. Barley, wheat, and oats are important to the Northern Plains, and rice is the dominant crop in the gulf coast area of Texas and Louisiana and in some counties of the Mississippi Delta and California. Large farms (500 acres or more) predominate in cluster 10, with an average size of 964 acres, but sales per acre are quite low. Farm income dependency for the farm household and county dependency on farming as a source of employment are also major attributes of cluster 10.

Cluster 11: Cotton

The importance of cotton sales is the most distinctive feature of cluster 11. Sales of cotton make up 45 percent of total farm sales in these counties compared with only 3 percent for the Nation as a whole. Almost 60 percent of all U.S. cotton sales are accounted for by farmers in this cluster. The average farm in this cluster covers 753 acres, over 60 percent higher than the national average, and had sales of \$94,569 in 1987, 45 percent higher than the national average. Average Government payments per farm in 1987 were \$12,120, more than 2.5 times the national average. Most counties in the cotton cluster are in the Texas High Plains area and the Mississippi Delta.

Cluster 12: Sheep, Cattle, and Other Livestock

Sheep and other livestock distinguish cluster 12 from other clusters with cattle. Sheep and other livestock are unimportant to total U.S. sales, making up only 1.6 percent of nationwide agricultural sales, but in cluster 12 counties, sheep and other livestock contribute 10 percent and 17 percent, respectively, to total sales along with 46 percent of total sales from cattle. Cluster 12 farms average 1,829 acres, the largest of any cluster. Cluster 12 counties that are located mainly in Texas and the mountainous areas of

the Western States reflect the presence of sheep, but cluster 12 counties in Kentucky show the importance of horses.

Conclusions

The U.S. farm sector is diverse in its enterprises, its resources, and its interactions with the nonfarm sector. The farm sector is composed of more than 2 million farms that have resource holdings ranging from a few hundred dollars of investment to assets worth several million dollars, that produce commodities ranging from sheep to rice to tomatoes, and that have interactions with the nonfarm sector ranging from operators working full-time off the farm to operators depending on the farm for all income. An appreciation of the diversity of U.S. agriculture can increase our understanding of the complexity of assessing the effects of farm problems and programs on various types of farms within the farm sector.

This research uses cluster analysis with county-level data to delineate U.S. counties into 12 clusters that are relatively homogeneous with respect to farm sector characteristics. The differences across the 12 clusters illustrate the diversity that exists in U.S. agriculture when the within-cluster diversity is minimized. Farm sector diversity can be studied by considering the attributes of farms within a cluster or by comparing differences in attributes across clusters. Such a comparison can help explain differences in responses to economic forces such as changes in international markets, domestic weather patterns, or specific farm program provisions.

Each of the 12 clusters delineated here represents an economic environment that is relatively homogeneous with respect to three dimensions: farm enterprise, farm resources, and farm-nonfarm linkages. This within-cluster homogeneity allows analysis of the effects of a specific economic force or public policy change on a given cluster or of the differential effect from one cluster to another. At the same time, because the counties may be spatially separated within a cluster, we gain a better understanding of how the effects of economic or policy change are distributed across the contiguous United States.

For example, we can assess the effect of a change in feed grain deficiency payment provisions across the 12 clusters by studying the importance of feed grain enterprises to each cluster, the farm resources of a typical farm in each cluster, and the dependence of farm households on farming in general and feed grains in particular. In the corn, soybeans, and hogs cluster, feed grains are the most important source of farm income, farm size is typically medium to large, and farm households highly depend on farm income. Thus, farms in this cluster are particularly vulnerable to changes in feed grain program provisions.

We can also use clusters to assess the effect of a change in international markets for farm commodities. Because wheat is the dominant farm commodity in the highly farm-dependent wheat-oats-other grains cluster, farms in this cluster are highly vulnerable to changes in global demand for wheat.

Besides being useful in studying differential effects of shocks to the farm sector, the cluster delineation is also useful in studying the effects of agriculture on local communities. For example, the possibility of environmental damage caused by a change in cultivation methods, chemical use, or irrigation practices associated with a commodity would be greatest in the cluster specializing in that commodity. We can use clusters to identify which counties are most likely to be affected.

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Item	Corn, soybeans, and hogs 1	Poultry 2	Dairy 3	Cattle, wheat, and sorghum 4	Tobacco 5	Part-time cattle 6	Fruit 7	Other crops 8	Vegetables and nursery 9	Wheat, oats, and other grains 10	Cotton 11	Sheep, cattle, and other livestock 12
<i>Standardized percent</i>												
Share of sales from:												
Corn	1.50	-0.55	-0.17	-0.30	-0.37	-0.54	-0.59	-0.35	-0.07	-0.42	-0.48	-0.60
Wheat	-.18	-.38	-.37	.95	-.37	-.31	-.24	.11	-.32	2.36	-.15	-.25
Soybeans	1.35	-.45	-.47	-.31	-.34	-.53	-.59	-.29	-.19	-.25	.51	-.60
Sorghum	-.08	-.27	-.28	1.15	-.28	-.20	-.28	-.26	-.26	.07	.37	-.22
Oats	-.14	-.27	.64	.08	-.27	-.19	-.27	-.25	-.21	2.21	-.27	-.11
Other grains ³	-.22	-.23	-.21	.07	-.27	-.20	-.09	.15	-.20	3.03	.39	-.17
Cotton	-.22	-.18	-.25	-.09	-.22	-.20	-.15	.08	-.21	-.20	4.11	-.11
Tobacco	-.15	-.18	-.27	-.29	3.47	-.24	-.29	-.12	-.24	-.29	-.27	-.14
Hay	-.35	-.31	.15	-.12	-.08	.86	-.26	-.09	-.13	.25	-.39	.05
Vegetables	-.25	-.13	-.03	-.29	-.13	-.16	.14	.22	1.63	-.23	-.22	-.26
Fruit	-.22	-.16	-.02	-.24	-.19	-.12	6.45	.01	.42	-.15	-.21	-.13
Nursery	-.28	-.16	-.10	-.31	-.18	-.09	.10	-.25	1.92	-.26	-.24	-.09
Other crops ⁴	-.23	-.17	-.07	-.15	-.19	-.14	-.06	3.31	-.03	-.20	-.20	-.22
Poultry	-.31	2.56	-.20	-.39	-.17	-.35	-.27	-.27	-.22	-.38	-.35	-.33
Dairy	-.37	-.18	2.45	-.51	-.02	.14	-.30	-.37	.17	-.26	-.59	-.41
Cattle	-.34	-.57	-.62	1.26	-.30	.89	-.72	-.45	-.70	-.19	-.47	.74
Hogs	1.38	-.39	-.37	-.31	--	-.43	-.64	-.06	-.35	-.40	-.55	-.61
Sheep	-.17	-.19	-.17	-.05	-.20	--	-.11	-.02	-.17	-.02	-.15	3.67
Other livestock	-.26	-.19	-.05	-.22	-.11	.14	-.11	-.18	.18	-.09	.06	2.75
Share of farms with:												
Fewer than 10 acres	-.18	-.22	-.37	-.26	.42	-.17	1.35	-.01	1.43	-.51	-.41	.24
500 acres or more	-.10	-.68	-.61	1.47	-.80	-.37	-.51	.31	-.66	1.42	.78	.86
Sales less than \$40,000	-.06	-.41	-.36	-.32	1.66	.79	-.51	-.65	-.42	-.01	-.54	--
Sales \$100,000 or more	.04	.53	.11	.33	-.98	-.89	.64	.70	.47	-.37	.54	-.17
Operators working off-farm												
100 days or more	-.34	.73	-.36	-.80	.39	.79	.42	-.37	.43	-1.05	-.46	.08
Share of:												
Farmland in crops	.95	-.33	.32	-.33	-.13	-.76	-.66	--	.14	.34	.33	-1.45
Farm household income from farming	.40	-.48	.34	.87	-.55	-.74	-.22	.06	-.66	.87	.20	.10
County employment in farm production	.23	-.37	-.39	.76	.35	-.29	-.45	.05	-.84	.66	.14	.18

-- = Near zero. ¹Z-scores are standardized variables with mean = 0 and standard deviation = 1. ²The cluster name is derived from mean Z-scores of a group of counties and does not necessarily indicate the Z-scores of any individual county within a group. ³"Other grains" in the Census of Agriculture includes barley, dry edible beans, dry lima beans, buckwheat, dry cowpeas, emmer and spelt, flaxseed, mixed grains, lentils, mustard seed, dry edible peas, popcorn, proso millet, rice, rye for grain, safflower, sunflower seed, triticale, and wild rice. ⁴"Other crops" includes crops with individual market value not listed in the 1987 Census of Agriculture, such as potatoes, sugar beets, peanuts, and sugarcane.

Appendix table 2--Mean Z-scores of variables used in clustering for 15 farming-defined county clusters before final agglomeration¹

Item	Corn, soybeans, and hogs	Poultry	Tobacco	Dairy	Other crops	Cattle and wheat	Sorghum	Small grains	Wheat, oats, and other grains	Cotton	Sheep and cattle	Other livestock	Part-time cattle	Vegetables and nursery	Fruit
	<i>Number</i>														
Counties	597	316	175	456	51	281	89	29	75	124	66	24	476	165	48
	<i>Standardized percent</i>														
Share of sales from:															
Corn	1.51	-.55	-.37	-.05	-.30	-.34	-.18	-.43	-.42	-.48	-.63	-.53	-.54	-.43	-.59
Wheat	-.18	-.38	-.37	-.22	.20	1.04	.68	-.13	3.87	-.15	-.19	-.41	-.31	-.36	-.24
Soybeans	1.38	-.45	-.34	-.29	-.24	-.48	.23	.79	-.55	.51	-.62	-.54	-.53	-.43	-.59
Sorghum	-.08	-.27	-.28	-.27	-.28	.18	4.21	1.05	-.20	.37	-.20	-.28	-.20	-.24	-.28
Oats	-.13	-.27	-.27	.33	-.27	.18	-.24	-.19	3.12	-.27	-.09	-.17	-.19	-.21	-.27
Other grains	-.22	-.23	-.27	-.10	.23	.14	-.17	7.17	2.05	.39	-.15	-.24	-.20	-.21	-.09
Cotton	-.22	-.18	-.22	-.19	.12	.14	.04	-.03	-.25	4.11	-.12	-.09	-.20	-.20	-.15
Tobacco	-.15	-.18	3.47	-.22	-.23	-.29	-.29	-.29	-.29	-.27	-.29	.27	-.24	-.24	-.29
Hay	-.35	-.31	-.08	.19	-.50	-.13	-.09	-.40	-.15	-.39	.10	-.10	.86	-.13	-.26
Vegetables	-.25	-.13	-.13	.32	-.02	-.32	-.22	-.06	-.31	-.22	-.29	-.17	-.16	1.94	-.14
Fruit	-.22	-.16	-.19	.09	-.09	-.24	-.23	.14	-.24	-.21	-.18	.01	-.12	.43	6.45
Nursery	-.28	-.16	-.18	-.04	-.31	-.32	-.28	-.15	-.33	-.24	-.25	.34	-.09	3.06	.10
Other crops	-.23	-.17	-.19	.30	5.72	-.12	-.25	-.16	-.23	-.20	-.25	-.13	-.14	-.07	-.06
Poultry	-.31	2.56	-.17	-.21	-.38	-.40	-.37	-.39	-.39	-.35	-.34	-.31	-.35	-.23	-.27
Dairy	-.39	-.18	-.02	1.38	-.54	-.55	-.39	-.61	-.40	-.59	-.46	-.26	.14	-.09	-.30
Cattle	-.34	-.57	-.30	-.52	-.85	1.49	.53	-.65	-.02	-.47	1.16	-.43	-.89	-.76	-.72
Hogs	1.38	-.39	--	-.16	-.32	-.46	.15	-.68	-.30	-.55	-.64	-.53	-.43	-.58	-.64
Sheep	-.17	-.19	-.20	-.13	-.16	-.01	-.18	-.19	.06	-.15	5.00	.02	--	-.15	-.11
Other livestock	-.26	-.19	-.11	-.04	-.24	-.23	-.19	.01	-.16	.06	.73	8.31	.14	.27	-.11
Share of farms with:															
Fewer than 10 acres	-.18	-.22	.42	-.22	-.13	-.23	-.37	-.09	-.62	-.41	.02	.84	-.17	2.42	1.35
500 acres or more	-.10	-.68	-.80	-.42	.45	1.79	.45	.35	2.29	.77	1.34	-.45	-.37	-.72	-.51
Sales less than \$40,000	-.06	-.41	1.66	-.33	-.77	-.52	.32	-.34	-.07	-.54	.03	-.06	.79	-.54	-.51
Sales \$100,000 or more	.03	.53	-.98	.20	.89	.49	-.19	.33	-.41	.54	-.22	-.03	-.89	.53	.64
Operators working off-farm 100 days or more	-.32	.73	.39	-.13	-.61	-1.02	-.08	-.41	-1.75	-.46	-.11	.60	.79	.48	.42
Share of:															
Farmland in crops	.95	-.33	-.13	.28	.50	-.51	.26	.47	.36	.33	-1.85	-.34	-.76	-.20	-.66
Farm household income from farming	.39	-.48	-.55	.10	-.03	1.03	.38	-.01	1.50	.20	.26	-.33	-.74	-.82	-.22
County employment in farm production	.22	-.37	.35	-.35	-.03	.97	.15	-.08	1.19	.14	.37	-.34	-.29	-.96	-.45

-- = Near zero.

¹Z-scores are standardized variables with mean = 0 and standard deviation = 1.

Appendix table 3--Mean Z-scores for eight subclusters of the original dairy cluster¹

Item	Subcluster ²							
	Other crops	Vegetables	Oats and dairy	Hay and oats	Dairy	Dairy	Dairy	Hogs and dairy
	<i>Number</i>							
Subcluster	41	47	69	83	151	213	348	865
Assigned cluster	2	9	3	10	3	3	3	1
Counties	84	112	71	21	80	52	28	8
	<i>Standardized percent</i>							
Share of sales from:								
Corn	-.37	.46	.24	-.42	-.54	-.26	-.03	.48
Wheat	.06	-.25	-.26	-.44	-.42	-.43	-.36	-.44
Soybeans	-.32	.17	-.25	-.59	-.60	-.57	-.48	-.43
Sorghum	-.25	-.28	-.28	-.28	-.28	-.28	-.28	-.28
Oats	-.24	-.21	2.70	2.27	-.27	-.27	-.27	-.27
Other grains	.10	-.19	-.08	.81	-.27	-.26	-.24	-.27
Cotton	.05	-.23	-.24	-.26	-.26	-.26	-.26	-.26
Tobacco	-.06	-.23	-.29	-.29	-.24	-.28	-.28	-.29
Hay	.17	-.13	.29	2.55	.21	-.03	-.07	-.28
Vegetables	.37	1.17	.23	-.19	-.19	-.15	-.05	-.34
Fruit	.07	.42	-.05	-.20	-.16	-.19	-.16	-.23
Nursery	-.21	.24	.12	-.15	-.14	-.28	-.24	-.34
Other crops	1.84	.03	.31	-.18	-.27	-.20	-.20	-.28
Poultry	-.21	-.22	-.24	-.32	-.30	-.35	.48	-.38
Dairy	-.27	.55	1.46	.76	3.04	3.23	1.80	1.23
Cattle	-.21	-.62	-.64	-.18	-.62	-.61	-.63	-.10
Hogs	.10	-.02	-.23	-.38	-.63	-.45	.16	1.81
Sheep	.07	-.19	-.16	-.06	-.16	-.20	-.20	-.21
Other livestock	-.14	.04	.14	.02	-.12	-.15	-.13	-.28
Share of farms with:								
Fewer than 10 acres	.07	-.03	-.35	-.70	-.34	-.53	-.22	-.24
500 acres or more	.22	-.57	-.59	-.22	-.58	-.60	-.76	-.48
Sales less than \$40,000	-.58	-.25	-.11	.70	-.41	-.58	-.45	-.53
Sales \$100,000 or more	.58	.38	.03	-1.21	0	.28	.29	.42
Operators working off-farm 100 days or more	-.23	.35	.07	.56	-.08	-1.19	-.70	-1.37
Share of:								
Farmland in crops	-.31	.64	.67	.08	-.17	.40	.71	.64
Farm household income from farming	.12	-.42	-.17	-.17	.27	1.08	.47	1.01
County employment in farm production	.09	-.67	-.63	-.26	-.50	.02	-.25	.45

¹County Z-scores computed using 2,972 counties.

²The subcluster name indicates commodities with mean Z-scores greater than 1. High Z-scores identify commodities that are relatively more important in some subclusters than in others. For example, dairy is more important in subclusters 213 (3.23), 151 (3.04), 348 (1.80), and 69 (1.46), than in the rest.

Appendix table 4--Sales of major farm commodities for 12 farming-defined county clusters, 1987

Item	United States ¹	Corn, soybeans, and hogs 1	Poultry 2	Dairy 3	Cattle, wheat, and sorghum 4	Tobacco 5	Part-time cattle 6	Fruit 7	Other crops 8	Vegetables and nursery 9	Wheat, oats, and other grains 10	Cotton 11	Sheep, cattle, and other livestock 12
<i>Million dollars</i>													
Total farm sales	135,398	33,733	12,246	12,000	20,049	3,247	7,604	8,895	7,389	17,456	4,249	5,598	2,764
<i>Percent</i>													
Share of total farm sales from:													
Corn	8.0	23.2	1.3	5.3	4.2	3.6	1.3	.5	2.1	4.2	2.2	1.8	1.5
Wheat	3.6	1.6	.5	.6	10.1	1.0	2.1	1.0	7.3	.9	24.8	2.7	1.6
Soybeans	6.9	20.0	1.7	1.5	2.5	4.4	1.0	--	1.7	2.7	5.1	10.7	.3
Sorghum	.7	.4	.1	--	3.0	--	.4	--	.1	.1	1.1	1.7	.2
Oats	.2	.2	--	.4	.1	--	.1	--	.1	.1	.9	--	.1
Other grains	1.9	.3	.2	.6	1.8	--	.9	1.4	3.8	.5	25.2	5.3	.9
Cotton	3.1	.1	.6	--	1.4	.6	1.0	7.3	2.6	1.8	1.0	45.1	2.1
Tobacco	1.3	.6	1.0	.2	--	37.6	.3	--	1.0	.2	--	.1	2.3
Hay	1.9	.7	.8	2.2	1.3	1.3	6.4	2.4	3.8	2.2	2.2	1.2	2.4
Vegetables	3.5	.4	1.0	1.7	.2	1.1	1.2	6.4	4.5	16.9	1.6	1.2	1.4
Fruit	5.2	.1	.8	1.7	--	.4	1.2	46.5	4.6	9.9	3.7	1.4	.6
Nursery	3.9	.5	2.1	2.0	.2	1.8	2.4	3.6	1.8	21.3	1.0	1.2	1.5
Other crops	3.1	.3	1.0	2.2	1.4	2.2	2.8	2.9	26.6	4.7	1.0	.7	1.0
Poultry	8.9	2.4	66.3	6.5	.2	8.1	1.4	6.3	4.2	4.5	.6	1.3	3.4
Dairy	11.9	5.5	7.6	55.5	2.0	11.7	16.2	10.8	8.5	14.7	4.9	3.0	6.7
Cattle	27.0	22.4	10.6	14.1	67.7	16.6	56.0	9.8	22.9	11.3	20.6	19.2	45.6
Hogs	7.4	20.8	3.8	4.4	3.1	8.9	2.3	.3	3.1	2.3	2.7	1.1	.9
Sheep	.5	.3	.2	.2	.4	--	.9	.3	.7	.2	.6	.2	10.3
Other livestock	1.1	.2	.4	1.1	.2	.7	2.0	.5	.6	1.7	.9	2.2	17.4
Share of U.S. sales of:													
Corn	100.0	72.2	1.5	5.9	7.8	1.1	.9	.4	1.4	6.7	.9	.9	.4
Wheat	100.0	11.1	1.2	1.4	41.2	.7	3.0	1.8	10.9	3.2	21.5	3.0	.9
Soybeans	100.0	72.9	2.3	1.9	5.4	1.5	.7	--	1.3	5.1	2.3	6.3	.1
Sorghum	100.0	13.8	.7	--	64.9	--	3.2	--	.5	1.5	4.8	9.9	.6
Oats	100.0	28.2	1.5	22.6	14.2	.7	3.8	.4	2.5	6.0	18.9	.2	.9
Other grains	100.0	4.2	1.2	2.7	14.5	--	2.7	5.1	11.1	3.4	42.4	11.7	1.0
Cotton	100.0	1.0	1.7	.1	6.6	.5	1.6	15.5	4.4	7.4	1.0	58.7	1.4
Tobacco	100.0	11.6	7.2	1.3	--	69.1	1.3	--	4.1	1.6	--	.2	3.7
Hay	100.0	10.1	3.9	10.6	10.7	1.7	18.2	8.7	11.1	15.6	3.8	2.6	2.7
Vegetables	100.0	3.2	2.5	4.3	1.0	.8	1.8	12.2	7.1	63.1	1.4	1.5	.8
Fruit	100.0	.5	1.4	3.0	.1	.2	1.2	60.1	4.8	24.9	2.3	1.1	.2
Nursery	100.0	3.0	4.8	4.5	.9	1.1	3.3	6.2	2.4	70.4	.8	1.2	.8
Other crops	100.0	2.4	3.0	6.4	6.6	1.7	4.8	6.4	46.5	19.6	1.0	1.0	.7
Poultry	100.0	6.8	68.0	6.5	.4	2.2	.8	4.7	2.5	6.5	.2	.6	.8
Dairy	100.0	11.5	5.8	41.5	2.5	2.3	7.2	6.0	3.8	15.8	1.3	1.0	1.1
Cattle	100.0	20.8	3.6	4.7	37.3	1.5	11.0	2.4	4.6	5.4	2.4	2.9	3.5
Hogs	100.0	70.7	4.7	5.3	6.3	2.9	1.7	.3	2.3	4.0	1.1	.6	.2
Sheep	100.0	12.8	3.2	2.7	11.7	.2	9.1	3.8	7.1	4.9	3.6	1.4	39.3
Other livestock	100.0	5.1	3.2	9.2	3.3	1.5	9.6	3.0	3.0	19.3	2.4	8.1	32.1

-- = Near zero. ¹Excludes Alaska and Hawaii. Source: U.S. Department of Commerce, Bureau of the Census, Census of Agriculture, 1987.

Appendix table 5--Farm structure of 12 farming-defined county clusters, 1987

Item	United States ¹	Corn, soybeans, and hogs 1	Poultry 2	Dairy 3	Cattle, wheat, and sorghum 4	Tobacco 5	Part-time cattle 6	Fruit 7	Other crops 8	Vegetables and nursery 9	Wheat, oats, and other grains 10	Cotton 11	Sheep, cattle, and other livestock 12
<i>Number</i>													
Counties	3,069	605	316	231	370	175	476	48	135	277	125	124	90
Farms:													
1987	2,082,315	515,363	193,172	202,466	214,451	143,367	287,937	63,489	72,526	209,615	76,093	59,194	39,990
1982	2,235,811	566,095	209,349	221,792	218,898	167,037	297,695	62,068	77,580	226,941	77,939	66,246	39,179
<i>Percent</i>													
Change, 1982-87	-6.9	-9.0	-7.7	-8.7	-2.0	-14.2	-3.3	2.3	-6.5	-7.6	-2.4	-10.6	2.1
<i>Dollars</i>													
Value of land and buildings:													
Average per farm	288,308	273,767	187,318	199,379	379,503	134,317	238,803	546,017	389,188	358,611	373,984	401,983	534,711
Average per acre	627	868	1,033	940	311	995	600	1,480	597	1,395	387	543	292
Value of machinery and equipment:													
Average per farm	41,215	48,621	26,370	46,298	51,184	22,251	23,855	48,086	58,621	39,894	62,147	56,898	34,271
Average per farm:													
Sales	65,023	65,455	63,395	59,268	93,490	22,650	26,410	140,108	101,884	83,276	55,843	94,569	69,107
<i>Number</i>													
Acres	461	316	182	213	1,224	136	401	375	648	256	964	753	1,829
<i>Percent</i>													
Share of sales from farms with total sales:													
Less than \$10,000	2.6	2.1	3.2	2.4	1.6	11.1	9.5	1.0	1.4	2.0	2.3	1.6	2.5
\$10,000 to \$39,999	7.4	9.4	4.6	7.8	6.7	20.1	15.4	3.2	4.6	4.5	11.5	4.3	7.7
\$40,000 to \$99,999	13.7	19.4	6.3	22.7	12.4	17.7	13.9	6.0	9.4	7.2	25.3	9.6	10.7
\$100,000 to \$249,999	23.2	32.3	20.6	35.4	17.6	22.8	18.8	10.9	18.8	13.8	34.0	24.1	16.5
Over \$250,000	53.1	36.9	65.3	31.8	61.8	28.4	42.4	78.9	65.8	72.5	26.8	60.4	62.7
Share of farms with total sales:													
Less than \$10,000	49.2	35.0	63.1	41.8	38.5	66.3	69.8	45.9	41.7	58.4	35.9	44.4	52.6
\$10,000 to \$39,999	22.8	27.5	16.1	20.7	28.1	22.4	19.5	21.3	22.3	19.0	26.8	19.4	24.2
\$40,000 to \$99,999	13.8	19.4	6.5	19.9	18.1	6.7	6.0	13.1	15.0	9.5	21.8	13.9	11.8
\$100,000 to \$249,999	9.7	13.7	7.8	13.9	10.8	3.3	3.2	9.7	12.1	7.4	12.3	14.2	7.4
Over \$250,000	4.5	4.5	6.5	3.7	4.6	1.3	1.5	9.9	8.8	5.7	3.3	8.1	4.0

See notes at end of table.

Continued--

Appendix table 5--Farm structure of 12 farming-defined county clusters, 1987--Continued

Item	United States ¹	Corn, soybeans, and hogs 1	Poultry 2	Dairy 3	Cattle, wheat, and sorghum 4	Tobacco 5	Part-time cattle 6	Fruit 7	Other crops 8	Vegetables and nursery 9	Wheat, oats, and other grains 10	Cotton 11	Sheep, cattle, and other livestock 12
<i>Percent</i>													
Share of farms with:													
Less than 10 acres	8.7	7.0	6.7	5.6	6.0	11.2	6.6	20.1	9.9	19.0	5.0	5.9	10.1
500 acres or more	17.7	18.3	7.2	8.3	43.1	4.5	12.8	9.7	24.2	7.7	47.6	32.6	29.9
Share of farmland in crops	45.6	76.9	49.5	65.4	37.0	55.9	27.2	34.5	43.2	44.1	61.4	53.0	9.0
Share of farm household income from farming	27.0	32.2	19.4	31.6	35.7	19.0	15.6	26.0	26.8	17.5	37.5	27.4	23.3
Share of farm operators working off-farm: ²													
No days	43.1	46.3	37.3	50.7	47.6	38.4	35.1	40.1	46.4	39.0	52.8	47.2	40.8
1 to 49 days	6.9	8.2	5.1	6.5	8.4	6.4	5.4	6.1	7.5	5.7	9.1	6.7	7.2
50 to 99 days	3.3	3.4	3.0	2.8	3.8	3.5	3.2	3.4	3.6	3.1	3.6	3.2	3.7
100 to 149 days	3.6	3.4	3.5	3.1	3.7	3.6	3.9	4.0	3.8	3.6	3.8	3.5	4.3
150 to 199 days	5.5	4.8	5.8	5.2	5.1	5.6	6.6	6.2	5.3	6.0	5.3	5.0	6.2
200 days or more	37.6	33.9	45.3	31.7	31.3	42.5	45.9	40.2	33.4	42.6	25.4	34.3	37.8
<i>Million dollars</i>													
Net cash returns from agricultural sales for the farm unit:													
Total	26,311	7,811	1,715	2,779	2,886	808	1,009	1,954	1,309	3,504	764	1,259	477
<i>Dollars</i>													
Average per farm	12,636	15,156	8,881	13,725	13,458	5,636	3,505	30,782	18,051	16,716	10,035	21,272	11,924
<i>Percent</i>													
Share of farms with:													
Net gains	56.8	65.9	52.4	58.9	58.4	64.0	46.7	53.6	55.7	45.5	56.6	59.1	50.7
Net losses	43.2	34.1	47.6	41.1	41.6	36.0	53.3	46.4	44.3	54.5	43.4	40.9	49.2
<i>Million dollars</i>													
Government payments received: ³													
Total	9,634	4,043	174	482	1,847	95	222	148	437	523	854	717	88
<i>Dollars</i>													
Average per farm	4,627	7,846	901	2,383	8,612	661	771	2,327	6,026	2,493	11,228	12,120	2,189

¹Excludes Alaska and Hawaii. ²Percent of those reporting. ³Includes cash and value of commodity certificates.
Source: U.S. Department of Commerce, Bureau of the Census, Census of Agriculture, 1987.

Appendix table 6--Structure of farm production expenses in 12 farming-defined county clusters, 1987

Item	United States ¹	Corn, soybeans, and hogs 1	Poultry 2	Dairy 3	Cattle, wheat, and sorghum 4	Tobacco 5	Part-time cattle 6	Fruit 7	Other crops 8	Vegetables and nursery 9	Wheat, oats, and other grains 10	Cotton 11	Sheep, cattle, and other livestock 12
<i>Million dollars</i>													
Farm expenses:													
Total	107,596	25,613	10,080	9,152	17,030	2,388	6,503	6,878	6,021	13,823	3,449	4,247	2,262
<i>Dollars</i>													
Average per farm	51,671	49,699	52,180	45,202	79,412	16,654	22,585	108,332	83,015	65,945	45,329	71,748	56,561
<i>Percent</i>													
Share of total farm expenses for:													
Livestock and poultry purchased	17.8	17.3	17.9	9.1	40.6	9.4	20.8	6.3	13.4	7.6	6.4	12.5	29.7
Feed for livestock and poultry	17.5	15.0	46.7	24.1	13.6	16.8	18.0	12.6	12.3	12.7	5.8	8.3	16.9
Seed, bulbs, plants, and trees	3.1	4.9	1.0	3.0	2.0	2.8	1.7	1.2	4.2	3.9	4.7	3.7	1.1
Commercial fertilizer	6.2	9.0	2.9	5.8	4.2	9.3	5.3	4.7	8.4	5.4	10.1	7.3	2.0
Agricultural chemicals	4.3	5.4	1.5	2.6	2.6	4.4	2.4	6.8	6.0	4.7	8.0	9.7	1.6
Petroleum products	4.9	5.6	3.0	4.6	4.8	7.3	5.4	3.2	4.9	4.0	9.2	7.2	4.2
Electricity	2.0	1.9	1.5	3.1	1.2	2.2	2.1	3.1	2.6	2.3	2.2	2.0	1.6
Hired farm labor	9.8	5.2	6.9	9.0	4.9	11.2	8.7	21.0	12.0	21.2	8.2	12.0	10.4
Contract labor	1.7	.4	1.2	.6	.6	1.7	1.3	7.1	1.8	4.1	1.0	1.7	1.4
Repair and maintenance	5.9	6.7	3.5	7.3	4.7	7.1	6.7	5.0	5.9	5.6	9.3	7.4	5.0
Customwork, machine hire, rental of machinery and equipment	2.0	2.0	.7	1.4	2.0	1.8	1.7	3.6	2.7	1.7	3.4	3.7	1.3
Interest paid	7.5	9.1	4.3	9.0	6.6	8.7	8.6	7.5	7.8	6.2	10.2	7.1	8.1
Cash rent	4.3	6.4	1.4	3.4	3.5	4.7	3.2	2.7	5.7	3.8	6.9	6.7	3.0
Property taxes paid	2.9	3.2	1.5	4.7	2.1	3.4	3.6	2.8	2.4	3.2	3.5	1.5	2.5
All other	9.4	7.9	6.0	12.1	6.6	9.3	10.3	12.6	9.9	13.6	11.0	9.5	11.1
Share of U.S. expenses for:													
Livestock and poultry purchased	100.0	23.2	9.4	4.3	35.6	1.2	6.9	2.3	4.2	5.4	1.1	2.7	3.5
Feed for livestock and poultry	100.0	20.3	24.9	11.7	12.1	2.1	6.1	4.6	3.9	9.3	1.1	1.8	2.0
Seed, bulbs, plants, and trees	100.0	37.4	3.1	8.1	9.9	2.0	3.3	2.5	7.5	15.8	4.8	4.6	.8
Commercial fertilizer	100.0	34.5	4.4	8.0	10.5	3.3	5.1	4.8	7.5	11.2	5.2	4.6	.7
Agricultural chemicals	100.0	29.7	3.3	5.1	9.5	2.2	3.3	10.0	7.7	13.8	5.9	8.7	.8
Petroleum products	100.0	27.2	5.7	8.0	15.4	3.3	6.5	4.2	5.5	10.6	6.0	5.7	1.8
Electricity	100.0	22.1	7.1	13.1	9.2	2.3	6.2	9.6	7.0	14.3	3.5	3.7	1.6
Hired farm labor	100.0	12.6	6.5	7.8	7.7	2.5	5.2	13.6	6.8	27.4	2.6	4.7	2.2
Contract labor	100.0	5.8	6.7	3.1	5.6	2.3	4.6	27.0	5.9	31.2	1.8	3.9	1.8
Repair and maintenance	100.0	26.9	5.6	10.6	12.5	2.7	6.7	5.4	5.6	12.1	5.0	4.9	1.8
Customwork, machine hire, rental of machinery and equipment	100.0	23.3	3.3	6.1	16.0	2.0	5.2	11.5	7.6	11.1	5.4	7.2	1.4
Interest paid	100.0	28.7	5.3	10.2	13.7	2.6	6.8	6.3	5.7	10.5	4.3	3.6	2.3
Cash rent	100.0	35.4	3.0	6.6	12.7	2.4	4.4	4.0	7.4	11.4	5.1	6.0	1.5
Property taxes paid	100.0	26.8	4.9	14.0	11.4	2.6	7.5	6.2	4.6	14.1	3.9	2.0	1.8
All other	100.0	20.0	5.9	11.0	11.0	2.2	6.5	8.6	5.9	18.5	3.7	4.0	2.5

¹Excludes Alaska and Hawaii. Source: U.S. Department of Commerce, Bureau of the Census, Census of Agriculture, 1987.

Appendix table 7--Population change in 12 farming-defined county clusters, 1970-88

Item	Counties	Population, 1988	Population change		Counties losing population	
			1970-80	1980-88	1970-80	1980-88
	<i>Number</i>	<i>Thousands</i>	-----Percent-----			
United States: ¹						
Total	3,069	244,181	11.3	8.4	17.7	39.3
Nonmetro	2,358	56,425	14.2	4.5	19.5	46.2
Cluster 1 (corn, soybeans, and hogs):						
Total	605	21,714	8.9	2.1	22.8	60.0
Nonmetro	508	11,104	7.2	-.8	25.4	66.9
Cluster 2 (poultry):						
Total	316	15,329	19.9	11.0	1.6	11.1
Nonmetro	248	7,573	18.9	8.1	1.2	13.3
Cluster 3 (dairy):						
Total	231	17,010	8.1	2.9	8.7	27.7
Nonmetro	164	6,964	9.8	2.9	6.1	27.4
Cluster 4 (cattle, wheat, and sorghum):						
Total	370	7,826	15.1	9.4	42.7	66.2
Nonmetro	343	3,744	7.0	.2	45.5	70.8
Cluster 5 (tobacco):						
Total	175	7,447	17.8	7.6	2.3	21.7
Nonmetro	135	3,769	17.4	6.3	2.2	24.4
Cluster 6 (part-time cattle):						
Total	476	20,952	22.3	10.0	6.5	31.7
Nonmetro	371	8,983	21.6	6.8	6.2	34.8
Cluster 7 (fruit):						
Total	48	6,746	29.8	21.5	0	4.2
Nonmetro	26	1,192	32.7	19.3	0	7.7
Cluster 8 (other crops):						
Total	135	4,540	19.2	7.5	11.1	36.3
Nonmetro	116	2,650	16.1	5.4	12.1	38.8
Cluster 9 (vegetables and nursery):						
Total	277	111,665	11.5	10.8	12.3	12.6
Nonmetro	86	4,170	21.1	12.0	3.5	14.0
Cluster 10 (wheat, oats, and other grains):						
Total	125	3,031	12.1	2.1	44.8	62.4
Nonmetro	115	1,610	7.2	-.3	48.7	67.0
Cluster 11 (cotton):						
Total	124	5,361	11.8	6.9	32.3	60.5
Nonmetro	103	2,243	4.6	.2	38.8	71.8
Cluster 12 (sheep, cattle, and other livestock):						
Total	90	3,213	24.5	10.6	14.4	32.2
Nonmetro	75	1,225	36.1	8.9	17.3	36.0

¹Excludes Alaska and Hawaii.

Source: U.S. Department of Commerce, Bureau of the Census.

Appendix table 8--Agriculture-related employment in 12 farming-defined county clusters, 1987

Item	United States ¹	Corn, soybeans, and hogs 1	Poultry 2	Dairy 3	Cattle, wheat, and sorghum 4	Tobacco 5	Part-time cattle 6	Fruit 7	Other crops 8	Vegetables and nursery 9	Wheat, oats, and other grains 10	Cotton 11	Sheep, cattle, and other livestock 12
<i>1,000 workers</i>													
Total employment	97,429	8,867	6,039	6,785	3,237	3,102	7,797	2,397	1,612	53,236	1,093	1,949	1,314
<i>Percentage of total employment</i>													
Agriculture-related employment:													
Farm production sector	3.8	8.4	5.0	5.4	9.2	7.5	5.1	8.1	9.3	1.3	10.2	6.5	5.3
Direct agribusiness sectors--													
Farm inputs	.4	1.1	.4	.5	.9	.4	.3	.9	1.1	.2	.9	.8	.6
Farm processing and marketing	2.8	3.4	7.8	3.3	2.6	7.2	2.9	3.2	6.1	1.8	2.0	3.7	1.6
Total	3.2	4.4	8.2	3.9	3.5	7.6	3.2	4.0	7.2	2.0	2.9	4.5	2.2
Indirect agribusiness sector	2.2	2.3	2.5	2.8	1.3	2.4	2.1	1.7	1.9	2.2	1.6	2.1	2.0
Food and fiber wholesaling and retailing sector	10.4	10.0	9.4	10.5	10.2	9.6	10.7	12.0	10.2	10.5	10.4	9.9	11.2
Total	19.6	25.1	25.1	22.5	24.2	27.0	21.1	25.8	28.7	15.9	25.2	23.0	20.7
<i>Agribusiness jobs per 100 farm production workers</i>													
Direct agribusiness sectors:													
Farm inputs	10.4	12.8	7.9	9.8	9.7	5.1	6.1	10.5	11.3	13.4	8.9	11.5	10.9
Farm processing and marketing	75.3	40.0	155.9	61.9	27.9	96.9	57.4	39.1	66.0	137.3	19.6	57.1	29.9
Total	85.7	52.8	163.8	71.7	37.6	102.0	63.5	49.6	77.3	150.6	28.5	68.6	40.7

¹Excludes Alaska and Hawaii.

Source: U.S. Department of Commerce, Bureau of the Census and Bureau of Economic Analysis.

Appendix table 9--Farm operator characteristics for 12 farming-defined county clusters, 1987

Item	United States ¹	Corn, soybeans, and hogs 1	Poultry 2	Dairy 3	Cattle, wheat, and sorghum 4	Tobacco 5	Part-time cattle 6	Fruit 7	Other crops 8	Vegetables and nursery 9	Wheat, oats, and other grains 10	Cotton 11	Sheep, cattle, and other livestock 12
	<i>Percent</i>												
Farm operators by land tenure:													
Full owners	59.3	51.8	70.7	60.2	46.1	68.0	68.5	75.2	55.4	66.4	43.4	47.9	62.4
Part owners	29.2	32.7	23.8	31.8	38.2	23.2	24.7	16.0	30.9	23.7	40.0	32.3	25.9
Tenants	11.5	15.5	5.5	8.0	15.7	8.8	6.8	8.8	13.7	9.9	16.7	19.8	11.8
Farmland acres by land tenure:													
Owned	58.3	52.4	72.4	72.7	56.1	72.7	65.3	60.7	55.2	60.7	53.7	46.6	62.0
Rented	41.7	47.6	27.6	27.1	43.9	27.3	34.3	38.8	44.6	39.3	46.3	53.4	37.9
Farm operators by years on present farm:²													
2 years or less	6.6	6.3	6.6	5.4	6.8	6.9	6.3	7.2	7.7	6.4	6.8	10.8	7.6
3 or 4 years	7.9	6.9	8.5	7.0	7.7	7.8	8.6	9.1	8.3	8.9	7.3	9.1	9.1
5 to 9 years	17.7	15.3	18.4	16.8	17.0	16.5	19.6	22.0	19.0	20.6	17.2	17.2	20.5
10 years or more	67.8	71.5	66.5	70.8	68.6	68.8	65.5	61.7	64.9	64.2	68.7	62.8	62.7
Farm operators by age group:													
Under 25 years	1.7	2.7	1.0	1.6	2.2	1.5	.9	.7	1.5	1.1	2.3	2.1	1.1
25 to 34 years	11.6	14.8	9.0	13.1	13.2	10.0	8.2	7.8	11.7	9.5	14.7	11.8	9.4
35 to 44 years	19.7	19.8	19.4	22.0	18.7	18.8	18.2	20.1	20.9	20.6	20.6	18.8	19.3
45 to 54 years	21.8	20.9	23.1	22.4	19.6	21.9	22.4	23.1	21.8	23.4	20.6	22.6	21.8
55 to 64 years	23.7	23.3	24.2	23.1	23.5	23.3	24.6	25.1	23.8	24.0	23.3	24.2	24.3
65 years or over	21.4	18.5	23.3	17.8	22.8	24.5	25.7	23.2	20.1	21.4	18.6	20.4	24.2
Farm operators by sex:													
Male	93.7	96.1	92.3	94.7	94.9	92.1	92.0	90.2	94.4	90.8	95.5	94.7	90.7
Female	6.3	3.9	7.7	5.3	5.1	7.9	8.0	9.8	5.6	9.2	4.5	5.3	9.3
Farms by type of organization:													
Individual or sole proprietor	86.7	86.0	90.9	87.9	86.1	87.6	90.5	78.4	83.1	83.7	85.5	83.9	82.5
Partnership	9.6	10.6	6.7	9.4	9.4	11.0	7.1	13.2	10.6	10.0	9.9	10.7	11.5
Corporation, family-held	2.9	2.7	1.7	2.2	3.5	.8	1.6	6.7	5.2	4.9	3.8	4.0	4.5
Corporation, other than family	.3	.2	.2	.2	.3	.1	.2	.9	.4	.6	.2	.6	.5
Other	.6	.5	.4	.4	.7	.5	.6	.9	.7	.7	.6	.7	1.0
Farm operators by place of residence:²													
On farm operated	77.1	78.2	80.6	88.5	69.3	76.1	76.3	71.1	75.6	78.2	73.7	61.9	74.1
Not on farm operated	22.9	21.8	19.4	11.5	30.7	23.9	23.7	28.9	24.4	21.8	26.3	38.1	25.9
Farm operators by principal occupation:													
Farming	54.5	61.6	43.6	63.3	63.6	45.4	41.3	51.2	60.3	46.9	69.1	58.2	53.6
Other	45.5	38.4	56.4	36.7	36.4	54.6	58.7	48.8	39.7	53.1	30.9	41.8	46.4

¹Excludes Alaska and Hawaii. ²Percentage of those reporting.

Source: U.S. Department of Commerce, Bureau of the Census, Census of Agriculture, 1987.