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CHANGES IN FARM SIZE AND STRUCTURE IN AMERICAN AGRICULTURE IN THE TWENTIETH CENTURY

BY

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CHANGES IN FARM SIZE AND STRUCTURE IN AMERICAN AGRICULTURE IN THE TWENTIETH CENTURY

The dawn of the twentieth century heralded great change in American agriculture. Homesteaders had staked their claims to most of the productive land in the West. Mechanization had begun to save labor in a range of applications. Animal and human power, which had felled the forests, broken the prairie sod, and established farming across the continent, was to be aided and then replaced in large measure by mechanical power and the magic of electricity.

A nation of small farmers and tradesmen would rapidly become an industrial and service economy. Like most other sectors, agriculture would become industrialized; farm labor would move off the land to a myriad of new occupations; often these transitions would be painful and disruptive. Yet, the same hardy spirit which had carved out farms and ranches across the hills and plains would sustain another transformation: the consolidation of land, labor and capital into a new agriculture where science and machines would allow one worker to do what many had been required to do in previous generations.

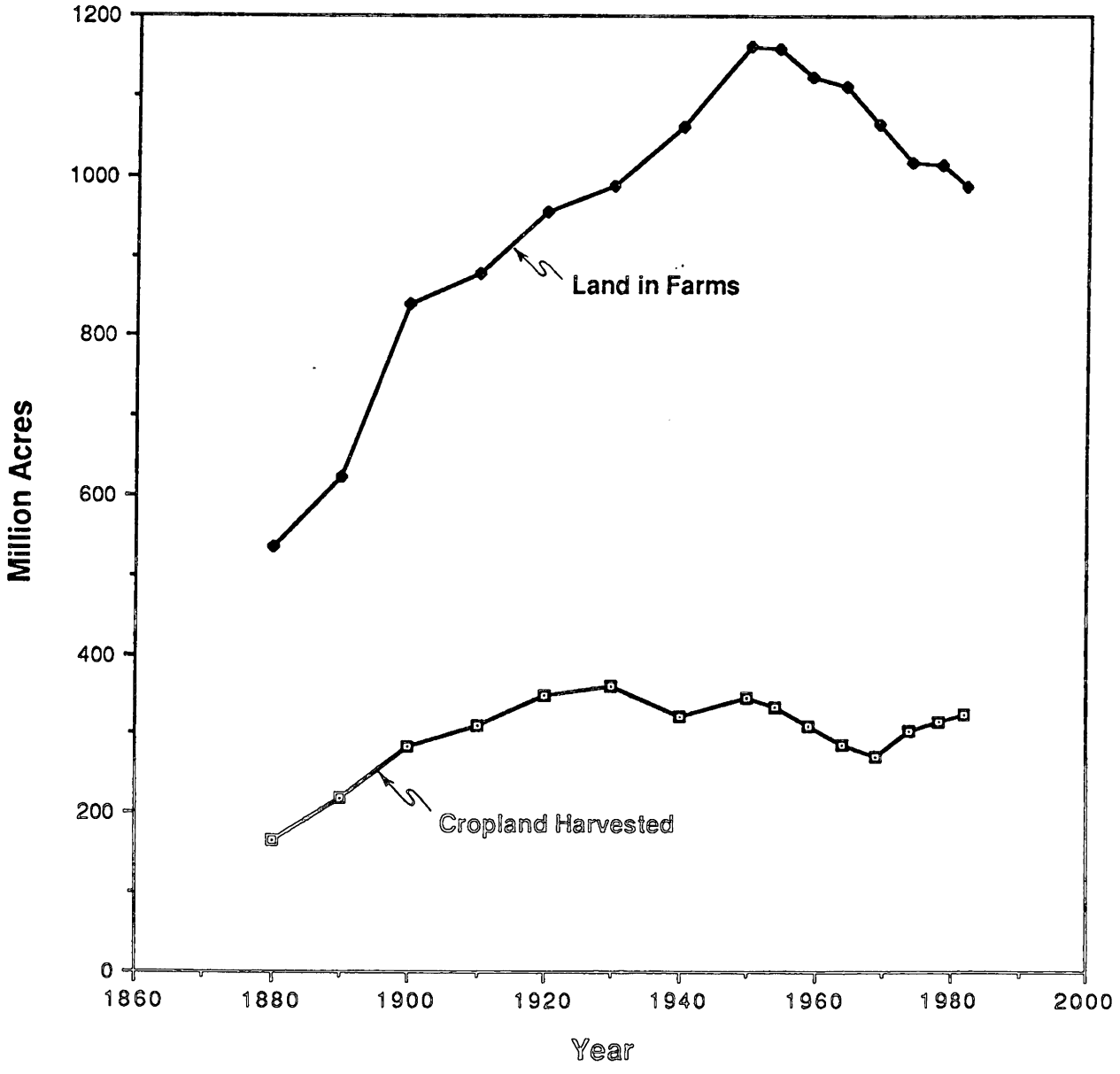
The process of structural change in agriculture during the twentieth century in the United States has not been easy. From the "Golden Age of Agriculture" before World War I to the depths of the Great Depression in a span of less than 20 years was traumatic for everyone; especially those who had to leave the land when there were no jobs and no places to start again. With economic expansion in the 1940s and continued growth in the postwar years, the great exodus out of agriculture between 1950 and 1970 was much less painful, but no less dramatic. Farm numbers fell in those years at the greatest rate in the century. Industrialization and the adoption of mechanical and electrical power was in full swing. Capital was substituted for labor across the land. A healthy economy absorbed displaced workers from the farm sector with substantial success. Yet, rural poverty and the "people left behind" remained no less a continuing problem, touched but not emancipated by the programs of "the Great Society."

Land in Farms and Farm Numbers

The story of change in American agriculture is documented effectively in Census statistics starting in 1850. The early Census counts chart the sweep of settlers out of the East and Midwest into new lands as they opened. The land in farms doubled between 1850 and 1890. The largest addition to land in farms in any decade occurred between 1890 and 1900 when more than 215 million acres, over one-fifth of total land in farms today, was added to the national total.

Cropland harvested was recorded in each Census period starting in 1880. Here, too, the greatest addition to the total cropland occurred between 1890 and 1900. Further additions to the cropland base occurred in each succeeding decade until 1930. From this base there have been important fluctuations in the next 50 years and some shifts between regions, but the national totals have remained relatively steady. Government programs, the weather, and economic conditions influenced acres planted and harvested from year to year.

FIGURE 1. LAND IN FARMS and CROPLAND HARVESTED
U.S. Census, United States, 1880-1982



Land in farms reached a highpoint in the 1950s. In each succeeding five year period the total has fallen modestly so that in 1982 land in farms has returned to the same total listed for 1930. It is important in looking at subsequent statistics on changes in farm numbers and size distributions to keep the land area used for farming in perspective. Land was being added to the agricultural base until 1950. The cropland total shifted out of some of the less productive areas in the Eastern United States to the West between 1930 and 1950, one of the results of animal power being replaced by tractor power. The cropland base in total remained close to 400 million acres throughout all of that period.

Table 1. FARM NUMBERS AND LAND IN FARMS
Census Data, United States, 1850-1987

Year	Number of farms	Land in farms	Average farm size
	millions	million acres	acres
1850	1.4	294	203
1860	2.0	407	199
1870	2.7	408	153
1880	4.0	536	138
1890	4.6	623	137
1900	5.7	839	146
1910	6.4	879	138
1920	6.4	956	148
1930	6.3	987	157
1940	6.1	1061	174
1950	5.4	1161	216
1954	4.8	1158	242
1959	3.7	1124	303
1964	3.2	1110	352
1969	2.7	1063	389
1974	2.3	1017	440
1978	2.3	1015	449
1982	2.2	987	440
1987			

The number of farms grew steadily from 1850 to 1910. Between 1910 and 1935, farm numbers remained relatively constant between 6 and 6.5 million as modest amounts of land were added to the total

and mechanization became more important. The fall in farm numbers which started in the decade of the 20s was slowed by the depression of the 30s. Once World War II was over the great decline in numbers, held back by the depression and the war, began in earnest.

Farm numbers decreased by more than 1.6 million in the decade of the 1950s. Undoubtedly, part of this decrease resulted from the adoption of new technology that would have occurred earlier but for the war and the lack of tractors and associated machinery. Consolidation of small units, particularly in the states east of the Mississippi, was common. Off-farm opportunities for employment were good and commuting to jobs from rural locations became possible as a network of all weather roads was extended.

The rapid consolidation of farms into larger units and the decrease in farm numbers continued in the decade of the 1960s. In a span of 20 years, farm numbers were cut in half with little fanfare. The great readjustment resulting from the introduction of tractor power and electrical energy, accompanied by the adoption of many technological developments in the plant and animal sciences, brought about striking advances in agricultural productivity. Excess production capacity was a continuing problem throughout these decades as government programs to limit acreages planted to basic crops and a system of price supports became institutionalized.

The decade of the 1970s brought a modest reduction in farm numbers, less than 500,000, compared to the two immediately preceding decades. Shortfalls of food and feed grains in other parts of the world led to rapid increases in farm prices in the early 1970s. Agricultural land prices rose more rapidly than the rate of inflation and a boom mentality led to rapid expansions on an important number of farms with large increases in debt.

After the boom of the 1970s came the inevitable readjustments in land prices and the debt-led reorganizations and liquidations of the early 1980s. Farm numbers in total decreased but modestly. The loss of 2.65 million farms between 1950 and 1970 could never be experienced again, even though the readjustments of the late 1970s and early 1980s caught much more public attention and debate. Structural change was still an issue but much more nearly in terms of the proportions of total agricultural output that would be produced by different economic classes of farms, than in declines in farm numbers as such.

While there are many things wrong with trying to describe American agriculture in terms of the average number of acres per farm, because of the vast differences between intensive and extensive forms of production, the statistics in Table 1 help to tell something about the nature of change. Average farm size fell in successive decades of the 19th century in a time when human labor and animal power were the primary sources of energy for agriculture. Average farm size began to increase after 1920 as tractor power

began increasingly to replace horses. The great leaps forward occurred between 1950 and 1969, at the same time as farm numbers were cut in half, another indication that this was the period of greatest structural change in U.S. agriculture.

The Measurement and Identification of Structural Change

Variables commonly cited in studying structural change in agriculture include: (1) size distributions of farms measured in terms of land area, labor force, or output; (2) status of farm operators measured in terms of ownership, land rented and tenancy, or in terms of the business organization used; and (3) the importance of off-farm sources of income and employment to the operator's family and the business enterprise. No single measure of structure can reflect the many facets of change associated with the technological revolution that is still in progress and had its roots in 19th century. Because so much of this change has occurred in the years since World War II, the process is even more difficult to place into an historical context. The various ways of looking at size distributions remains the most important evidence to evaluate.

Definition of a Farm

The official definition of a farm has changed 8 times since the first definition was provided for the Census of 1850. All of the definitions required that agricultural operations involving crops and/or livestock be conducted and operated as a single unit under the direction of one management (individual, partnership, or corporation).

From the beginning there was a requirement that there be some minimum level of sales, $100 in both 1850 and 1860. No minimum acreage was required initially; from 1870-1890 a minimum of 3 acres was needed unless total sales exceeded $500 when this requirement was waived. In 1900, a new condition was added: the full-time services of at least one person. This requirement continued until 1925 when it was dropped and operators reported in four categories about days worked off the farm.

The definition in place for the Censuses of 1974, 1978, 1982, and 1987 and the official one used for all government statistics is:

> "Any place from which $1000 or more of agricultural products were sold or normally would have been sold during the census year."

The acreage requirements used in 1959-69 were dropped and the minimum sales requirement increased. In all of these definitions, the minimum requirement to qualify as a farm unit was small enough

to insure that nearly any unit that could be thought of as a farming operation was included. From the beginning, many small, part-time operations were included in the farm count (Appendix B).

Size Distributions in Acres of Land

Acres of land in farms has been recorded in each of the census years. It provides a general indicator of change through time in the size distribution of farms. Clearly all acres are not the same. In a composite picture of farms across the country, it does indicate, however, something about the way in which the basic land resource used in operations changed with technology and economic conditions.

Table 2. SIZE DISTRIBUTION: ACRES IN FARMS
Census Data, United States, 1900-1940

Size Group	1900	1910	1920	1930	1940
acres			thousands of farms		
Small:					
Under 10	267	335	289	359	506
10-49	1664	1918	2010	2000	1780
Medium:					
50-99	1366	1438	1475	1375	1291
100-174	1422	1516	1450	1343	1310*
175-259	490	534	531	521	486*
Large:					
260-499	378	444	476	451	459
500-999	103	125	150	160	164
1000 and over	47	50	67	81	101
Total	5737	6362	6448	6289	6097

*The Census classes were 100-179 and 180-259 in 1940.

Perhaps the most striking thing about comparing the size distributions from 1900 through 1940 is their similarity. Farm numbers increased in each decade to 1920 and then fell slightly in 1930 and again in 1940. But the patterns remained relatively constant. About the same proportions remained in each of the classes. The proportion of the total that were under 50 acres in

size actually increased slightly between 1900 and 1940. Not surprisingly, the proportion of farms over 260 acres increased from 9.2 percent in 1900 to 11.9 percent in 1940. The stability of the distributions over these 40 years is the most noteworthy thing to recognize.

Table 3. SIZE DISTRIBUTIONS: ACRES IN FARMS
Census Data, United States, 1940-1982

Size Group	1940	1950	1959	1969	1982
acres			thousands of farms		
Small:					
Under 10	506	485	244	162	187
10-49	1780	1478	813	473	449
Medium:					
50-99	1291	1048	658	460	344
100-179	1310	1103	773	542	368
180-259	486	487	415	307	211
Large:					
260-499	459	478	472	419	315
500-999	164	182	200	216	204
1000 and over	101	121	136	151	161
Total	6097	5382	3711	2730	2239

In contrast, there were marked changes in the decades following 1940 (Table 3). This is the period when the great reductions in farm numbers occurred. There were 2.286 million farms with less than 50 acres in the 1940 Census and only 0.636 million in 1982. As a proportion of the total, the number of farms with less than 50 acres also declined from 37.5 percent in 1940 to 28.4 percent in 1982.

The shrink in numbers for farms with 50-279 acres was equally impressive between 1940 and 1982. Most of the drop in numbers occurred between 1950 and 1969 but the largest proportional shift occurred between 1969 and 1982 with only 41.2 percent of all farms remaining in the medium size category of 50-279 acres (Table 4).

The changes from decade to decade in the categories of large farms in Table 3 is of special interest. The total number of farms with 260 acres or more increased from 724,000 in 1940 to 781,000 in

1950 and 808,000 in 1969. The total dropped back to 786,000 in 1969 but fell by more than 100,000 units by 1982 to 680,000. Most of the full-time, commercial units in the 1980s fall in this general size category. Much of the shrink in numbers occurred in the 260-499 acre category, especially between 1969 and 1982.

Table 4. PERCENT OF FARMS BY SIZE CLASS
Acres in Farms, United States, 1900-1982

Year	Size class, acres in farms		
	Small Under 50	Medium 50-259	Large 260 and over
	percent of total		
1900	33.7	57.1	9.2
1910	35.4	54.8	9.7
1920	35.7	53.6	10.7
1930	37.5	51.5	11.0
1940	37.5	50.6	11.9
1950	36.5	49.0	14.5
1959	28.5	49.7	21.8
1969	23.2	48.0	28.8
1982	28.4	41.2	30.4

An overview of the shifts in farm numbers grouped into three somewhat arbitrary size categories is presented in Table 4. The farms with less than 50 acres were more than one-third of the total until after 1950. Even in the 1980s they included more than one-fourth of the total. The medium size category of 50-259 acres decreased in relative importance in nearly all of the decades but remained the largest category. A large part of these units are part-time units in the 1980s but in the 1950s and earlier included many full-time farms.

The impact of the adoption of new technology, mechanical power, and other labor saving devices is particularly evident in the increased proportion of total farms in the large category that occurred between 1950 and 1969. In 1969, 13.4 percent of total farms had 500 or more acres; in 1982, it had grown to 16.3 percent.

When land in farms is aggregated for each of the acreage classes so that total land in farms by size class can be considered in each of the Census years, the continuing shift of agricultural land into larger operating units is seen more clearly (Table 5). In

1910, over 53 percent of the farm land was in units of less than 260 acres; more than one-third of the land was in units of 50-179 acres. By 1930, a modest shift to larger units was evident. Land in farms of 500 acres or more had increased by 10.5 percent.

Table 5. PERCENT OF LAND IN FARMS BY SIZE CLASS
Census Data, United States, 1910-1982

Land per farm in acres	Census years				
	1910	1930	1950	1969	1982
	percent of land in farms				
Small:					
Under 50	6.2	5.7	3.6	1.3	1.4
Medium:					
50-179	35.1	28.3	19.4	10.2	8.1
180-259	12.0	11.2	9.1	6.2	4.9
Subtotal (Under 260)	(53.3)	(45.2)	(32.1)	(17.7)	(14.4)
Large:					
260-499	18.2	15.8	14.4	14.0	12.1
500-999	9.5	11.0	10.9	13.9	15.0
1000 and over	19.0	28.0	42.6	54.4	58.5
Subtotal (over 260)	(46.7)	(54.8)	(67.9)	(82.3)	(85.6)
Acres of land in farms, United States, millions	879	987	1161	1063	987

Between 1930 and 1950, an important shift of land from farms with less than 260 acres to larger units had already occurred. A combination of consolidation of small farms into larger units and renting of part of the land farmed was in process. The period between 1950 and 1969, when half of the farms dropped out of the statistics, is when the two largest size categories increased at the expense of the other four. Farms with 260-499 acres continued to be an important category in 1969, but now 68.3 percent of all the farm land was in operating units of 500 acres or more. Again, it is important to remember that in many cases only part of the land farmed was owned by the operators.

The changes between 1969 and 1982 were the least dramatic of any of the years compared. The same direction of change held true with more of the total agricultural land operated in units of 500 acres or more. By 1982, 85.6 percent of the land was in farms with

260 or more acres. The proportion of total agricultural land farmed in units of 1000 acres or more has increased steadily across the twentieth century.

With more than 161,000 operating units operating 1000 acres or more in 1982, concentration is far from a major problem, when compared with most businesses or industries. It is also easy to forecast that more of the total farm land can be expected to be included in operating units of 1000 acres or more in each of the remaining Census years in this century. It is also likely that the number of farms in this category will increase as more of those in the 500-999 acre category seek to enlarge their operations by bidding away land now operated in some of the smaller sized farms.

Farm Numbers and Land Use by Tenure Class

The Census has classified farms throughout the twentieth century into three important tenure classifications: full owners, part owners, and tenants. The basic definitions are implied by the titles. Full owners operate only land they own. Part owners operate land they own and as well as land they rent from others or work on shares for others. Tenants operate only land they rent from others or work on shares for others.

Tenancy was an important issue of public policy in the years before World War II. The number of tenant farmers grew in each decade until the mid 1930s when the count reached more than 2.8 million. An important part of this number were sharecroppers, often on relatively small holdings; many of these were located in the Southeast. The decline in tenant operated farms began before the end of the 1930s. Between 1935 and 1950 over 1.4 million tenant operated farms had dropped from the count. At the same time, full-owner farms held steady at more than 3.1 million and part owner farms increased from 689,000 to 825,000 (Appendix Table A).

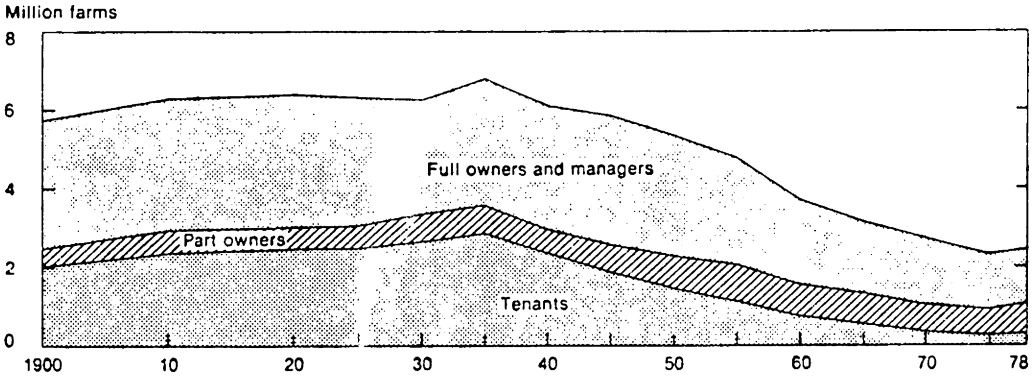
Tenant operated units became a smaller and smaller part of the total number of farms between 1950 and 1974. Since 1974, tenant farms have accounted for 11 to 13 percent of the total number. By 1982, tenant farms were no longer located primarily in the Southeast. The only states with 10,000 or more such farms were Illinois, Iowa, Kansas, Kentucky, Minnesota, Nebraska, and Texas.

The relative importance of tenancy is indicated by the proportion of all land in farms operated by tenants in different Census periods. Land operated by tenants increased steadily from 1900 to 1935. At its peak, one-third of the total was tenant operated (Table 6).

FIGURE 2. LAND TENURE PATTERNS
United States, 1900-1978

Chart 36

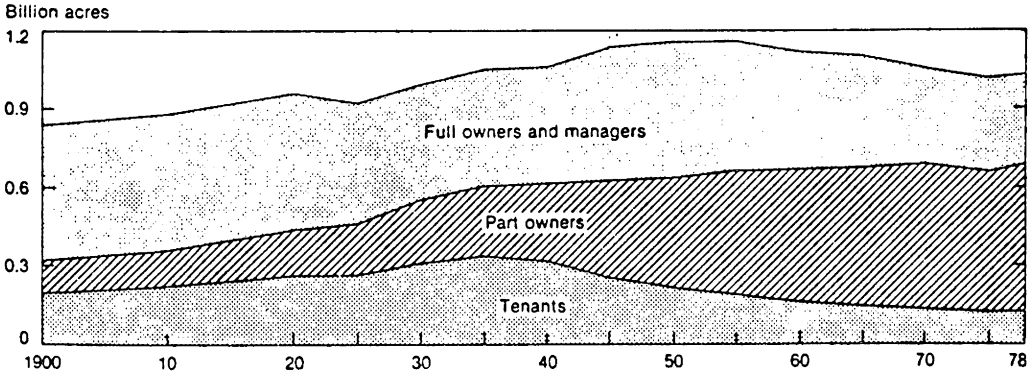
Number of Farms by Tenure of Operator



A separate classification for managed farms was discontinued in 1969. Such farms are now classified by tenure based on whether the land is owned or rented.
Source: 1978 Census of Agriculture.

Chart 37

Land in Farms by Tenure of Operator



A separate classification for managed farms was discontinued in 1969. Such farms are now classified by tenure based on whether the land is owned or rented.
Source: 1978 Census of Agriculture.

The steady decline of full tenancy starting in 1940 and continuing into the 1980s reflects an important structural change in American agriculture. Part ownership has become the dominant form of farm operations. A farmer owns part of the land he operates and rents the rest. The rented land may be one parcel of cropland or some pasture; it may also be 80 or 90 percent of the land he farms. The urge to own all the land one operates has been replaced by a desire to bring together a large enough resource base to make an effective business. Renting part of the land is now a natural part of much of the commercial sector in American agriculture. Since 1969, part owners have operated more than half of America's farm land and the trend continues.

Table 6. LAND IN FARMS BY TENURE
Census Data, United States, 1900-1982

Year	Tenure class			
	Full owners	Part owners	Tenants	Total
	million acres			
1900	519	125	195	839
1910	519	133	227	879
1920	515	176	265	956
1930	435	246	306	987
1935	452	266	337	1055
1940	449	300	312	1061
1945	519	371	252	1142
1950	526	423	212	1161
1954	495	470	193	1158
1959	459	498	167	1124
1964	432	533	145	1110
1969	375	550	138	1063
1974	360	535	122	1017
1978	332	561	122	1015
1982	342	531	114	987

Full owners were the dominant tenure class in the first half of the century both in numbers and land operated. The relative decline in importance of full ownership since 1950 does not make this an unimportant group. It is still the largest in terms of numbers including many small, part-time and residential farms. Most farmers want to own their land; for many, however, the most efficient way to expand operations is to rent rather than buy additional cropland. The social status of a renter or tenant has changed during the course of the century. Renting is seen as part of successful operations. Tenancy is no longer viewed as an important social problem. It is simply a component of the way in which commercial agriculture is organized and operated. Landlords provide an important part of the capital to both tenants and part owners in a capital intensive industry.

Size Distributions by Gross Sales

One of the most common methods of measuring size of business, regardless of the type of industry, is to look at output in terms of gross sales. This is an internationally accepted way of comparing

firms both within and between industries. It has been widely used in the United States in looking at distributions of farms particularly in the second half of the century.

One of the major disadvantages in using gross sales in discussing changes in farm size or structure is the difficulty of removing the effect of changes in prices from these distributions when comparisons are made across time periods. A farm that sold $25,000 of farm products in 1950 is far different from one that had sales of $25,000 in 1969 or 1982. Moreover, there is more than price level changes involved in seeking comparability. Changes in technical efficiency have occurred which affect the prices of both outputs and inputs. Capital has been substituted for labor so that a farm requiring between one and two full time workers in 1940 is substantially different from one using between one and two full time workers in the 1980s.

The following list summarizes some of the commonly recognized problems with using sales as a measure of farm size in any given year:

(1) Effects of changing price levels are not easily accounted for in comparisons between years.

(2) Changes in crop or livestock inventories are not considered. Sales from two years or only part of a year may be included.

(3) Government payments are not included as a source of income as in the case of the Census in 1987.

(4) Crop failures or livestock losses understate the size of input requirements for farms so troubled.

Despite these well-recognized problems, gross sales persists as the most commonly used way of describing farm size and presenting size distributions.

The dimensions of the problems of making comparisons across time are suggested by the data in Table 7 taken from the Censuses of 1969-1982. Farm numbers declined only slightly during this period. There was one change in the definition of a farm when the minimum level of sales to qualify as a farm was increased from $250 to $1000 in 1974. The price level essentially doubled between 1969 and 1978; it increased by about 15 percent between 1978 and 1982.

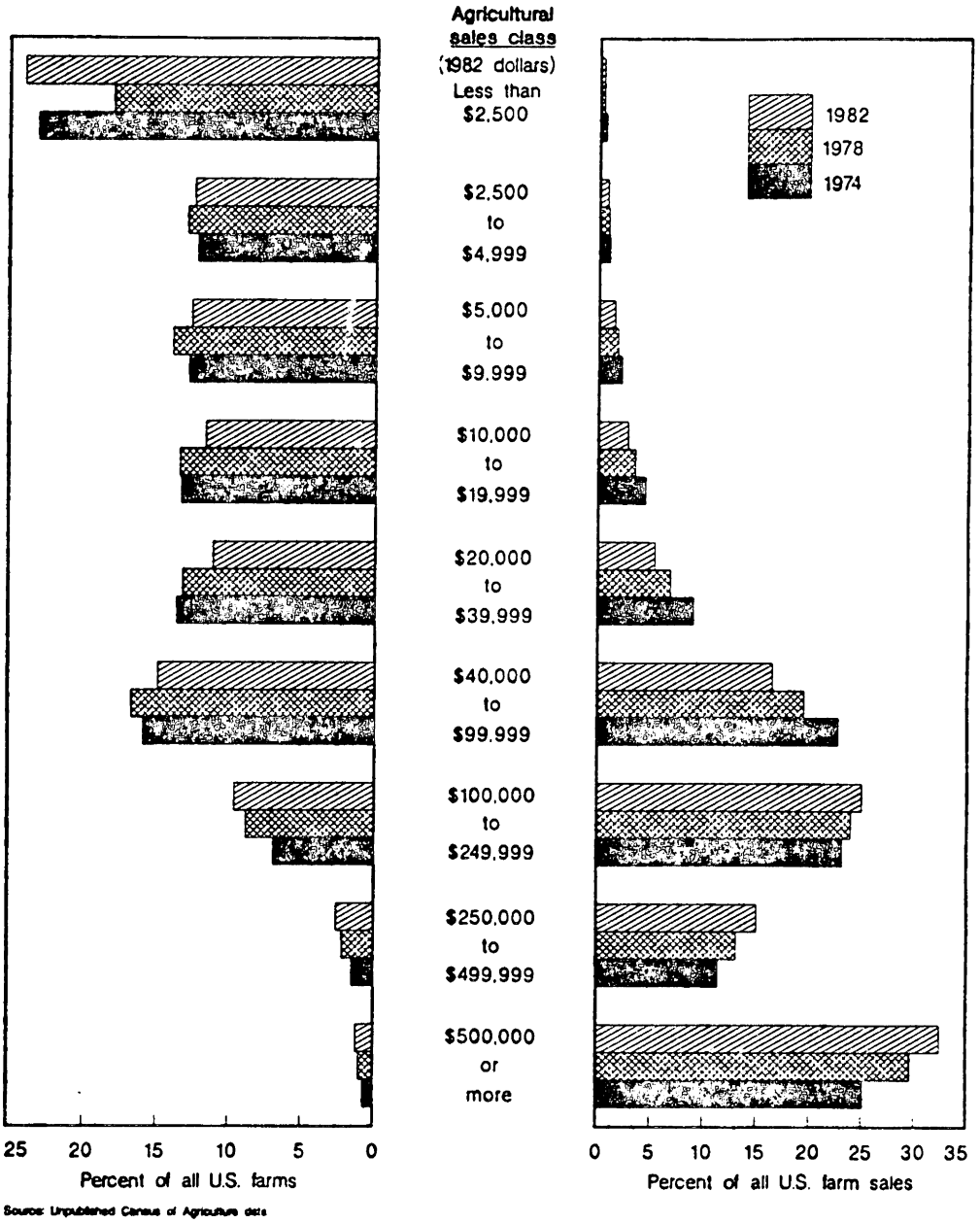
Table 7. DISTRIBUTION OF FARM NUMBERS BY SALES CLASS
Census of Agriculture, United States, 1969, 1974, 1978, 1982

Description	Census Year 1969	1974	1978	1982
Producer Price Index, Farm Products (1967=100)	109.1	187.7	212.5	242.4
Prices Received by Farmers (1977=100)	59	105	115	133
Value of Farm Products Sold:		number of farms		
$500,000 or more	4,079	11,412	17,973	27,800
200,000 - 499,999	12,608	40,034	62,645	93,891
100,000 - 199,999	35,308	101,153	141,050	180,689
40,000 - 99,999	169,695	324,310	360,093	332,751
	(221,690)	(476,909)	(581,761)	(635,131)
$ 20,000 - 39,999	330,992	321,771	299,175	248,825
10,000 - 19,999	395,472	310,011	299,215	259,007
5,000 - 9,999	390,425	296,373	314,088	281,802
2,500 - 4,999	395,104	257,263	300,699	278,208
Under $2,500	994,456	649,448	460,535	536,327
Abnormal	2,111	2,238	2,302	1,676
Total	2,730,250	2,314,013	2,257,775	2,240,976

Source: Census of Agriculture and Statistical Abstract of the United States.

It is quite easy to see how individuals could look at these unadjusted data and see a very substantial shift to "larger" farms and be concerned at the structural changes which appeared to be occurring. The Census staff at the request of the Economic Research Service and with USDA funding, went back to the original data sets, using Prices Received by Farmers as a deflator, and reestimated the size distributions from 1974 and 1978 on a 1982 base. These were published in September 1986 in Ahearn, Financial Well Being of Farm Operators and Their Households, Economic Research Service, USDA, AER #563.

FIGURE 3. DISTRIBUTION OF FARMS AND SALES AND AGRICULTURAL COMMODITIES BY AGRICULTURAL SALES CLASS 1974, 1978, and 1982



These bar charts show that there has been relatively little change in the number of farms in the sales classes with less than $20,000 of sales when the effect of prices is taken into account. In the classes with sales between $20,000 and $100,000, there has been some loss in numbers between 1974 and 1982 and a concurrent increase in numbers for farms selling more than $100,000 annually.

This is further accentuated when the total value of all sales for a given class is expressed as a percent of the total for each of the Census years. The three largest classes of farms increased at the expense of all the others but especially those with sales between $20,000 and $100,000.

Table 8. COMPARISON OF FARM NUMBERS BY ADJUSTED SALES CLASS
United States Census Data, 1969 and 1978

Description		1969 Census data distributed on 1978 base*		1978 Census
Producer Price Index, Farm Products (1967=100)		109.1		212.5
Index of Prices Received by Farmers (1977=100)		59		115
Value of Farm Products Sold:			number of farms	
Full-time:				
$500,000 or more	11,535		17,973	
200,000 - 499,999	40,460		62,645	
100,000 - 199,999	103,990		141,050	
40,000 - 99,999	396,697		360,093	
Subtotal		552,682		581,761
Part-time:				
$ 20,000 - 39,999	395,472		299,175	
10,000 - 19,999	390,425		299,215	
Subtotal		785,897		598,390
Primarily residential:				
$ 5,000 - 9,999	357,922		314,088	
2,500 - 4,999	339,444		300,699	
1,000 - 2,499	346,732		460,535	
Subtotal		1,044,098		1,075,322
Abnormal		2,111		2,302
Total		2,384,788**		2,257,775

*Adjusted Census distributions from Table 7.

**Reduced from 2,730,250 to account for all farms with sales of $500 or less in 1969 (definition change).

Something more than a change in prices was at work even though much of the change in the unadjusted distributions can be attributed to price inflation. This is especially evident if comparisons are made between 1969 and 1978 (Table 8).

The loss in farm numbers in that decade came in part from the units with sales of less than $20,000. One source of the loss in numbers of small farms between 1969 and 1978 was the change in the definition of a farm when the minimum sales requirement was increased from $250 to $1000. This accounted for about 350,000 of the drop in numbers.

The important conclusion is that farm size, measured in terms of gross sales, is increasing by more than the rate of inflation among the larger units. Many of the farms with sales of $60,000 in 1978, which could be considered part-time legitimately in terms of labor requirements and the ability to provide primary support for a farm family, would have been full-time farms in 1969 with sales of $30,000 in then current prices. Changes in technology resulted in important increases in real dollars of output per worker in this short span of years.

Table 9. FARM BUSINESS SUMMARY AVERAGES
Northern Illinois Grain Farms, 340-499 Acres, Soils Rated 76-100

Characteristic	Record summary averages for: 1960	1970	1975	1980*	1985*
Number of farms	122	408	235	534	487
Months of labor	20	15	14	16	14
Acres of tillable land	384	395	405	534	487
% land in corn and soybeans	77	87	95	98	93
Yield of corn/bushel	92	93	146	100	166
Price received, corn/bushel	$1.04	$1.18	$2.78	$2.64	$2.57
Capital investment	$223,600	$342,600	$691,300	$2,020,000	$1,309,900
Cash receipts	$ 33,089	$ 48,707	$113,267	$ 178,315	$ 186,031

*In 1980 and 1985, the acre interval was 340-799.

Sources: Summaries of Illinois Farm Business Records.

Evidence of the combined effects of price and technology on data for farms of relatively constant size in terms of labor, cropland, and management is suggested by averages taken from the

Illinois Farm Business Record Summaries (Table 9). This source includes records from a large number of continuing farmers over a long span of years using the same summary procedures and full inventory adjustments annually. Groups of farms with essentially the same resource base are averaged.

Between 1960 and 1975, these grain farms used about the same amount of cropland annually but the average months of labor used per farm decreased from 20 to 14 months. Specialization in production of corn and soybeans increased. Cash receipts were clearly influenced by yields and prices. A comparison of the averages for 1970 and 1975 reflects both of these effects.

Between 1975 and 1980 the analysts summarizing records for grain farms in Northern Illinois broadened the acreage base from 340-499 to 340-799 acres. The average amount of labor used per farm, however, remained nearly the same and by 1985 the average used for more land was 14 months, the same as ten years earlier. If one simply looks at average cash receipts on these farms across this span of years, one sees substantial growth in size. From 1960 to 1985, cash receipts increased 5.6 times. Corn prices were 2.5 times higher; corn yields were up by 180 percent. Less labor harvested more land and much more product.

This brief examination of farm records helps to demonstrate why gross sales or cash receipts, even when corrected for changes in prices, do not capture the nature of structural change in agriculture as effectively as they might. Particularly in the years since 1940, one worker has been able to handle more units of livestock and more units of cropland with the aid of substantial investments of additional capital.

ECONOMIC CLASSES OF FARMS

Under the leadership of Ray Hurley at the Bureau of Census and with the encouragement of the Bureau of Agricultural Economics, USDA and the Census Advisory Committee, a special section in the Census of 1945 was devoted to Value of Farm Products and Type of Farm. Size distributions by value of farm products sold or used were developed for all farms and for individual types of farms. A summary comparison with similar data for 1930 and 1940 was constructed (Table 10).

A brief examination of these historical data help to remind us near the end of the twentieth century, how much prices fell in the Great Depression and how long it took to recover. In 1940, there were one million more farms than in 1930 for which the total value of production was less than $1000. Substantial change occurred between 1940 and 1945 as prices rose and nearly 2 million farms had sales of $2500 or more compared to only 690,000 in 1940.

Table 10. SIZE DISTRIBUTIONS OF FARMS BY VALUE OF PRODUCTS
Census Data, United States, 1930, 1940, 1945

Value of farm products sold or used by households	1930	1940	1945
		thousands of farms	
Under $250	398	1234	552
250- 399	518	822	434
400- 599	766	871	514
600- 999	1246	1054	780
Subtotal	(2928)	(3981)	(2280)
1,000- 1,499	938	709	718
1,500- 2,499	981	680	909
2,500- 3,999	628	376	743
4,000- 5,999	291	166	514
6,000- 9,999	147	89	398
10,000-19,999	62	41	206
20,000 and over	25	18	83
Total	6000	5969	5753

The difficulty in interpreting historic changes in size distributions of farms by value of sales led Hurley to construct an Economic Classification System in 1950. He first divided all farms into "commercial" and "other." The "other" category was further subdivided into three groups described as "part-time," "residential" and "abnormal." He divided the commercial farms into six classes on the basis of farm products sold (Table 11).

In many respects, this system divides farms into three major categories: full-time, part-time and residential. The subdivision for economic Class VI differs only from part-time on the reported number of days of work off the farm. If one were to assume that most of the 717,201 farms in economic Class VI were, in fact, partly retired individuals or necessarily getting more than half their livelihood from off-farm sources, they could well be counted with the part-time units. Thus 56 percent of the total, just under three million could be considered full-time farms; 25 percent were part-time or close to that designation; and 19 percent were residential.

Table 11. DISTRIBUTION OF FARMS BY ECONOMIC CLASS
Census of Agriculture, United States, 1950

Class	Criteria used: Value of farm products sold	Other	Number of farms
Commercial:			
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
Other:			
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.

Hurley continued to experiment with Economic Classes adjusting the six commercial categories to reflect both changes in prices and technology. Most of the sales class intervals doubled between 1950 and 1969 even though the Producer Price Index for farm products and processed foods and feeds had only increased from 93.9 to 108.0 over those 20 years. The "other" categories now included part-time and part retirement with the use of an age criterion as well as days of work off the farm.

Table 12. DISTRIBUTION OF FARMS BY ECONOMIC CLASS
Census of Agriculture, United States, 1969

Class	Criteria used: Value of farm products sold	Criteria used: Other	Number of farms
Commercial:			
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.	2,111
Total number			2,730,250

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

In 1974, the economic classes were dropped and have not reappeared in subsequent Census publications. No doubt the tremendous changes in prices and economic climate for agriculture between 1969 and 1974 were part of the reason. While there were obvious problems in establishing meaningful criteria in which to group farms by size, the lack of such classes left interpretation of these distributions to the reader, often unskilled in thinking about the many different forces at work. The great restructuring of American agriculture, which occurred between 1950 and 1969, was sometimes believed to be continuing at the same rates in the 1970s and 1980s.

Alternative Systems for Classifying Farms

The European Community. Given the number of problems that are recognized in using value of farm products sold to define farm size when making comparisons over time, some other alternatives have been proposed. The European Community has developed a system of economic size classes denominated in European Size Units. There are nine size classes; the smallest is Class I with less than 2 ESU; the largest includes farms with 100 or more ESU.

A European Size Unit is equal to 1000 ECU's of Standard Gross Margin. Standardized Gross Margin is calculated in each of the 12 countries of the EC for every productive agricultural enterprise annually. Gross Margin is the difference between gross receipts and variable costs per unit. These are standardized using ECU's for the 1980 reference period. Thus, if one hectare of wheat has an average gross margin of 120 ECU's in France in 1988 and the index of prices is 150 on the 1980 base, the SGM will be 80 per hectare using the 1980 reference period. Put another way, if prices increased 50 percent between 1980 and 1988, one ESU = 1500 ECU in 1988 prices.

The ESU and the nine economic size classes have worked well for the Europeans. Both the Farm Accountancy Data Network used throughout the EC and the Community Surveys of Agricultural Holdings, similar to our Census, use these classifications. Standard Gross Margin has the additional advantage of being an approximation of Value Added which makes comparisons of size across enterprises much more appropriate than gross sales.

Ahearn and Lee. A recent proposal for classifying farms was forwarded by Ahearn and Lee from the Economic Research Service, USDA. They suggest four basic classes using major occupation of the operator and household dependency on farm income as criteria. The four categories with a few comments about each follows:

1. Operator's major occupation is not farming and household not dependent on farm income.

   a. About one-third of current FCRS farms.
   b. Probably about 40-50 percent of U.S. farms.
   c. Six percent of U.S. agricultural production.
   d. Lowest poverty rate of four groups.

2. Operator's major occupation is not farming but the household is dependent on farm income.

   a. Small group; about four percent of U.S. farms.
   b. Operators of cash grain farms + off-farm jobs.
   c. Small livestock farms + off-farm jobs.

3. Operator's major occupation is farming but household not dependent on farm income.

   a. About 25 percent of FCRS households.
   b. About 12 percent of U.S. production.
   c. Half specialize in livestock production.
   d. Includes many near or in retirement.
   e. Highest poverty rate of four groups.

4. Operator's major occupation is farming and household is dependent on farm income.

   a. Nearly 40 percent of FCRS farms.
   b. 75 percent of U.S. production.
   c. Mid-size and large farms in terms of sales.
   d. Second lowest poverty rate of four groups.

This classification system draws attention to primary occupation of the operator and dependence of the operator's family on farm income. This is not a classification system concerned primarily with comparison of changes in size and structure over time. The basic elements could be essential parts of a system where a consistent measure of size was included as well.

Labor Used in Agricultural Production. Much of the technology applied in agricultural production has sought to increase labor productivity. Labor is a key input around which production is organized. It can be a common denominator across all types of production and is an input which can be measured in physical units on a consistent basis over time. Thus, it has many of the key elements which might be used in a basic classification system for U.S. farming. A labor-based classification system might include the following general categories:

1. Full-time, Large. Establishment where agricultural production and marketing is the primary occupation of the operator (manager), and where 60 months or more of operator, family, regular hired or day labor are employed.

2. Full-time, Family. Establishment where agricultural production and marketing is the primary occupation of the operator (manager), and where from 10 to 60 months of operator, family, regular hired or day labor are employed.

3. Part-time. Establishment where agricultural production is an important contributor to family income and where from 2 to 10 months of operator, family or day labor in total is required in business operations.

4. Residential. Establishment where agricultural production occurs but is not an important contributor to family income; less than 2 months of total labor are required under average conditions to carry out agricultural operations.

This classification system uses some of the original descriptive terms from Hurley's economic classification system for the 1950 Census. It provides four major categories within which subdivisions by value of production or value added could be constructed as well. If the basic classes were used regularly, it would help to identify more clearly the major groups of farms within agriculture and help to reduce confusion about the number of farms affected by different types of public policy. Such a system would require that more information be obtained about labor provided by family members in agricultural operations. Essentially, no other new information is required.

An alternative approach for a labor-based classification system is to use standardized labor requirements for each of the productive enterprises on a farm and determine size of operations in this manner after determining acres of crops and numbers of livestock. Activities of direct marketing, farm processing and similar activities would then have to be counted in days required.

SUMMARY AND CONCLUSIONS

Farm Numbers. The 20th century was a time of great change in the structure of agriculture in the United States. Farm numbers had been increasing steadily throughout the 19th century as had land in farms. In 1900, there were 5.7 million farms and 839 million acres in farms. Farm numbers continued to increase until there were more than 6.3 million units counted as farms. Farm numbers held at more than 6.0 million until after 1940 and U.S. entry into World War II. After this, with good job opportunities available, farm numbers declined rapidly, especially between 1950 and 1969 when farm numbers were cut in half. After 1969, the drop in numbers has continued but at a much slower rate.

Land in Farms. Land in farms continued to increase in each decade during the first half of the century. The peak in land in farms at 1,161 million acres occurred in 1950. In subsequent years, farm land has slowly been converted to forest, recreational uses, and for urban and suburban development. Land in farms in 1982 had declined to 987 million acres, a drop of 15 percent in three decades.

Technology. Farming at the turn of the 20th century was powered by horses, mules and human labor. The mechanical revolution in agriculture had started; machines were used to harvest many

important crops; the first agricultural experiment stations and colleges had been put in operation. Applications of science and technology to solve agricultural problems and reduce human toil and drudgery had just begun to make their mark.

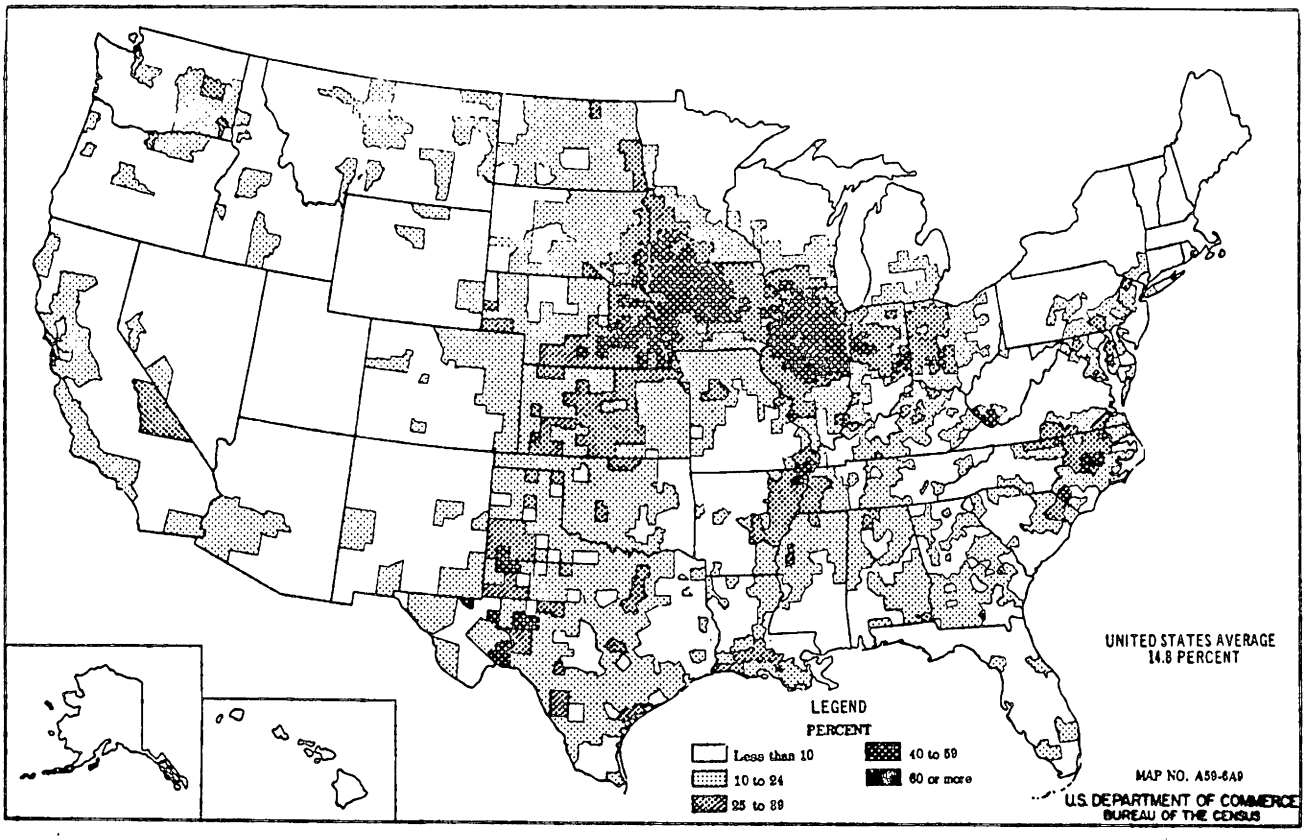
Between 1900 and 1940, there was modest structural change. Farm size changed little; tractor power began to replace horses; the agricultural depression of the 1920s followed by the general depression of the 1930s slowed the adoption of new technology developed to improve agricultural productivity.

The sweeping structural changes between 1950 and 1969 were foreshadowed by developments within agriculture during the War and the immediate postwar years. People were uprooted from their old patterns of life by the War. New skills were learned and new jobs were made available. Electricity and all weather roads made life in the country and commuting to industrial jobs a fine alternative. Applying the new agricultural technology developed over the previous 30 years now became possible.

Tenancy. Farm tenancy and sharecropping was cut in half between 1935 and 1960, partly aided by federal programs in the 1930s and 1940s. This was primarily brought about by the availability of off-farm jobs and the advent of a tractor-powered, mechanized agriculture which saw part owners competing effectively for additional rented land.

The summary map from the 1960 Census provides a generalized picture of the pattern of land in farms operated by tenants which continues to hold true in the 1980s. In 1959, a little less than 15 percent of all land in farms was operated by tenants. This has decreased to a little less than 12 percent in 1982. Public concern for the problems of tenancy, an issue of the 1920s and 1930s, has essentially disappeared.

FIGURE 4. PERCENT OF LAND IN FARMS OPERATED BY ALL TENANTS, 1959



Size Distributions. Whether measured in terms of acres of land in farms or in value of sales per farm, adjusted for price changes, the great changes in farm size occurred between 1950 and 1969. Farm numbers were cut in half. Labor productivity increased dramatically; excess capacity in agriculture became a chronic problem. A shift away from general crop and livestock farms to specialization in one or two enterprises became the general rule.

An economic classification of farms was developed by Hurley at Census and the BAE, USDA in 1950 to more adequately identify the component parts that made up farm numbers. Using value of farm products sold to compare size distributions through time proved difficult because of changes in prices and technology. The potential usefulness of an economic classification system, based on a physical standard like acres of cropland or months of labor, in describing the structure of agriculture is evident.

Structure at the Beginning of the 1990s. Family farms, simply defined as units where family labor accounts for 40 percent or more of the total used, continue to account for the bulk of all full-time farms. About 50 percent of all units defined as farms in the 1980s sell less than $10,000 of farm products. Most of these can be

characterized as residential units where farming provides much less than 20 percent of family income. Part-time farms accounting for less than 10 percent of all farm products sold include about 500,000 establishments. A line between full-time and part-time farms has not been drawn formally. The importance of family income from off-farm sources and labor used in farm operations are possibilities.

The 30,000 largest farms account for 30 percent of farm products sold and have increased somewhat in importance during the 1980s. The policy debate about structure in part relates to how rapidly the largest farm units will come to dominate production and marketing in specialized types of farming. The competitive structure of American agriculture, characterized by many relatively small units, remains the norm in contrast to most industries in the United States. Structural change continues into the 1990s but at similar rates to those in the 1980s.

APPENDIX A

Table A. TENURE OF FARM OPERATORS
Census Data, United States, 1900-1982

Year	Tenure Class			Total
	Full owners	Part owners	Tenants	
	thousands			
1900	3261	451	2025	5737
1910	3413	594	2355	6362
1920	3435	558	2455	6448
1930	2968	657	2664	6289
1935	3258	689	2865	6812
1940	3121	615	2361	6097
1945	3340	661	1858	5859
1950	3113	825	1444	5382
1954	2757	857	1168	4782
1959	2140	811	760	3711
1964	1836	782	540	3158
1969	1706	671	353	2730
1974	1424	628	262	2314
1978	1298	681	279	2258
1982	1326	656	259	2241

APPENDIX B

The Farm Definition:

"When the first census of agriculture was conducted in 1840, there was no official attempt to define what exactly constituted a farm. The first census definition, for 1850, was simple; any place that had $100 or more in total agricultural products sales value was a farm. Since that time, acreage and dollar values of sales limits have been added, changed, or removed, but the requirements that the land be involved in, or connected with, agricultural "operations," and that it be under the day-to-day control of a single management (individual, partnership, corporation, etc.) have been retained."

"The most important requirement is, of course, the connection with agricultural operations, which -- again for Census purposes -- are the production of livestock, poultry, and animal specialties and their products, and/or crops, including fruits, greenhouse, and nursery products. The land involved in these operations need not be contiguous to comprise a single farm, it must only be operated as a single unit." (For an exception to this general rule, see the section on the definition used in 1950-1954 censuses.)

"The changes in the various criteria used for the definition of a farm are outlined below, by census:

1. 1850-1860. No acreage requirement, but a minimum of $100 in total sales value of agricultural products.

2. 1870-1890. A minimum of 3 acres was needed for a tract to qualify as a farm. Places with less than 3 acres were considered farms if they had a minimum of $500 in agricultural product sales.

3. 1900. The acreage and minimum sales requirements were removed, and cranberry marshes, greenhouses, and city dairies were included, provided they required the full-time services of at least one person.

4. 1910-1920. A minimum of 3 acres, with $250 or more in total value of sales, unless the individual operation required the full-time services of at least one person.

5. 1925-1945. The requirement for continuous services by at least one person was dropped for the 1925 and following censuses; otherwise the definition used in the 1910-1920 censuses was unchanged.

6. 1950-1954. The acreage qualification was retained, but places of less than 3 acres were counted as farms if they had $150 or more in total sales value of agricultural products during the census year. Places that would normally have had at least $150 in sales, or that had begun operating as a farm for the first time in 1954, were also counted as farms. If a place had sharecroppers or other tenants, the land assigned to each was treated as a separate farm, even though the landlord handled the entire holding as a single unit. Land retained and worked by the landlord was considered a separate farm.

7. 1959-1974. Any place with 10 acres or more, and with $50 or more in agricultural products sales, or any place with less than 10 acres, but with at least $250 in total sales qualified. If sales were not reported, or if the reported sales figures were obviously incorrect, average prices were applied to reported estimates of harvests and livestock produced to arrive at estimated sales values.

8. 1978-1982. The minimum acreage requirement was dropped. Any place that had, or normally would have had, $1,000 or more in total agricultural products sales during the census year was counted as a farm."

Source: 1982 Census of Agriculture, AC82-SS-4, Volume 2 Subject Series, Part 4, History, U.S. Department of Commerce, Bureau of the Census, p. 72.

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