Part II

The Changing Structure of American Agriculture

Chapter 4

Dynamic Structure of Agriculture

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Dynamic Structure of Agriculture

Who will use a technology is as important a consideration as which technology will be adopted, for the distribution of technology affects both agricultural production and the socioeconomic structure of the entire agricultural sector.

The trend toward concentration of agricultural resources in fewer but larger farms will continue, although the degree of concentration will vary by region and by commodity. Indeed, in the future, 75 percent of the food and fiber in this country will probably be produced by only 50,000 of the 1 million farms in existence. Further concentration of resources will be most likely in those industries already highly concentrated, for example, the broiler, fruit and vegetable, and dairy industries.

Several factors contribute to the changing character of the agricultural sector: policies, institutions, economies of size, and new technologies themselves. This chapter provides a perspective for analyzing technology's distributional impacts on agricultural structure by surveying the characteristics of that structure and the factors that affect it.

PRESENT STRUCTURE OF AGRICULTURE

The heart of agriculture—the farm—is officially defined as a place that produces and sells, or normally would have sold, at least $1,000 worth of agricultural products per year. So defined, there were about 2.2 million farms in 1982. Farms in that year had an average net income from farming of $9,976 and an average off-farm income of $17,601, for a total of $27,577.

Perhaps the best known characteristic of U.S. agriculture is the trend toward larger but fewer farms. Currently, about 1 billion acres of land are in farms, resulting in an average farm size of about 400 acres. However, this average size has little meaning, since fewer than 25 percent of all farms fall within the range of 180 to 500 acres. Almost 30 percent of all U.S. farms have less than 50 acres, whereas 7 percent have more than 1,000 acres.

The number of farms reached a peak of about 6.8 million farms in 1935 and is now approximately 2.2 million. The rate of decline has slowed since the late 1960s, with a loss of about 100,000 farms since 1974.

Employment in farming began a pronounced decline after World War II, when a major technological revolution occurred in agriculture. The replacement of draft animals by the tractor began in the 1930s and was virtually complete by 1960, releasing about 20 percent of the cropland, which had been used to grow feed for draft animals.

The increased mechanization of farming permitted the amount of land cultivated per farm worker to increase fivefold from 1930 to 1980. The amount of capital used per worker increased more than 15 times in this period. Total productivity (production per unit of total inputs) more than doubled because of the adoption of new technologies such as hybrid seeds and improved livestock feeding and disease prevention. The use of both agricultural chemicals and fuel also grew very rapidly in the postwar period. Agricultural production began to rely heavily on the nonfarm sector for machinery, fuel, fertilizer, and other chemicals. These, not more land or labor, produced the growth in farm production. The resultant changes have greatly increased the capital investment necessary to enter farming and have generated new requirements for operating credit during the growing cycle.

One of the best ways to look at changes in the economic structure of U.S. agriculture is in terms of value of production as measured by

gross sales per year. Farms can be usefully classified into the five categories of gross sales shown in table 4-I.

Small farms generally do not provide a significant source of income to their operators. This class of farms is operated by people living in poverty and by people who use the farm as a source of recreation.

Part-time farms may produce significant net income but in general are operated by people who depend on off-farm employment for their primary source of income.

Table 4-1.—Sales Classes of Farms

Class	Amount of gross sales per year
Small	< $20,000
Part-time	$20,000 to $99,999
Moderate	$100! 000 to $199,000
Large	$200,000 to $499,999
Very large	$500,000

SOURCE: Office of Technology Assessment.

Moderate-size commercial farms cover the lower end of the range in which the farm is large enough to be the primary source of income for an individual or family. Most families with farms in this range also rely on off-farm income. In general, farms in this range require labor and management from at least one operator on more than a part-time basis.

Large and *very large* commercial farms include a range of diverse farms. The great majority of these are family owned and operated. Most farms in these classes require one or more full-time operators, and many depend on hired labor on a full-time basis. Five percent of these farms are owned by nonfamily-owned corporations, a much higher percentage than in the other three classes. In general, the degree of contracting and vertical integration is much higher in these classes.

CHANGES IN THE STRUCTURE OF U.S. AGRICULTURE

In tables 4-2 to 4-5 changes in the structure of U.S. agriculture between 1969 and 1982 are presented in terms of four basic attributes: numbers of farms, gross income of farms, net farm income, and off-farm income. The information in each table has been adjusted to account for the impact of inflation and is presented in terms of constant 1982 dollars. Inflation in commodity prices over the 13 years between 1969 and 1982 has tended to move many farms from lower sales classes into higher sales classes. Farm numbers, sales, and income values have accordingly been redistributed to correct for this.[1]

Changes in Farm Size and Number

Major changes in the structure of U.S. agriculture can be seen in the changes in the number of farms shown in table 4-2. Even after the number of farms was redistributed toward the larger sales classes in the years prior to 1982, the real number of small farms declined by about 39 percent—a dramatic decline. Recent reports that the number of small farms has actually increased since 1978 refer primarily to farms that have less than 50 acres, not to farms with less than $20,000 per year in sales. The number of part-time farms has increased by about 57 percent. The number of moderate-size farms has increased greatly, by 111 percent. The numbers of large and very large farms have also increased very dramatically, by about 130 and 101 percent, respectively. The substantial increase in the real number of moderate-size farms appears to contradict many claims that the moderate-size farm is disappearing from the structure of American agriculture. However, as will be shown in the next two sections and in later chapters, changes in the number of farms is not, by itself, a good indicator of economic health or the abilit y of different classes of farms to survive financially.

IThe redistribution to correct for inflation in terms of 1982 dollars has the effect of moving farm numbers, sales, and income from lower sales classes into higher sales classes in the years prior to 1982.

Table 4-2.—Number of Farms and Percent of Farms by Sales Class, 1969-82 (1982 **dollars)**

Sales class	Value of farm products sold	Number of farms				Percent of farms			
		1969	1974	1978	1982	1969	1974	1978	1982
Small	c $20,000	2,216,851	1,926,875	1,617,385	1,355,344	81.30/o	70.90/0	66.00/0	60.50/0
Part-time	$20,000-$99,999	371,180	559,076	573,976	581,576	13.6	20.6	23.4	26.0
Moderate	$100,000-$199,999	65,569	146,089	160,289	180,689	3.1	5.4	6.5	8.1
Large	$200,000-$499,999	40,691	67,091	75,891	93,891		2.5	3.1	4.2
Very large	$500,000	13,800	19,200	21,500	27,600	0.5	0.7	0.9	1.2
All farms		2,728,111	2,718,331	2,449,041	2,239,300	100.0%	100.0%	100.0%	1OO.OO/.

SOURCE: Office of Technology Assessment, Compiled from data in Economic *Indicators of* the *Farm Sector: Income and Balance* Sheet *Statistics, 1983.* USDA, Economic Research Service, 1984. Data adjustment for inflation baaed on redistribution of farm numbers in the Census of Agriculture, 1989, 1974, 1978, 1982, Bureau of the Census, U.S. Department of Commerce. Price indices in Agricultural Statistics, 1983, USDA.

Changes in the Distribution Of Sales and Income

Changes in the number of farms do not give the whole picture. Changes in the distribution of sales and income are more important to the economic structure of U.S. agriculture and more clearly show the direction in which U.S. agriculture is heading.

Changes in the distribution of gross farm income between 1969 and 1982 are shown in table 4-3.[2] As can be seen, the real value Of total gross farm income increased significantly in the period 1969-78, then declined somewhat by 1982. The gross farm income of small farms decreased significantly between 1969 and 1978, then decreased greatly between 1978 and 1982, resulting in an overall reduction in the share of gross income, from *17* percent in 1969 to 6 percent in 1982. Gross income of part-time farms remained roughly the same over the period. Gross farm income of moderate-size farms increased from 15 to 19 percent. In the same period, the percent of sales from large and very large farms combined increased from 45 to 54 percent. Overall, the majority of market share shifted from the combined shares of the small, part-time, and moderate-size farms in 1969 to the combined shares of the large and very large farms in 1982.

The most telling changes of all have occurred in the distribution of net farm income, as shown in table 4-4. The large and very large farms not only have captured the majority of gross farm income, but also have controlled or substantially reduced their costs of production. As a result, their combined share of net income has increased from 51 percent in 1969 to 84 percent in 1982, after adjustment for inflation. Very large farms have been responsible for the majority of this growth in net income. This class of farms, which currently accounts for only 1.2 percent of U.S. farms, increased its share of net farm income from 36 percent in 1969 to 64 percent in 1982.

Examination of the amounts of net farm income in real terms shows that the total amount of net farm income for all farms increased greatly from 1969 to 1974, and then declined.

[2]Gross farm income includes cash receipts; net Commodity Credit Corporation loans; income from recreational, machine hire, and custom work; the value of home consumption of products produced onfarm, and ***gross*** rental value of farm dwellings.

Table 4.3.–Gross Farm Income and Percent of Gross Farm Income by Sales Class, 1989-82 (1982 dollars)

Sales class	Value of farm products sold	Gross farm income				Percent of gross farm income			
		1969	1974	1978	1982	1969	1974	1978	1962
Small	< $20,000	$21,791,756	$16,160,371	$ 17,694,223	$ 7,260,143	17.2%	12.70/o	12.1 0/0	5.5%
Part-time	$20,000-$99,999	28,012,247	30,844,011	35,623,571	28,763,908	22.1	24.3	24.3	21.9
Moderate	$100,000-$199,999	19,477,342	22,930,645	26,794,096	25,100,815	15.4	18.1	18.3	19.1
Large	$200,000-$499,999	19,566,095	22,233,997	26,180,305	27,680,560	15.4	17.5	17.9	21.0
Very large	$500,000	37,635,967	34,704,598	40,311,553	42,764,189	29.9	27.4	27.5	32.5
All farms		$126,683,408	$126,873,622	$146,603,748	$131,589,615	100.0%	100.0%	100.0%	100.0%

SOURCE: Office of Technology Assessment. Compiled from data in Economic *Indicators of the* Farm Sector: Income and Balance Sheet Statistics, 1983. USDA, Economic Research Service, 1984. Data adjustment for inflation based on redistribution of farm numbers In the Census of *Agriculture, 1989, 1974, 1978,* 1982, Bureau of the Census, U.S. Department of Commerce. Price indices in *Agriculture/ Statistics,* 1983, USDA.

Table 44.—Net Farm Income and Percent of Net Farm Income by Sales Class, 1969-82 (1982 dollars)

Sales class	Value of farm products sold	Net farm income				Percent of net farm income			
		1989	1974	1978	1982	1989	1974	1978	1982
Small	c $20,000	$3,791,609	$ 1,802,327	$ (675,036)	$ (847,409)	10.3%	3.2%	1.70/o	−3.80/o
Part-time	$20,000-$99,999	9,026,790	13,033,232	8,010,487	1,186,510	24.5	23.2	20.2	5.4
Moderate.	$100,000-$199,999	5,400,579	11,384,523	7,720,282	3,218,012	14.6	20.3	19.4	14.6
Large	$200,000-$499,999	5,474,381	11,887,994	8,149,347	4,515,675	14.8	21.2	20.5	20.4
Very large	$500,000	13,210,919	18,091,384	16,511,511	14,034,343	35.8	32.2	41.6	63.5
All farms		$38,904,279	$58,199,461	$39,716,592	$22,107,132	100.0%	100.0%	100.0%	100.0%

SOURCE: Office of Technology Assessment. Compiled from data In *Economic Indicators of the farm Sector: Income and Balance Sheaf Statistics, 1983.* USDA, Economic Research Service, 1984. Data adjustment for Inflation baaed on redistribution of farm numbers in the *Census of Agriculture*, 1989, 1974, 1978, 1982, Bureau of the Census, U.S. Department of Commerce. Price indices in *Agricultural Statistics*, 1983, USDA.

Table 4&-Total Farm Income and Percent of Total Farm Income by Sales Class, 1969-82 (1982 dollars)

Sales class	Value of farm products sold	Off-farm income				Percent of off-farm income			
		1969	1974	1978	1982	1989	1974	1978	1982
Small	<$20,000	$37,936,097	$46,908,672	$33,712,998	$24,266,444	87.80/,	85.50/0	76.70/o	71.80/,
Part-time	$20,000-$99,999	2,898,500	4,852,067	6,697,884	5,593,893	6.7		15.2	16.5
Moderate.	$100,000-$199,999	1,268,407	1,842,151	1,872,481	1,998,753	2.9	3.4	4.3	5.9
Large	$200,000-$499,999	802,790	981,677	1,103,743	1,256,672	1.9	1.8	2.5	3.7
Very large	>$500,000	285,377	282,039	575,800	687,778	0.7	0.5	1.3	2.0
All farms		$43,191,171	$54,864,605	$43,962,685	$33,801 ,541	100.0%	100.0%	100.0%	100.0%

SOURCE: Office of Technology Assessment. Compiled from data in *Economic Indicators of the Farm Sector: Income and Balance Sheet Statistical 1983*. USDA, Economic Research Service, 1984. Data adjustment for inflation based on redistribution of farm numbers in the *census of* Agriculture, 1989, 1974, 1978, 1982, Bureau of the Census, U.S. Department of Commerce. Price indices in *Agricultural Statistics,* 1983, USDA.

Changes in net farm income by sales class generally reflect this rise and fall in total net income. However, real net farm income has declined the least for very large farms, while all other classes of farms have had substantial declines in real net income. Moderate-size farms had an increase in percent of net farm income between 1969 and 1974. Since then their share of net income has declined. Farms in the large sales class increased their percentage of net income, from 16 to 20 percent in 1974, and basically held this share in 1978 and 1982. Moderate-size farms clearly have not been as successful as large and very large farms in controlling or reducing their costs of production.

Table 4-6 shows the average gross farm income, net farm income, off-farm income, and total income by sales class. As can be seen, the average net farm income of all classes of farms has declined substantially in real terms since the highly profitable years in the 1970s. But the comparison between 1969 and 1982 is even more telling. The average net farm income has declined. The average real net farm income of part-time and moderate-size farms has declined by a factor of 12 and 3.5, respectively. The net income of large farms has declined by a factor of 3, while the net farm income of very large farms has declined by a factor of 2.[3] In 1969 the average farm in the part-time sales class produced enough income to support a family. A farm that in 1982 is classed as moderate clearly had a substantial income in 1969. By 1982, the average part-time farm was extremely dependent on off-farm income, while even moderate-size farms required off-farm income to make ends meet.

Changes in the Sources of Income

Employment and the sources of income of U.S. farmers changed greatly in the 20th century, continuing at a rapid rate in the 1970s. The largest single source of change has been the tremendous increase in labor productivity made

[3]Table 4-6 must be interpreted in terms of 1982 dollars. Consequently, the values of earlier years are adjusted upward so that they are equivalent to the values in 1982. The sales class intervals are not adjusted. Therefore, the sales class names—small, part-time, moderate, large, and very large should be understood in terms of income-generating potential in 1982. For example, a farm in the part-time sales class in 1969 is roughly equivalent to a farm in the "moderate" sales class in 1982 in terms of income.

Table 4-6.—Average Gross Farm Income, Net Farm Income, Off-Farm Income, and Total Income of Farms, 1989-82 (1982 dollars)

Sales class	Value of farm products sold	Average gross farm income				Average off-farm income			
		1989	1974	1978	1982	1969	1974	1978	1982
Small	< $20,000	$ 9,830	$ 8,387	$ 10,940	$ 5,357	$17,113	$24,343	$20,844	$20,499
Part-time	$20,000-$99,999	75,488	55,170	62,085	49,493	7,809	8,679	11,669	13,216
Moderate	$100,000-$199,999	227,568	156,984	167,161	138,917	14,820	12,610	11,682	11,428
Large	$200,000-$499,999	480,848	331,401	344,972	294,816	19,729	14,632	14,544	12,834
Very large	$500,000	2,741,737	1,807,531	1,674,958	1,538,280	20,679	14,690	26,761	24,317
All farms		$ 46,436	$ 46,673	$ 59,862	$ 58,764	$15,832	$20,183	$17,951	$17,601
		Average net farm income				Average total income of farms			
Small	< $20,000	$ 1,710	$ 935	($417)	(.$825)	$ 16,823	$25,279	$20,427	$ 19,874
Part-time	$20,000-$99,999	24,319	23,312	13,956	2,040	32,126	31,991	25,625	15,258
Moderate	$100,000-$199,999	63,099	77,929	48,165	17,810	77,919	90,538	59,847	29,238
Large	$200,000-$499,999	134,535	177,192	107,382	48,095	154,264	191,824	121,926	60,929
Very large	z $500,000	957,313	942,260	767,977	504,832	977,992	958,949	794,759	529,149
All farms		$ 13,527	$ 20,674	$ 16,217	$ 9,872	$29,359	$40,857	$34,168	$ 27,474

SOURCE: Office of Technology Assessment. Compiled from data in *Economic Indicators of the Farm Sector: Income and Balance Sheet Statistics, 1983*. USDA, Economic Research Service, 1984. Data adjustment for inflation based on redistribution of farm numbers in the *Census of Agriculture*, 19S9, 1974, 1978, 1982, Bureau of the Census, US. Department of Commerce. Price indices in *Agricultural Statistics*, 1983, USDA.

possible by technological changes, resulting in a sharp drop in the demand for agricultural labor. During the 1930s the disposable farm income per capita was less than 40 percent of that in the rest of the economy. This income differential resulted in the large migration of the farm labor force out of agriculture and rural areas. This outmigration accelerated after the Great Depression of the 1930s as employment and per capita income opportunities increased greatly outside of agriculture. In general, the marginal productivity of labor was higher outside the agricultural sector from the 1930s to the early 1970s. Therefore, the migration of labor from farming to the nonfarm sector has contributed to national economic growth.

In the 1970s, the average income differential between farm and nonfarm households narrowed to about 88 percent, owing both to rapid increases in farm prices and a substantial increase in the number of farm jobs available from growth in rural industries. These two factors resulted in a slowing of the rate of outmigration.

Changes in off-farm income by sales class are shown in table 4-6. In 1982 the average income of farm and nonfarm households was quite close, at $27,578 and $28,638, respectively. However, two-thirds of the income of farm households comes from off-farm sources. The majority of farm operators today have some off-farm employment.

The average income statistics mask economic problems that exist for part-time and moderate-size farms. Farms in the part-time class are in serious trouble. There were about 580,000 farms in this class in 1982, at an average total income of about $15,000. The average net income from such farming is only $2,040. These farms are not large enough to generate much net farm income, and at the same time these farms have lower-than-average off-farm incomes. Moreover, the amount of off-farm income earned by part-time farmers decreased substantially between 1978 and 1982. Thus, part-time farms have a smaller share of total off-farm income now than in 1969. In contrast, households that operate farms with sales of less than $20,000 have substantial off-farm incomes and low or negative net farm income. Small farms have the largest share of off-farm income, and their share has increased the most since 1969. However, it should be noted that the socioeconomic structure of the small farm subsector is nonhomogeneous. This subsector contains a large number of subsistence-type farms whose operators live at or below the poverty level as well as a large number of affluent families to whom the farm is more a form of recreation than a source of income. So, while the average off-farm income of these households enables them to maintain this way of life, there are probably many small farms that may leave agriculture for economic reasons.

Moderate-size farms have sufficient off-farm income to maintain a household. However, this group maybe under the most stress. To provide an adequate total income, moderate-size farms must earn almost as much off-farm as onfarm income. The total amount of off-farm income earned by moderate-size farms has declined in real terms since 1969. Since the number of these farms has increased in the same period, the average off-farm income of moderate-size farms has declined from $14,800 in 1969 (1982 dollars) to $11,400 in 1982. Farms with sales in excess of $200,000 have moderate off-farm incomes and moderate-to-very large net farm incomes. As a group, the households that own and operate these farms are well-off.

PROJECTIONS OF STRUCTURAL CHANGE IN U.S. AGRICULTURE TO YEAR 2000

The dramatic changes in the structure of agriculture that have occurred between 1969 and 1982 raise a new set of questions: if these trends continue what will the structure of agriculture be in 1990 and the year 2000? It is risky to extrapolate very far into the future on the basis of changes in the past, especially in a sector as dynamic as that of agriculture. However, the structural changes in agriculture are generally strong and consistent and warrant some extrapolation.

The most likely projection of farm numbers, based on a Markov chain projection using a 1969 through 1982 base, suggest that farm numbers are likely to decline from 2.2 million in 1982 to 1.8 million in 1990 and 1.2 million in 2000. The projections indicate that farm numbers will follow a bimodal or bipolar distribution—a large proportion of small and part-time farms, an increasing proportion of large farms, and a declining number of moderate farms (table 4-7). Small farms are projected to account for approximately 51 percent of all farms—down from 61 percent in 1982. In contrast, large and very large farms are projected to account for about 15 percent of all farms, three times their proportion in 1982. The number and proportion of moderate-size farms is likely to begin declining by the end of the century.

The projected decline in the number of small farms is dramatic but plausible, given the strong trend in this direction and the persistently negative farm income in this class. However, a substantial number of farms in the small size class are horse farms, small orchards, and vineyards that are primarily recreation or "hobby" type

Table 4.7.—Most Likely Projection of Total Number of U.S. Farms in 1990 and 2000, by Sales Class[a]

	Sales class	1982 (actual)	1990	2000
Small	<$20,000	1,355,344	991,609	637,597
Part-time	$20,000-$99,000	581,576	486,790	362,555
Moderate	$100,000-$199,000	180,689	126,205	75,011
Large	$200,000-$199,000	93,891	144,234	125,019
Very large	$500,000	27,800	54,087	50,008
Total		2,239,300	1,802,925	1,250,190
Percent of total farm numbers:				
Small	<$20,000	61	55	51
Part-time	$20,000-$99,000	26	27	29
Moderate	$100,000-$ 199,000	8	7	6
Large	$200,000-$499,000	4	8	10
Very large	2$500,000	1	3	4
Total		100	100	100

[a]Based on a Markov chain projection using a 1969-82 base.

SOURCE: Office of Technology Assessment.

farms. The proportion of recreational farms is not known, but such farms may help stabilize the precipitous decline in the number of small farms.

The projections for the number and proportion of moderate-size farms show a decline, indicating that a farm of that size may not be economically viable. In the past there has been a steady increase in the number of these farms in real dollar terms, however, the outlook for financial survival of many of the moderate-size farms is not very good. In 1982, the average net farm income of $17,810 for moderate-size farms was less as compared with $63,099 in 1969 and $77,929 in 1974 (measured in 1982 dollars). During this period a large proportion of the growth of moderate-size farms was due to expansion of production by small farms and part-time farms into moderate-size farms. Survival of moderate-size farms will depend on the operator's ability to increase farm income or to provide sufficient off-farm income to compensate for low farm income.

An important implication of the projections is the further concentration of agricultural production in terms of total net farm income and total farm cash receipts. The share of total farm income by large farms has grown steadily from 51 percent in 1969 to 84 percent in 1982. If this trend continues, over 90 percent of net farm income will be earned by farms with sales over $200,000 by year 2000.

About 35 percent of total farm cash receipts were received by farms with sales over $100,000 in 1969. About 30 percent of the total farm production was produced by the largest 50,000 farms (2 percent of the total farms) and 50 percent by the largest 200,000 farms. This pattern will likely continue to the year 2000 when approximately 95 percent of total production is projected to come from farms with sales over $100,000. The 50,000 largest farms (sales over $500,000) will probably produce 75 percent of all farm products.

In general, if these trends continue, small farms are likely to disappear to the extent that the operators of these farms depend on them for income. The number of small recreational, or hobby, farms may increase or hold steady. Part-time farms could increase in number if the families that live on these farms are willing and able to earn the bulk of their income from off-farm sources. The number of moderate-size farms are likely to decrease and such farms will have a small share of total gross farm income and a declining share of net farm income. Large and very large farms will dominate agriculture.

Moderate-size farms comprise most of the farms whose owners depend on agriculture for the majority of their income. Traditionally, the moderate-size farm has been viewed as the backbone of American agriculture. As the numbers and economic importance of small and part-time farms decline, moderate, large, and very large farms all have an opportunity to increase their shares of farm income. However, large and very large farms are maintaining or increasing their shares of farm income, whereas the net income of moderate-size farms is decreasing both in absolute terms and in terms of their share of total farm income.

STRUCTURE Of U.S. AGRICULTURE BY MAJOR COMMODITY GROUPS

The preceding sections have provided a picture of the overall structure of agriculture for all commodities. This section provides a set of pictures of the structure of U.S. agriculture in terms of six major agricultural commodity groups: cash grains (primarily corn, wheat, and soybeans), cotton, dairy, poultry and eggs, cattle and calves, and pork. In particular, changes in the pattern of concentration of production, as measured by sales, will be described.

Figures 4-1 through 4-6 show the percent of commodity group sales in 1969 dollars by sales class for 1969 to 1982.[4] The general pattern is: the percent of sales by the lower sales classes declines, while the percent of sales of the upper sales classes increases.

Cash Grain Subsector

Figure 4-1 shows the percent of cash grain sales in real terms by sales class for 1969 to 1982. This figure clearly shows the dramatic decline in cash grain sales by farms with sales less than $100,000 and the great increase in sales by farms with sales over $100,000. The increase in market share from farms with sales in the $200,000 to $499,999 class is also especially striking. These farms increased their percent of total sales from 2 percent in 1969 to 34 percent in 1982. In the same period, farms with $100,000 to $199,000 in sales increased their share of gross sales from 6 to 18 percent. The combined sales of the top two sales classes of cash grain farms had increased to 50 percent of the total sales in 1982. Concentration of sales from farms with more than $500,000 in sales was lower than for most of the other commodity groups. However, the rate of growth of the market share of the top sales class was relatively high.

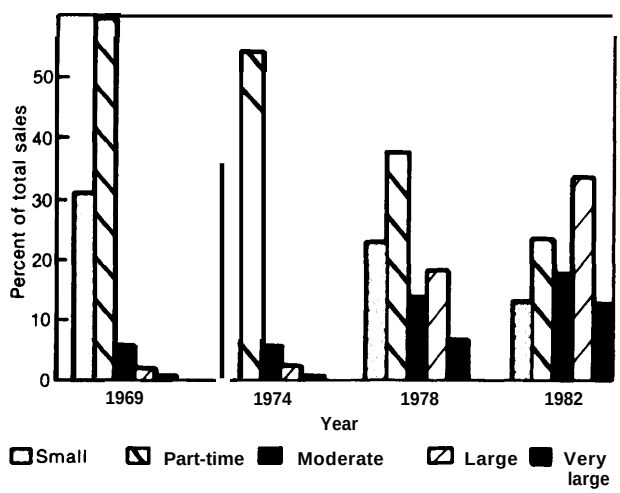
There is evidence that the structure of cash grain farms is bimodal in terms of sales by sales class. In both 1978 and 1982, farms in the $20,000 to $99,999 and $200,000 to $499,999 classes had more sales than farms in the middle class ($100,000 to $199,999 in sales).

cotton Subsector

The cotton subsector includes all sales of cotton and cottonseed. Figure 4-2 shows the percent of cotton and cottonseed sales in 1969 dollars by sales class for 1969 to 1982. The growth in sales by cotton farms with more than $500,000 in sales has been very dramatic. The market share of these farms has increased from less than

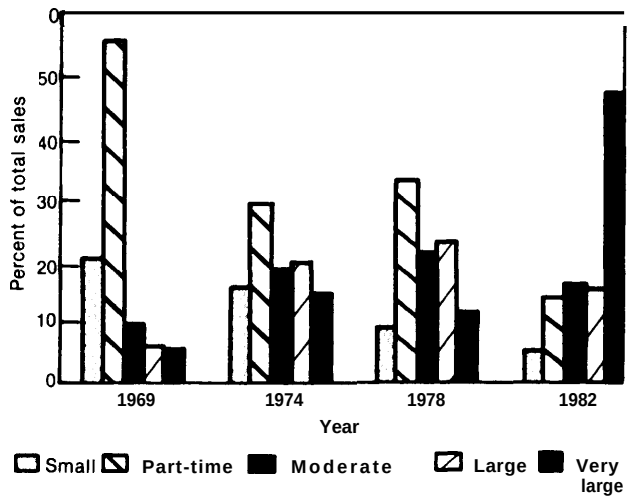
[4]The discussion of national aggregate farm structure in the preceding section was presented in terms of constant 1982 dollars. In this section, the percents of sales and sales classes are presented in terms of 1969 dollars, This means that the sales class intervals used in the tables, figures, and text represent different real values. For example, farms with sales in the $20,000 to $99,000 interval in 1969 dollars as presented in this section would have sales in approximately the $45,000 to $225,000 range in 1982 dollars, Therefore, results for a given sales class in this section cannot be directly compared with results from a sales class in the previous section on national aggregate statistics. Since the sales class names used in the previous section—small, part-time, moderate, large, and very large—are defined in terms of the average income of farms in these classes in 1982 dollars, these names would be misleading if used in this section. Consequently, the sales classes in 1969 dollars are referred to in terms of the sales class interval alone.

Figure 4-1.—Cash Grain Sales by Sales Class, 1969-82 (1969 dollars)



SOURCE: Office of Technology Assessment.

Figure 4.2.—Cotton Sales by Sales Class, 1969=82 (1969 dollars)



SOURCE: Office of Technology Assessment.

7 percent in 1969 to 48 percent in 1982. In the same period, sales from farms in the $20,000 to $99,999 class declined from 56 to 14 percent of the total. It is interesting to note that between 1974 and 1978 there was an upswing in the percent of sales from farms in the middle of the range ($20,000 to $499,999) and then a subsequent decline from 1978 to 1982. If the trend of the period 1978-82 continues, sales of cotton and cottonseed are likely to become even more heavily concentrated in the top sales class.

Dairy Subsector

Figure 4-3 shows the percent of dairy sales in real terms by sales class for 1969 to 1982. Farms in the $20,000 to $99,999 sales class completely dominated the production of dairy products in 1969 with about 66 percent of sales. By 1982 their share had declined to 41 percent. During the same period, dairy farms with sales in excess of $100,000 increased their share of production substantially. The most dramatic single change occurred in the period 1978-82, when dairy farms in the $200,000 to $499,999 class increased their market share threefold, from less than 5 to 14 percent. As with the other commodity groups, the trend in structural change is unambiguously in the direction of greater concentration of sales in the top sales classes. It is also clear that the subsector is likely to pass through a transition period in which there will be a bimodal distribution of sales among the five classes shown on figure 4-3. That is, dairy farms with sales less than $100,000 and more than $200,000 in 1969 dollars will both have greater shares of the market than farms in the $100,000 to $199,999 class.

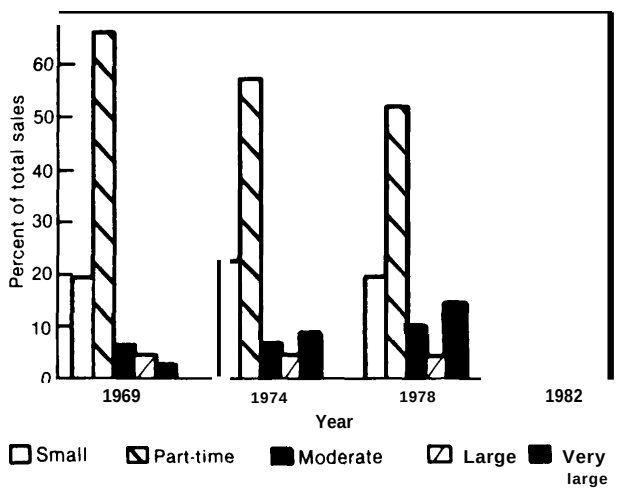
Poultry Subsector

Figure 4-4 shows the percent of poultry and poultry products sales in real terms by sales class for 1969 to 1982. As with dairy farms, poultry farms in the $20,000 to $99,999 class dominated the structure of the subsector in 1969 with 61 percent of sales. Since 1969, the percent of sales from poultry farms with sales greater than $500,000 has increased at a very rapid rate, while the percent of sales from the $20,000 to $99,999 class has declined greatly. In 1982, poultry farms with sales in excess of $200,000 accounted for 77 percent of sales, compared with less than 25 percent of sales in 1969.

Cattle and Calf Subsector

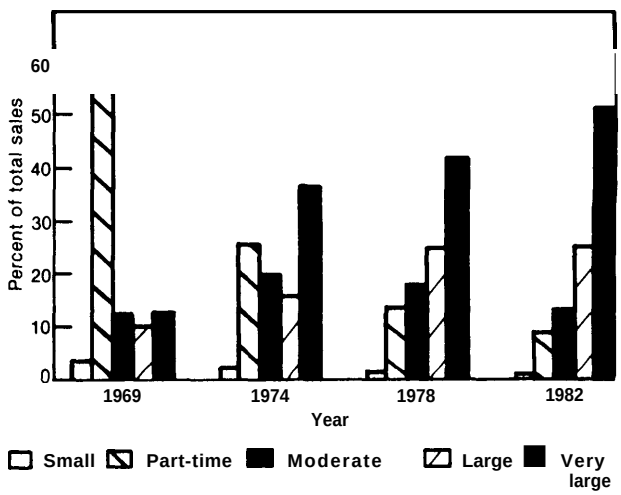
Figure 4-5 shows the percent of cattle and calf sales in 1969 dollars by sales class for the years 1969, 1974, 1978, and 1982. Sales from cattle

Figure 4-3.—Dairy Sales by Sales Class, 1969-82 (1969 dollars)



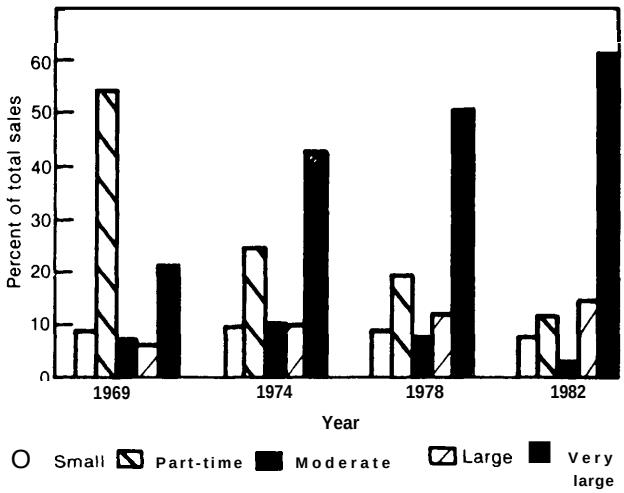
SOURCE: Office of Technology Assessment.

Figure 4.4.—Poultry Sales by Sales Class, 1969-82 (1969 dollars)



SOURCE: Office of Technology Assessment,

Figure 4=5.-Cattle Sales by Sales Class, 1969=82 (1969 **dollars)**



SOURCE: Office of Technology Assessment.

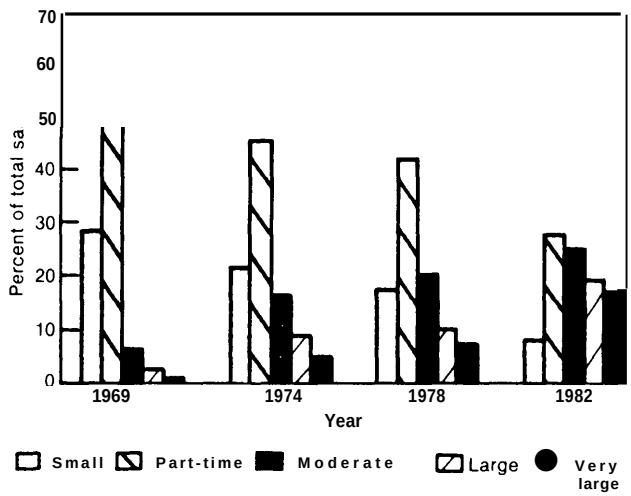
feedlots were excluded. The inversion of structure that has taken place over this time period is striking. In 1969, cattle operations in the $20,000 to $99,999 class had 56 percent of sales, and operations with sales in excess of $500,000 had 22 percent of total sales. The ranking of these two classes reversed in the 4 years between 1969 and 1974. By 1982, cattle operations with sales in excess of $500,000 had about 62 percent of sales, whereas the operations in the $20,000 to $99,999 range had fallen to 12 percent of total sales. Nationwide, cattle operations with sales greater than $200,000 per year had 77 percent of sales. This is remarkable in light of the broad distribution of cattle farms and the large numbers of cattle farms nationwide.

This subsector also clearly has a bimodal structure. While sales are skewed towards the largest cattle farms, both of the lower sales classes have a larger percentage of sales than the middle range ($100,000 to $199,999).

Pork Subsector

Figure 4-6 shows the percent of hog and pig sales in 1969 dollars by sales class for 1969 to 1982. As of 1982 this subsector did not yet have the same degree of concentration of sales in the upper sales classes that was apparent in the other commodity groups. As of 1982 there was a relatively high degree of equality of market share among the different sales classes. However, there have been tremendous structural changes in this subsector, and the direction of change is clear. Sales from farms in the $20,000 to $100,000 class have declined from 61 percent in 1969 to 28 percent in 1982. As a group, hog and pig farms with sales in excess of $100,000 in 1969 dollars had a majority of sales in 1982. Farms with sales in excess of $200,000 are gaining market share at the fastest rate. It is likely that these largest hog farms will soon have a majority of sales, if this has not already occurred.

Figure 4-6.—Hog and Pig Sales by Sales Class, 1969.82 *(1969* dollars)



SOURCE" Office of Technology Assessment.

REGIONAL STRUCTURE

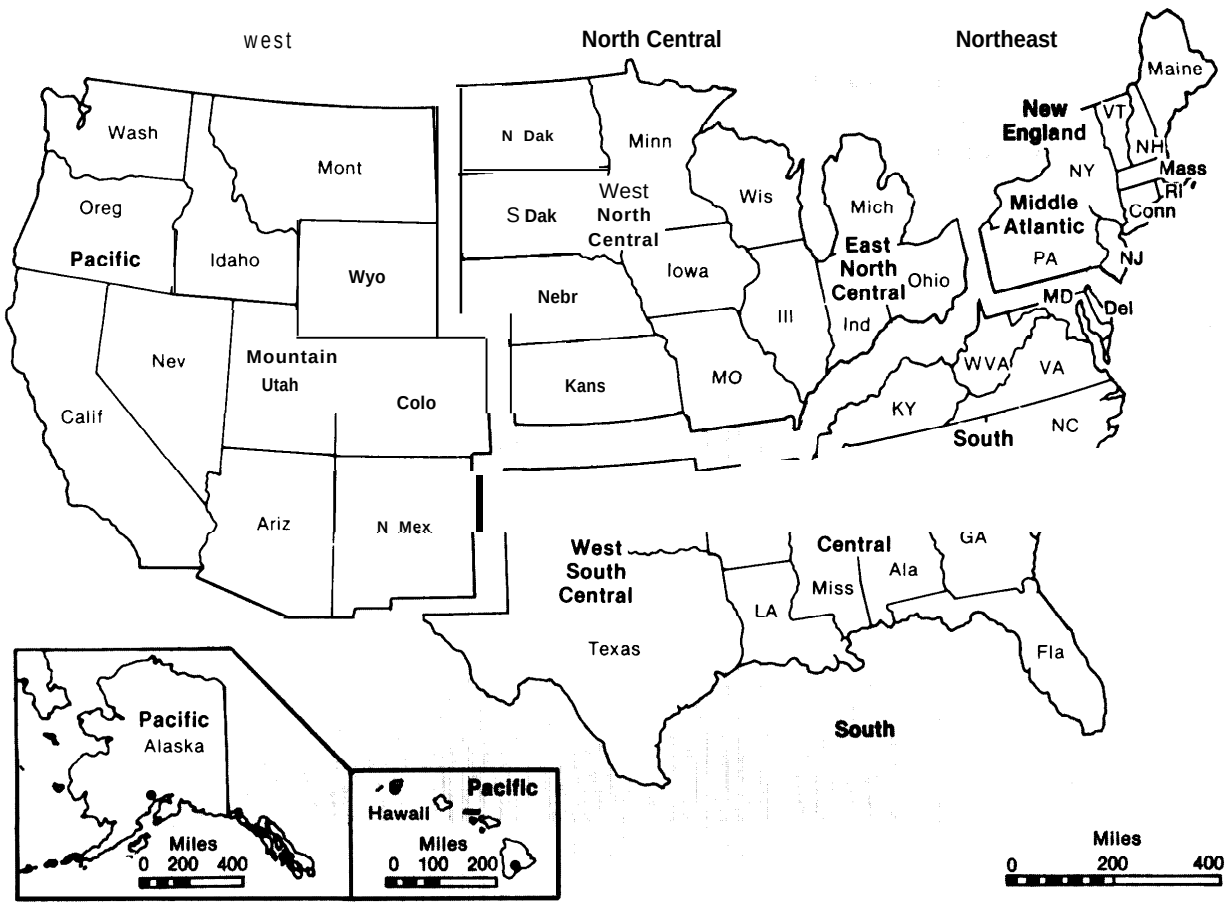
There is a common perception that U.S. agriculture has become increasingly homogeneous from one part of the country to another. This is true in terms of many aspects of agricultural technology: machinery, crop varieties, livestock breeds, chemicals, and cultural practices have become standardized in many ways. However, there are still major differences in the structure of agriculture in the United States. These differences are seen in the predominance of certain

commodities in different parts of the country, the extent to which the production of some commodities is concentrated in different regions, and the pattern of concentration of sales within regions. The basic intent of this section is to show how the structure of agriculture differs between the four major agricultural regions of the United States. The data on which this section is based came from the 1982 Census of Agriculture.[5] The basic units of analysis are the four regions of the United States shown in figure 4-7: the Northeast, South, North Central, and West. Alaska and Hawaii are included in the Western region.

Attention is concentrated on eight different commodity groups. These groups include the six commodity groups whose structure was considered in the national context in the previous section: cash grains (corn, wheat, soybeans, and other specialty grains); cotton and cottonseed; cattle and calves (except sales from feedlots); hogs and pigs; poultry and poultry products; and dairy products. Two additional commodities are included in this section on regional structure: 1) fruit and tree nuts, and 2) vegetables (including potatoes and melons).

[5]This data is the most current that is available on the regional structure of agriculture. Since the general trend has been toward increasing concentration of production in the large and very large sales classes of farms, it is likely that the distributions of sales by sales class described in this section underestimate the true structure of agriculture in 1985.

Figure 4-7.—Regions and Divisions of the United States



SOURCE. U S. Department of Commerce, Bureau of the Census

The first part of this section presents summary statistics on sales by region and commodity group. The second provides a more detailed look at the differences in the structure within and among the four regions in sales classes of farms. The use of sales classes as the unit of structural analysis is more useful than size of farm, since some commodities require much more land per dollar of sales than other commodities and since land values vary greatly from one part of the country to another. Information in this subsection is organized both in terms of sales by sales class and farm numbers by sales class.

Comparison Between Regions and Commodities

Table 4-8 shows the percent of combined total U.S. sales of the eight major commodity groups by group and region in 1982. Ranked in order of total sales, cash grains come first, and cotton is the least valuable commodity. The North Central region accounted for the largest share of sales of the combined commodity groups, at 47 percent. The Northeast region had only 5.2 percent of total sales in the United States in 1982.

Table 4-9 shows the distribution of total U.S. sales of each commodity among the four regions in 1982. The North Central region stands out as the predominant agricultural region of the United States. This region had the most sales in four of the eight commodity groups. It also had 80 percent of hog sales, the highest proportion of any region in any commodity. The West dominated the fruit and tree nut sales and vegetable and melon sales, with 65 and 58 percent, respectively.

A measure of the dependence on particular commodity groups by the agricultural sectors of the different regions can be seen on table 4-10, which shows the percent of each region's total sales of the eight commodities by commodity in 1982. The New England region had more sales from a single commodity group than

Table 48.–Percent of Total U.S. Sales of All Commodities by Commodity Group and Region, 1982

Commodity groups	Northeast region	Southern region	North Central region	Western region	Total United States
Cash grains	0.4 "/0	6.50/o	20.2 "/0	3.4%0	30.4 "/0
Cattle and calves	0.3	7.4	12.0	6.5	26.3
Dairy	2.9	2.7	6.0	3.0	14.5
Poultry and eggs	0.8	5.7	1.5	1.1	9.1
Hogs and pigs	0.2	1.2	6.4	0.2	8.0
Fruit and tree nuts	0.4	1.2	0.3	3.3	5.1
Vegetables, melon, and potatoes	0.3	1.0	0.3	2.1	3.7
Cotton	0.0	1.5	.0	1.2	2.8
Total	5	27	47	21	100

NOTE: Totals may not add due to rounding.

SOURCE: Office of Technology Assessment. Compiled from regional data provided by the U.S. Department of Commerce, Bureau of the Census, Agriculture Division, 1982 *Census of Agriculture.*

Table 49.–Percent of Total U.S. Sales of Each Commodity by Region, 1982

Commodity groups	Northeast region	Southern region	North Central region	Western region	Total United States
Cash grains	1.3%0	21.4%0	*66.20/o*	11 .O%	100.070
Cattle and calves	1.3	28.2	*45.6*	24.9	100.0
Dairy	19.9	18.4	*41.2*	20.5	100.0
Poultry and eggs	8.6	62.2	*17.0*	12.2	100.0
Hogs and pigs	2.0	15.3	*80.1*		100.0
Fruit and tree nuts	6.9	23,4	*5.2*	64.5	100.0
Vegetables, melon, and potatoes	7.6	25.8	9.0	57.6	100.0
Cotton	0.0	54.9	1.4	43.7	100.0

NOTE: Totals may not add due to rounding.

SOURCE: Office of Technology Assessment. Compiled from regional data provided by the U.S. Department of Commerce, Bureau of the Census, Agriculture Division, 1982 *Census of Agriculture.*

Table 4-10.–Percent of Total Regional Sales by Commodity, 1982

Commodity groups	Northeast region	Southern region	North Central region	Western region	Total United States
Cash grains	7.7 "/0	24.00/o	43.1 '/0	16.1 0/0	30%
Cattle and calves	6.6	27.2	25.6	31.3	26
Dairy	55.4	9.8	12.8	14.3	15
Poultry and eggs	14.9	20.8	3.3	5.3	9
Hogs and pigs	3.1	4.5	13.7	1.0	8
Fruit and tree nuts	6.8	4.4	0.6	15.8	5
Vegetables, melon, and potatoes	5.4	3.5	0.7	10.3	4
Cotton	0.0	5.7	0.1	5.9	3
Total	100.0	100.0	100.0	100.0	100.0

NOTE: Totals may not add due to rounding.

SOURCE:Office of Technology Assessment Compiled from regional data provided by the US. Department of Commerce, Bureau of the Census, Agriculture Division, *1982 Census of Agriculture*.

did any other region, with 57 percent of sales coming from dairy products alone. The North Central region ranked second, with 43 percent of sales in the cash grain group alone. TheSouthern and Western regions had relatively diversified agricultural sectors. However, both regions were more dependent on cattle production than on any other commodity. It is interesting to note that the West accounted for only l percent of national hog sales. This seems to be anomalous in light of the relatively large production of the other seven commodity groups in the West.

Distribution of Sales Within Regions and Among Regions

The data for this section is contained in appendix B, which shows the amount of sales of each commodity by sales class and region for 1982. Sales are expressed as a percent of the total regional sales of each commodity and as a percent of the national sales total for each commodity. Examination of these tables provides useful information on the distribution of production within regions and among regions. The extent to which agricultural production is concentrated in the large and very large sales classes is of particular interest because this information can contribute to an assessment of the rate of technology adoption and the impacts from technology adoption. However, in many cases the degree of concentration should also be considered in the context of the proportion of total national sales. Production of some commodities is highly concentrated in certain regions, but this production amounts to only a small percentage of the national sales of these commodities.

Cash Grains

Cash grain production was the least concentrated of the eight commodity groups within each region in 1982. With the exception of the West, sales of cash grains were concentrated in the part-time, moderate, and large sales classes. The West differed from the other regions in that its cash grain production was relatively skewed toward the larger farms. In the other regions, the moderate-size farm had the largest share of sales. Moderate-size farms in the North Central region had a relatively large share of national cash grain sales, 25 percent of the total. With the exception of the Western region, large farms also had higher sales than very large farms. The North Central region had 69 percent of the total number of cash grain farms in the United States, with small and part-time farms accounting for 57 percent of the total.

Cattle and Calves

The South had 159,000 small farms that raised cattle in 1982. These small farms accounted for 91 percent of the number of cattle farms in the region and 54 percent of the national total. However, these farms accounted for only 3.1 percent of national cattle sales. The other regions also had a disproportionate number of cattle farms in the small farm class. In general, these farms were either subsistence farms, whose owners had low incomes, or they were hobby farms, whose owners had sufficient income

from other sources to subsidize this type of production.

The pattern of cattle and calf sales in the Northeast stands out in comparison with the other regions. The other regions had a high concentration of sales in the large farm class and fairly even distributions in the other classes. The Northeast had more sales in the small farm class (less than $20,000) than in any other class, and the sales from the very large farms and large farms were lower than those from the small, part-time, and moderate-size farms. However, the sales of cattle and calves from Northeast farms accounted for only 1.3 percent of the national total, whereas 24 percent of the Nation's cattle and calf sales were made by the very large farms in the North Central region.

Dairy

Three different distributions of dairy production are evident among the four regions. The Northeast and North Central regions had high concentrations of dairy production in part-time and moderate farms and very little production in very large farms. It is striking that the largest single national share of dairy sales were made by part-time farms in the North Central region. There were about 60,000 part-time dairy farms in 1982, 36 percent of all dairy farms in the United States. This large group of farms is especially at risk from rapid changes in the technology and cost structure of the dairy industry.

In contrast, the West had a moderately high concentration of production, 64 percent, in very large farms and relatively little production from part-time and moderate-size farms. The very large dairy farms of the West accounted for 13 percent of the Nation's dairy sales in 1982. This share is expected to increase rapidly.

The South falls between these two patterns, with 46 percent of production in large and very large farms combined and 38 percent in moderate-size farms. None of the regions had more than 2 percent of dairy production in small farms.

Poultry and Eggs

The South had the largest number of poultry and egg farms in the United States, with 28,000 operations in 1982. Twenty-five percent of all poultry and egg farms in the United States were moderate-size farms in the South.

Poultry and egg production was the most concentrated of the eight commodity groups in 1982. In all four regions, very large farms had the highest percentage of sales. The West had the highest degree of concentration, with 85 percent of sales from very large farms. The South had the least amount of concentration, with 39 percent of sales from very large farms and 54 percent of sales from moderate and large farms combined. However, the very large poultry and egg operations in the South had the largest single share of national sales, at 24 percent in 1982.

Hogs and Pigs

The North Central region had the largest number of hog farms in the country in 1982. Thirty percent of the Nation's hog farms were in the moderate size class in this region.

Next to the cash grains, hogs and pigs showed the least amount of concentration. The West was the most highly concentrated region, with 37 percent of sales from very large farms. However, the West had only 3 percent of the national sales of hogs. The North Central region had a low degree of concentration in the very large class, with only 17 percent of sales from these farms. Thirty-eight percent of sales came from moderate-size farms. However, since the North Central region accounted for 80 percent of national hog sales, the moderate-size farms in this region had the largest single share of national sales, 30 percent. Concentration of hog sales in the South was close to that of the West, 21 percent from moderate-size farms and 33 percent from very large farms. However, the very large farms in the South had only 0.9 percent of the national sales in 1982.

Fruit and Tree Nuts

The South had the most concentrated sales of fruits and nut crops; 65 percent of sales were from very large farms, Part-time, moderate, and large farms in the South all had nearly equal shares of 10 to 11 percent. It is interesting to note that 15 percent of the U.S. fruit and nut tree sales come from farms in the part-time sales class in the West. There are 4,462 fruit and nut farms in the part-time class in the West as compared with 7,247 in all 5 classes in the Northeast. The North Central region had the lowest concentration of sales; only 23 percent of sales were from very large farms. Twenty-four percent of sales in the North Central region came from moderate-size farms; however, these moderate-size farms accounted for only 1.3 percent of national sales in 1982.

Vegetables and Melons

The West has a high concentration of national and regional sales of vegetables and melons in the very large class of farms. In 1982 these farms had 83 percent of regional sales and 48 percent of national sales. Vegetable production is popularly associated with small and part-time farmers. The Northeast came the closest to meeting this concept, with 21 percent of sales from the part-time class of farms. However, none of the regions has more than 3 percent of national sales from small and part-time farms combined.

Cotton

The South produced 55 percent of the national cotton sales in 1982, and the West had 44 percent of sales. The Northeast does not produce any cotton, and the North Central region accounted for only 1.4 percent of national production in 1982. Very large farms in the West had 33 percent of total national sales of cotton in 1982, Cotton sales are highly concentrated in the West, with 76 percent of regional sales from very large farms. In contrast, most of the sales in the South came from moderate and large farms (with combined sales of 62 percent), accounting for 34 percent of the national total.

SUMMARY

Overall the trend toward concentration of agricultural resources in fewer but larger farms will continue but will differ by commodity and region. Farm numbers will continue to decline from 2.2 million in 1982 to approximately 1.2 million in 2000. They will follow a distribution of a large proportion of small and part-time farms, an increasing proportion of large farms and a declining number of moderate-size farms. Small farms will account for 50 percent of all farms–a decline from 60 percent in 1982. In contrast, large and very large farms will account for 15 percent of all farms, three times their proportion in 1982. The number and proportion of moderate-size farms will begin to decline by the end of the century.

An important implication of these projections is the further concentration of agricultural production. Over 90 percent of total net farm income will be earned by operators of large and very large farms by year 2000, And the 50,000 largest farms will produce 75 percent of all farm products sold.

However, the increased concentration of resources will differ by commodity and region. The four major agricultural regions differ in their total contribution to U.S. agriculture as a whole and in their contribution to the production of specific commodities. Major differences in structure are apparent when each region is considered in terms of the distribution of sales by sales class for each of the eight major commodity groups. Some regions, such as the West, have a high concentration of sales for several commodities in the large and very large sales classes and a low concentration of sales for other commodities. The North Central region is characterized by very large shares of regional and national production concentrated in moderate-size farms, especially in hogs, dairy, and cash grain sales. The Northeast stands out as a region that has little concentration of sales in the

large and very large farms in any commodity, including dairy products, its largest single commodity.

In general, the Nation's agriculture cannot be considered structurally homogeneous even when examined on the basis of large geographical units. Differences in agricultural structure become even more extreme when the United States is considered at the subdivision and State level. As a consequence, agricultural policies that may be appropriate for one part of the country run the risk of being inappropriate when applied to another.