1.3 Land Ownership and Farm Structure

Although the Federal Government once held most U.S. land, 60 percent (1.4 billion acres) is now privately owned. Virtually all farmland is privately owned. Leased land has assumed an increasing share of farm operations as farm numbers decline and average farm size increases. Farms today vary widely in size and other characteristics. Most farms are family farms; the share of sales accounted for by nonfamily corporations has been consistently small over time. Small family farms (sales less than $250,000) account for 92 percent of all farms, but only 32 percent of production. Nevertheless, small family farms account for 61 percent of the land operated, which is important to the Nation's conservation and environmental efforts. Farmers' tenure also affects their use of conservation measures, particularly those measures with a long payback period.

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Farm structure can be defined by the way farms and their resources are organized to produce farm products. This chapter focuses on the organization of land, a resource important to farming. Land ownership, broadly defined, ranges from fee simple ownership to partial interests including easements and leases by public or private parties. But even fee simple ownership is not total, because rights to use land may be restricted. This chapter begins by looking at the ownership of all U.S. land, including farmland, and then discusses trends in farm numbers and the types of farms in existence today. Land uses of the various types of farms are also examined, including the placement of land in conservation programs. The chapter then explores two aspects of farm structure concerning land—tenure of agricultural lands and the increasing concentration of agricultural production on fewer farms and acres—that affect conservation and the environment.

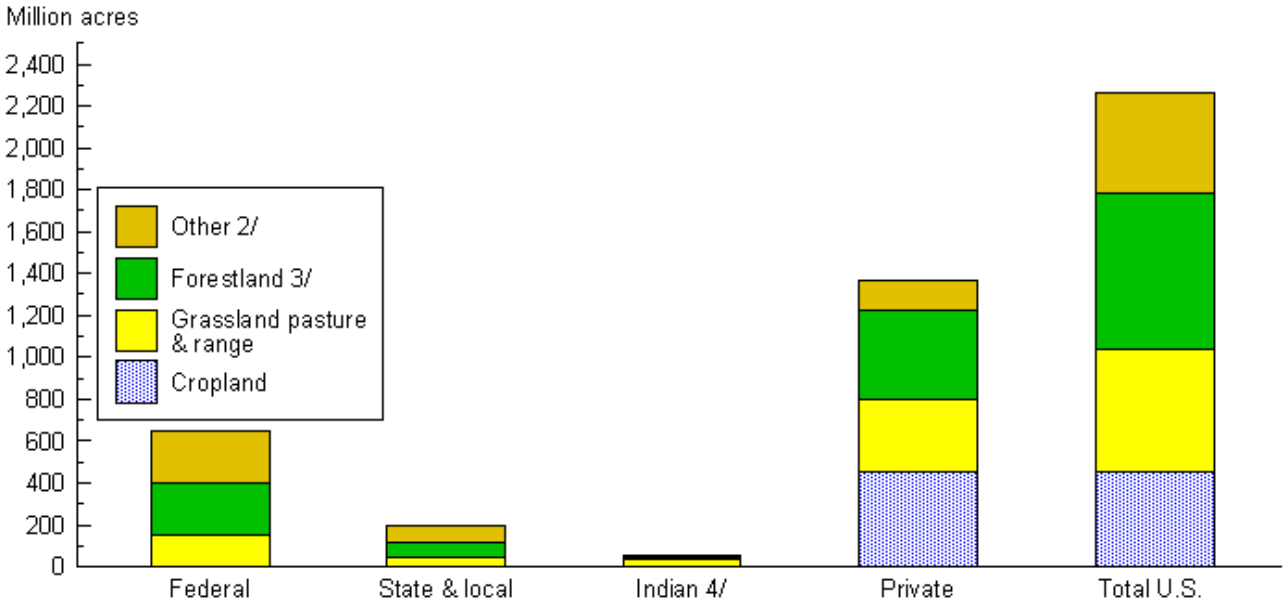
Ownership of U.S. Land

The land surface of the United States covers 2.3 billion acres. Sixty percent (1.4 billion acres) is privately owned, 29 percent is owned by the Federal Government, 9 percent is owned by State and local governments, and 2 percent is in Indian reservations (fig. 1.3.1). Virtually all cropland is privately owned, as is over half of grassland pasture and range and forestland (cropland and other terms are defined in the Glossary). Federal, State, and local government holdings consist primarily of forestland, rangeland, and other land. Despite past concern over foreign ownership of farmland, foreigners own only 1 percent of agricultural land (including forestland).

Historic Land Ownership Patterns

Land ownership patterns changed substantially in the first century after U.S. independence. Between 1781 and 1867, through purchase, cession, and treaty, the Federal Government acquired lands totaling 80 percent of current U.S. area, constituting the original "public domain" (table 1.3.1). The largest acquisition, the Louisiana

Figure 1.3.1--Major use of land by ownership, United States, 1997 1/



1/All 50 States.
2/Includes urban land, highways, and other special or miscellaneous uses. Excludes an estimated 105 million acres in special uses that have forest cover and, therefore are included with forestland.
3/Includes forest land in parks and other special uses.
4/Managed in trust by the Bureau of Indian Affairs, U.S. Department of the Interior.

Source: USDA, ERS, based on Vesterby and Krupa 2001.

Table 1.3.1—Acquisition of the original public domain, 1781-1867

Acquisition	Year(s)	Land area	Water area	Total area	Percent of total U.S. land	Cost
		Million acres			*Percent*	*$ million*[3]
State cessions	1781-1802	233.4	3.4	236.8	10.3	6.2
Louisiana Purchase[1]	1803	523.4	6.5	529.9	23.1	23.2
Red River Basin	1782-1817	29.1	0.5	29.6	1.3	--
Cession from Spain	1819	43.3	2.8	46.1	1.9	6.7
Oregon Compromise	1846	180.6	2.7	183.4	8.0	--
Mexican Cession	1848	334.5	4.2	338.7	14.8	16.3
Purchase from Texas	1850	78.8	0.1	78.9	3.5	15.5
Gadsden Purchase	1853	19.0	0.0	19.0	0.8	10.0
Alaska Purchase[2]	1867	365.3	12.9	378.2	16.1	7.2
Total	1781-1867	1,807.5	33.2	1,840.7	79.9	85.1

[1]Excludes areas eliminated by the treaty of 1819 with Spain.
[2]Adjusted for the recomputation of the areas of the United States that was made for the 1980 decennial census.
[3]Nominal dollars.
Source: USDA, ERS, based on U.S. Department of the Interior, Bureau of Land Management.

Purchase, added 523 million acres in 1803. Other large acquisitions included cessions from the original 13 States and from Mexico, as well as the Alaska Purchase. Acquisitions after 1867, including purchase of degraded forest and farmlands, added most of the Eastern United States' national forests (45 million acres) as well as 4 million acres of national grasslands in the West (National Research Council; USDA, Forest Service, 1993).

The difference between the total land area of the United States (2.3 billion acres) and the original public domain (1.8 billion acres, from table 1.3.1) is land that has never been in the original public domain. Land never in the original public domain includes (Marschner):

- The original 13 States, after their cessions to the Federal Government.
- Four new States created from territory the original States did not cede to the Federal Government. These new States were Vermont (admitted in 1791), Kentucky (1792), Maine (1820), and West Virginia (1863).
- The District of Columbia, a Maryland cession in 1788.
- The current area of the State of Texas. When Texas was admitted to the Union in 1845, it was larger than it is now. The State sold part of its area to the Federal Government in 1850, and the area sold is considered an addition to the original public domain (Marschner).

As of 1998, 1.1 billion acres of the original public domain (about half of the total U.S. area) had been granted or sold by the Federal Government to States, corporations, and individuals (table 1.3.2). Grants to States totaled 329 million acres, including 65 million acres of wetlands granted on condition that proceeds from their subsequent sale to individuals be used to convert those acres to agricultural production. Another 288 million acres were granted or sold directly to homesteaders on condition that the land be settled and cultivated. Disposition of Federal lands had slowed by the 1930s, and in 1976 the Federal Land Policy and Management Act explicitly directed that most remaining Federal lands be retained in Federal ownership (National Research Council). Remaining Federal lands totaled 656 million acres in 1997 (table 1.3.3).

Federal and State Lands Today

Most lands in Federal ownership are managed by four agencies: USDA's Forest Service and the Department of the Interior's Bureau of Land Management (BLM), Fish and Wildlife Service (FWS), and National Park Service (NPS) (table 1.3.4). Federal lands are concentrated in the West (fig. 1.3.2, table 1.3.5). Alaska alone has about one-third of Federal land. Forest Service and BLM lands are managed for a variety of uses, including grazing, timber harvest, recreation, and wilderness preservation, while FWS and NPS lands are managed primarily for preservation and recreation.

The principal source of funding for Federal land acquisitions today is the Land and Water Conservation Fund (LWCF), created by Congress in 1964 (National Research Council). LWCF appropriations allow Federal land management agencies and State and local governments to buy lands for recreation, environmental protection, and scenic and historic preservation. LWCF appropriations have fluctuated between $100 million and $400 million in most years (fig. 1.3.3). The Conservation and Reinvestment Act (CARA) proposed the use of offshore oil and gas revenues to fully fund the LWCF at its $900 million annual authorized level (Zinn, 2001a and 2001b). The CARA legislation was approved by the House, but not the Senate, in the 106th Congress (met 1999-2000). The CARA proposal was reintroduced in the 107th Congress, which meets in 2001 and 2002. The Bush Administration proposed full funding for the LWCF (at $900 million) in its FY2002 budget.

Table 1.3.2—Disposition of the original public domain, 1781-1998

Disposition	Million acres	Percent of total disposition
Granted to States for:		
Support of common schools	77.6	6.8
Reclamation of swampland	64.9	5.7
Construction of railroads	37.1	3.2
Support of miscellaneous institutions[1]	21.7	1.9
Canals and rivers	6.1	0.5
Construction of wagon roads	3.4	0.3
Other[2]	117.6	10.3
Total granted to States	328.5	28.7
Granted or sold to homesteaders[3]	287.5	25.1
Granted to railroad corporations	94.4	8.2
Granted to veterans as military bounties	61	5.3
Confirmed as private land claims[4]	34	3
Sold under timber and stone law[5]	13.9	1.2
Granted or sold under timber culture law [6]	10.9	1
Sold under desert land law[7]	10.7	0.9
Other[8]	303.5	26.5
Total dispositions, 1781-1998	1,144.40	100

[1]Universities, hospitals, asylums, etc.
[2]Construction of unspecified public improvements, reclamation of desert lands, etc.
[3]The homestead laws generally provide for the granting of lands to homesteaders who settle upon and improve vacant agricultural public lands.
[4]The Government has confirmed title to lands claimed under valid grants made by foreign governments prior to the acquisition of the public domain by the United States.
[5]The timber and stone laws provided for the sale of lands valuable for timber or stone but unfit for cultivation.
[6]The timber culture laws provided for the granting of public lands to settlers on condition that they plant and cultivate trees on the lands granted.
[7]The desert land laws provide for sale of arid agricultural public lands to settlers who irrigate them and bring them under cultivation.
[8]Chiefly public, private, and preemption sales, but includes mineral entries, strip locations, and sales of townsites and townlots.
Source: USDA, ERS, based on U.S. Department of the Interior, Bureau of Land Management.

Foreign Ownership of U.S. Farm Land

Congress passed the Agricultural Foreign Investment Disclosure Act of 1978 (AFIDA) in response to concern about foreign ownership of U.S. farmland. The AFIDA required all foreigners holding agricultural land (see Glossary), including forestlands, to report their holdings to the Secretary of Agriculture by August 1, 1979. All foreign persons purchasing or selling agricultural land thereafter were required to report these transactions to the Secretary (Barnard and Stokes, 1998). Despite earlier concern over foreign ownership of land, data collected through the AFIDA show that foreigners have consistently owned approximately 1 percent of agricultural land during the past two decades. Most of the changes in foreigners' agricultural land holdings result from changes in the ownership of forestland. Changes in foreign ownership of forestland are largely due to transactions by large timber companies that may involve millions of acres (Blevins and Smith).

Foreign individuals and corporations owned 16 million acres (or 1.2 percent) of the 1.3 billion acres of privately owned agricultural land as of February 29, 2000, nearly two-thirds of it in the Northeast, Mountain States, and Southeast (table 1.3.6). Foreign holdings in 2000 remained relatively constant compared with earlier years (table 1.3.7). In 2000, foreign holdings exceeded 5 percent of privately owned farm and forestland in three States, led by Maine with 17 percent. Forestland accounted for 48 percent of all foreign holdings, pasture and other noncropped agricultural land accounted for 32 percent, cropland accounted for 17 percent, and nonagricultural land accounted for 3 percent. Individuals and corporations from Canada held the largest share of foreign-owned farm and forestland (31 percent), followed by owners from Germany (11 percent) and the United Kingdom (10 percent).

Table 1.3.3—Federal land acquisition, disposition, and holdings as of 1997

Item	Million acres
Public domain acquisitions	1,840.70
- Public domain dispositions	1,144.40
- Water area	33.2
- Lands held in trust	52
+ Net other Federal acquisitions[1]	44.6
= Federal landholdings, 1997	655.7

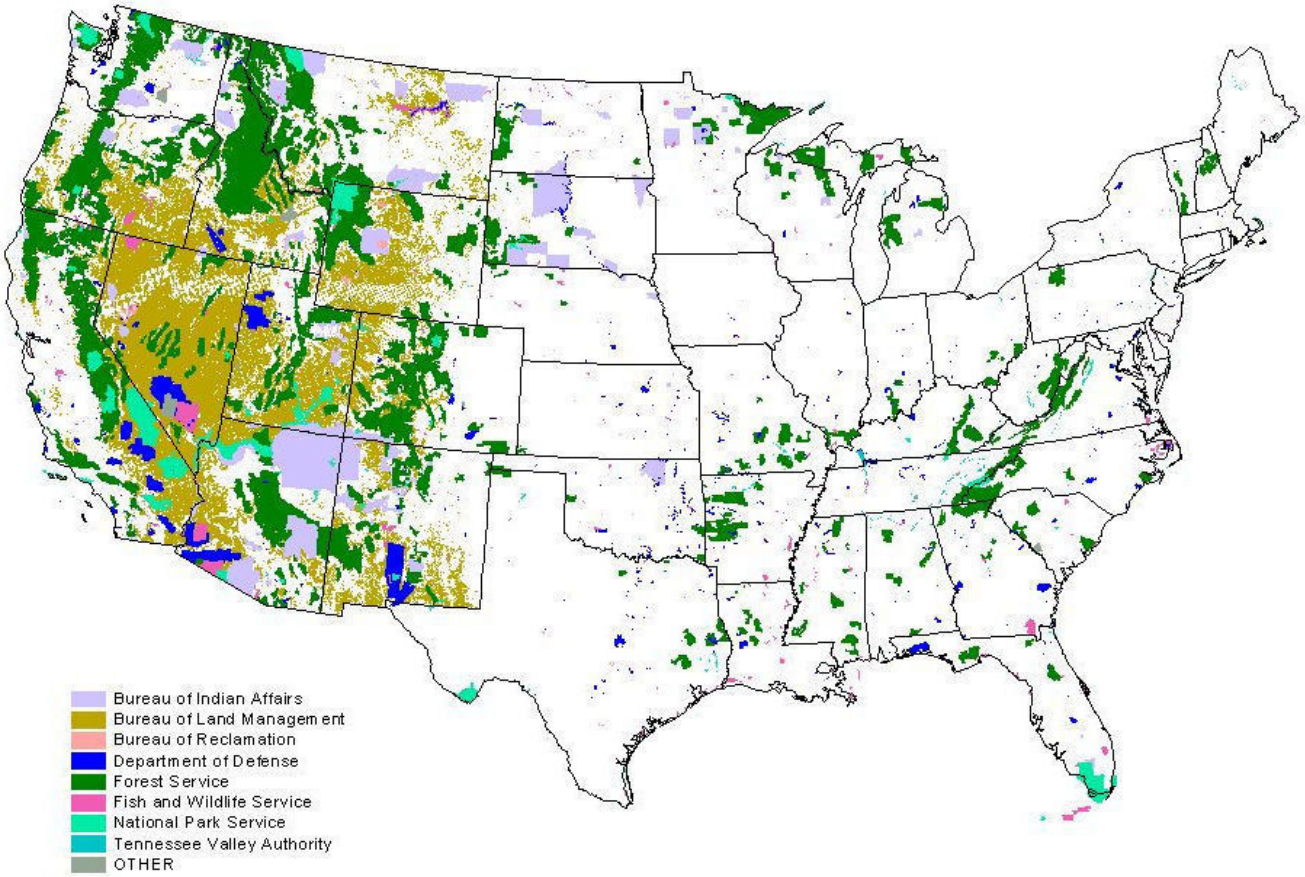
[1]This figure reconciles BLM data on public domain acquisitions, dispositions, and waters with GSA and FWS data on lands held in trust and Federal landholdings in 1997. GSA reports net Federal acquisitions of 55.1 million acres as of 1997.
Source: USDA, ERS, based on U.S. Department of the Interior, Bureau of Land Management; U.S. General Services Administration; U.S. Department of the Interior, Fish and Wildlife Service.

Table 1.3.4—Federal landholdings by agency, 1997

Department/Agency	Million acres	Percent of total
Department of Agriculture	189.4	28.9
Forest Service (FS)	189.1	28.9
Other Agencies	0.4	0.1
Department of Defense (DOD)	14	2.1
Department of the Interior	448.8	68.4
Bureau of Land Management (BLM)	271.2	41.4
Fish and Wildlife Service (FWS)	92.9	14.2
National Park Service (NPS)	75.8	11.6
Other Agencies	8.9	1.4
Other Departments	3.5	0.5
Total	655.7	100

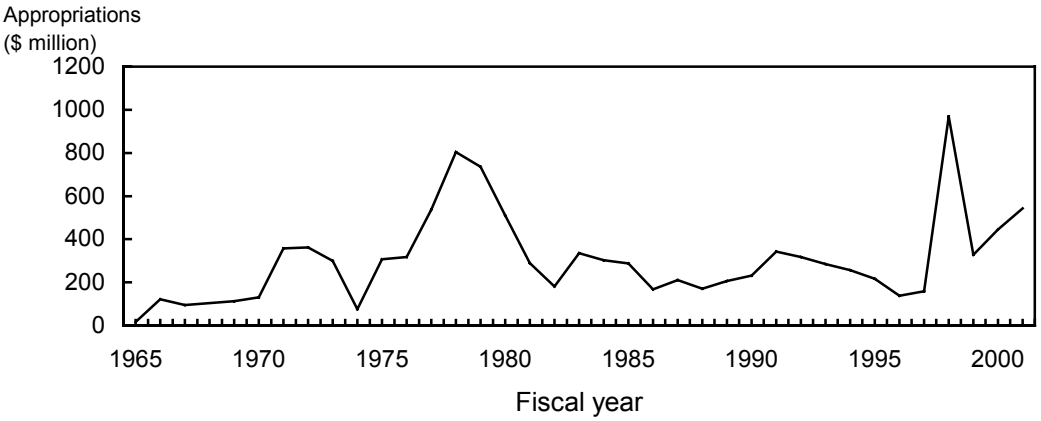
Source: USDA, ERS, based on U.S. General Services Administration and U.S. Department of the Interior, Fish and Wildlife Service, 1999.

Figure 1.3.2 -- Federal landholdings by agency, 1997



Source: ERS, USDA based on Managed Areas Database (McGhie); USDI, USGS, 1997.

Figure 1.3.3--Land and Water Conservation Fund appropriations, 1965-2001



Sources: USDA, ERS, based on U.S. Department of the Interior, 1999; Land Letter (various years); Conservation Fund.

Table 1.3.5—Land ownership by farm production region, 1997[1]

Region	Federal	State	Local	Indian	Private	Total
			Million acres			
Northeast	2.6	10.5	2.4	0.3	95.5	111.4
Appalachia	8.9	2.6	1.0	0.1	111.2	123.7
Southeast	7.3	4.8	1.4	0.2	109.7	123.4
Delta States	6.5	2.1	1.0	0.0	81.6	91.2
Corn Belt	3.9	2.9	2.2	0.0	155.6	164.6
Lake States	10.5	12.3	6.4	1.5	91.4	122.1
Northern Plains	6.0	3.7	1.7	6.0	176.9	194.3
Southern Plains	4.1	5.1	1.7	1.1	199.6	211.6
Mountain States	266.6	36.2	1.6	41.2	202.3	547.9
Pacific Coast	89.6	6.8	2.0	4.0	101.5	203.9
Total, 48 States	406.0	87.0	21.4	54.2	1,325.5	1,894.1
Far West (AK & HI)	241.3	86.8	0.7	1.1	39.2	369.2
Total, US	647.3	173.8	22.1	55.4	1,364.7	2,263.3

Note: Total Federal land in this table differs somewhat from the estimate in tables 1.3.3 and 1.3.4, due to the different data sources used.

[1]All land, including urban land.

Source: USDA, ERS, based on 1997 National Resources Inventory and Vesterby and Krupa.

Table 1.3.6—U.S. agricultural landholdings of foreign owners, February 29, 2000

Region	Acres foreign-owned	Percent of private land[1]	Percent of total foreign holdings
Northeast	3,761,201	4.5	23.9
Appalachia	687,242	0.7	4.4
Southeast	3,001,874	3	19
Delta States	722,190	0.9	4.6
Corn Belt	577,180	0.4	3.7
Lake States	594,491	0.7	3.8
Northern Plains	130,802	0.1	0.8
Southern Plains	1,481,492	0.8	9.4
Mountain States	3,129,946	1.6	19.9
Pacific Coast	1,483,023	1.6	9.4
Alaska, Hawaii & Puerto Rico	196,007	7.8	1.2
U.S. total	15,765,524	1.2	100

[1]Private agricultural land as defined by 7 USC 3508. Agricultural land includes both farm and forest lands.

Source: USDA, ERS, based on Barnard and Stokes, 1998, and Blevins and Smith

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Table 1.3.7—Proportion of foreign-owned to privately owned farm and forest land, 1981-2000[1]

Selected States[2]	1981	1987	1993	1994	1995	1996	1997	2000
					Percent			
Arizona	2.1	2.5	3.2	3.2	3.2	3.4	3.3	3.3
California	1.8	1.9	2.1	2.1	2.2	2.2	2.1	2.3
Florida	1.8	2	2.6	2.6	2.6	2.7	2.8	4.5
Hawaii	2.8	2.7	9	9	9	9.1	9	9.8
Louisiana	0.6	2.5	2.8	2.7	2.8	3.1	1.4	1.5
Maine	14.1	9	13.4	11.4	16.4	17.9	16.8	17.4
Nevada	0.7	0.6	3.5	3.5	4.7	4.7	5.3	5.3
New Mexico	1.9	1.6	2.2	2.2	2.2	2.2	2.2	2.2
Oregon	2	3.4	2.6	2.3	2.3	0.8	0.8	0.9
Total U.S.	1	1	1.2	1.1	1.2	1.1	1.1	1.2

[1]As defined by 7 USC 3508. Agricultural land includes both farm and forest lands.

[2]States with at least 2 percent foreign ownership in 1995.

Source: USDA, ERS, based on DeBraal; Krupa et al.; Barnard and Stokes, 1997 and 1998; and Blevins and Smith.

Partial Interests in Land

Land ownership—whether private, government, or foreign—consists of a "bundle of property rights," not all of which are necessarily held by the landowner (Wiebe et al., 1996). There are typically many interests in a single parcel of land, including rights to grow crops, build houses, or mine minerals. The bundle of rights that comprise land ownership may remain largely intact or they may be allocated among multiple parties, both public and private. For example, a farmland owner may rent land to a farm operator and sell drilling rights on the same parcel of land to an oil company. The landowner also holds development rights. If the land has potential for conversion to residential, commercial, or industrial use, these rights may be highly valued by developers, government agencies, and conservation organizations.

The fact that partial interests in a particular tract of land—the "sticks" in the bundle—can be held and traded separately presents opportunities for public agencies to influence resource use without incurring the political costs of regulation or the full financial costs of outright land acquisition. An example of partial interests used by Federal programs is the Wetlands Reserve Program (WRP), through which the Federal Government acquires cultivation rights from willing farmers and farmland owners in an effort to reduce soil erosion, protect wildlife habitat, and improve water quality. State and local government agencies and nongovernmental organizations also acquire partial interests in private land for conservation purposes, including the preservation of farmland, wetlands, and wildlife habitat. Farmland preservation programs, which seek to retain land in agricultural use when land values rise due to urban pressure, operate primarily at the State and local levels, although USDA's Farmland Protection Program (FPP) offers assistance for easement acquisition (USDA, Natural Resources Conservation Service).

To succeed as resource policy tools, partial interests must be tailored to meet specific program and landowner goals on specific parcels of land, and can thus involve substantial negotiation and settlement costs. They also require ongoing monitoring and enforcement. These costs may partially offset savings that might otherwise be achieved relative to regulation or outright land acquisition.

The Private Property Rights Issue

From an economic perspective, property rights in land represent expectations about which land uses will be legally permitted over time, as well as expectations about the returns that those uses will generate. The actual decisions that farmers make about crop production, input use, conservation, waste disposal, and land conversion are all influenced by the nature of the specific property rights they hold in the land they own or rent. Land ownership rights are not absolute. In order to balance landowners' rights with the rights of other members of society, rights to use land may be limited by government regulations, zoning ordinances, conservation easements, contracts, or other instruments that arise out of law, custom, and the operation of private markets. This holds true whether the landowner is a private individual or the Federal Government.

Despite these limitations, private property is protected by the Constitution's Fifth Amendment, which states that private property shall not be taken for public use without just compensation. Only physical appropriations of property were viewed as "takings" until 1922, when the Supreme Court ruled that regulation could also be considered a taking if it went "too far" (*Pennsylvania Coal Company v. Mahon*). Even so, the courts have considered a regulation's impact on a property's value as only one among several criteria—such as the nature of the public purpose accomplished by the regulation—in determining whether a taking has occurred.

Various bills have been considered by Congress in recent years that would require the Federal Government to compensate landowners whenever Federal restrictions on land use cause property values to fall by more than a threshold percentage. This would establish diminution in value as a sufficient criterion by which takings could be determined, regardless of other economic and legal criteria. Support for such changes has subsided since the mid-1990s.

Farm and Nonfarm Owners of Farmland

So far, this chapter has centered on the broad topic of land ownership by various entities and the rights associated with land ownership. The rest of the chapter focuses on farms, because of the large amounts of land they use. Note, however, that farm operators do not own all the land used in agriculture. According to the 1999 Agricultural Economics and Land Ownership Survey (AELOS), a special "follow-on" survey to the 1997 Census of Agriculture, farmers made up 58 percent of the 3.4 million farmland owners in 1999. These landowning farmers also held 58 percent of the land in farms (USDA, National Agricultural Statistics Service, 2001b).

Nonoperator landlords accounted for the remaining 42 percent of the land in farms. Ninety-five percent of nonoperator landlords were individuals/families or partnerships. Of these landlords, 55 percent were at least 65 years old, and another 11 percent were between 60 and 64 years of age. Many nonoperator landlords have a connection to farming in their past. Among the people who have exited farming or inherited farmland since the number of farms peaked during the Great Depression, a number have retained ownership of some or all their land (Hoppe et al.).

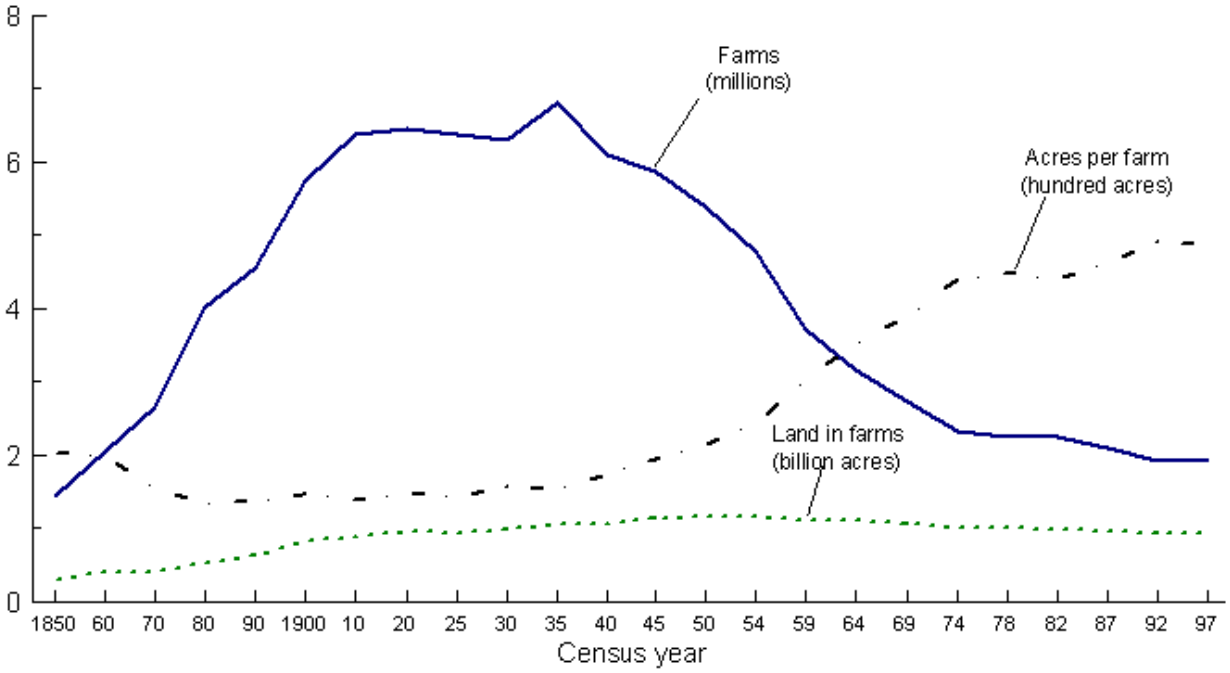
Farm Numbers, Farm Types, and Land Use

The number of farms declined dramatically since its maximum of nearly 7 million in 1935, with most of the decline occurring during the 1940s, 1950s, and 1960s (fig. 1.3.4). The decline in farm numbers still continues, but at slower pace. By 1997, about 2 million farms remained. Because the amount of farmland did not decrease as much as the number of farms, the remaining farms have a larger average acreage.

Averages, however, mask different trends in different acreage classes. The number of farms with at least 500 acres increased steadily from 1880 through the 1950s, before stabilizing at 350,000 to 370,000 farms (fig. 1.3.5). Farms with 1-49 acres declined from their maximum of 2.7 million in 1935 to about 500,000 in 1974. After 1974, the count of these farms has ranged between 540,000 and 640,000. In contrast, the number of farms with 50-499 acres declined from 3.9 million in 1935 continuously to about 1 million farms in 1997. As a result of these changes, farms with fewer than 50 acres and farms with more than 500 acres have both increased their share of total farms since 1974, but midsized farms' share has declined.

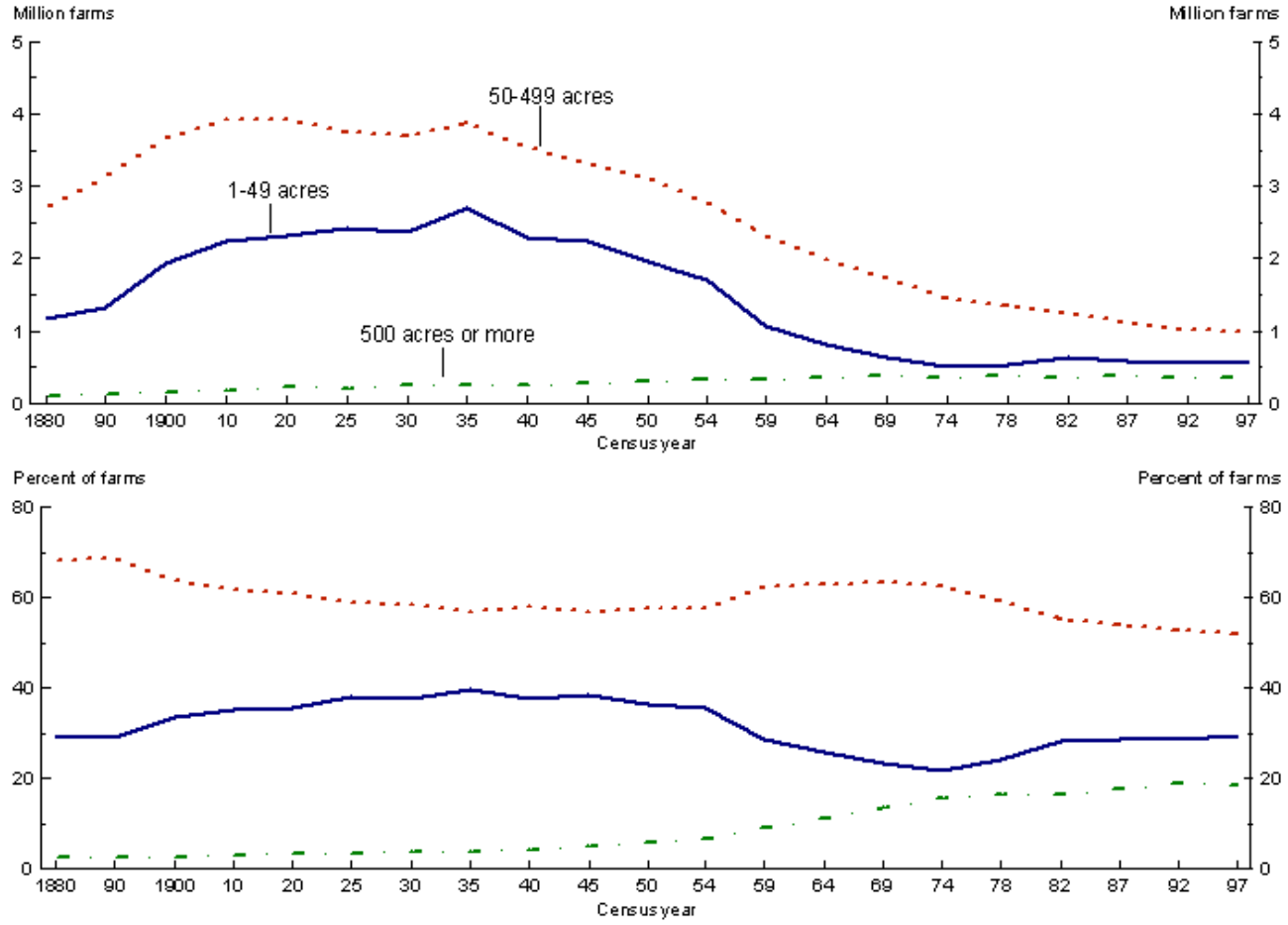
The farms remaining today are diverse, ranging from very small retirement and residential farms to industrialized operations with sales in the millions. Part of this diversity stems from the very low sales threshold ($1,000) necessary for an operation to qualify as a farm for statistical purposes (see box "What Is a Farm?").

Figure 1.3.4--Farms, land in farms, and average acres per farm, 1850-1997



Source: USDA, ERS, based on Census of Agriculture data anc Wunderlich, 1991.

Figure 1.3.5--Changing farm size in U.S. agriculture, 1880-1997



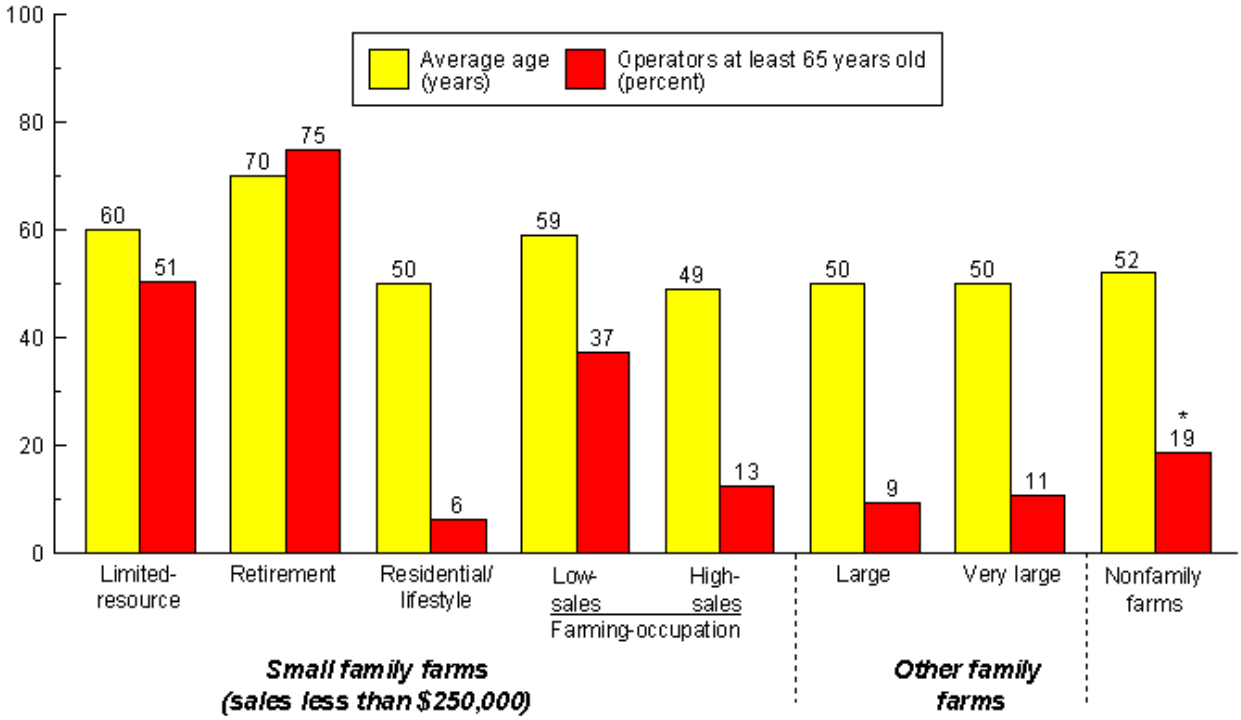
Source: USDA, ERS, based on Census of Agriculture data.

The Farm Typology

One way to address the diversity of farms is to categorize them into more homogeneous groups. The farm typology developed by the USDA's Economic Research Service (ERS) identifies five groups of small family farms (sales less than $250,000): limited-resource, retirement, residential/lifestyle, farming-occupation/low-sales, and farming-occupation/high-sales. (See box "Defining the Farm Typology Groups.") The typology also includes large family farms, very large family farms, and nonfamily farms, thereby accounting for all U.S. farms. Information on the ERS typology presented in this chapter is from the Agricultural Resource Management Survey (ARMS), Phase III. (For more information about ARMS, see box "The Agricultural Resource Management Survey.")

The typology groups are based on the occupation of the operator and the sales class of the farm. In the case of limited-resource farmers, the asset base and total household income are also low. Compared with classifications based on sales class alone, the typology groups are more reflective of operators' expectations from farming, their position in the life cycle, and their dependence on agriculture (Hoppe, 2001; Hoppe and MacDonald). For

Figure 1.3.6--Average age of operator and share of operators at least 65 years old by farm typology group, 2000



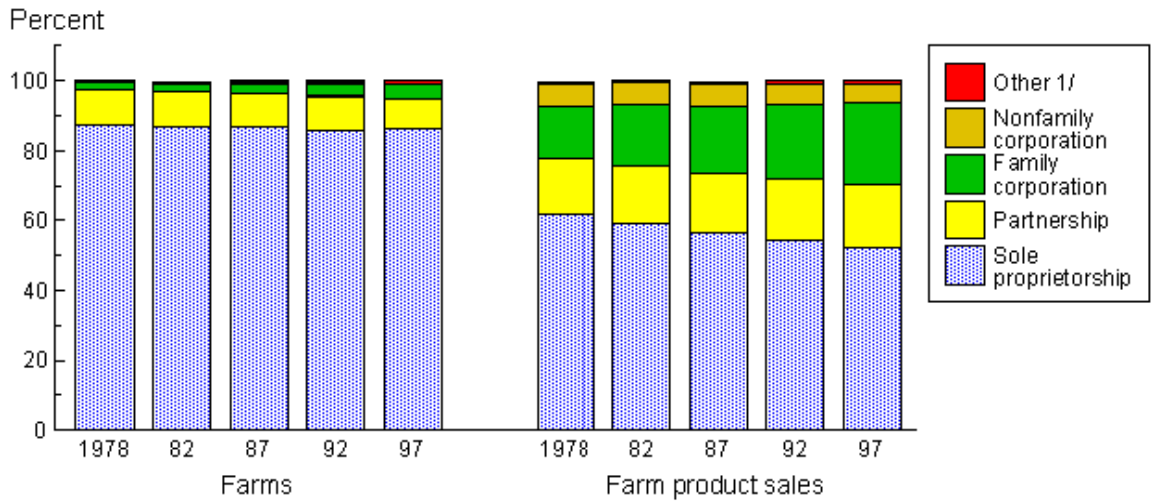
*The standard error exceeds 25 percent of the estimate, but is no more than 50 percent of the estimate.
The standard errors of other estimates are no more than 25 percent of the estimates.

Source: USDA, ERS, based on 2000 Agricultural Resource Management Survey data.

example, operators of retirement farms have an average age of 70 years (fig. 1.3.6). In contrast, the average age for operators of high-sales, large, and very large family farms is around 50 years. The farms in these last three groups have sales of $100,000 or more (by definition) and are more likely to be run by younger operators as commercial enterprises.

The farm typology distinguishes "family farms," defined here as farms organized as proprietorships, partnerships, and family corporations, from nonfamily farms. A family farm is closely held (legally controlled) by its operator and the operator's family. In other words, a family farm is organized as a sole proprietorship, a partnership, or a family corporation. Nonfamily farms include farms organized as nonfamily corporations or cooperatives, as well as any proprietorships, partnerships, or family corporations with hired managers. Only 2 percent of U.S. farms are nonfamily farms (table 1.3.8). Contrary to popular belief (Hoppe, 1996a), the share of farms and sales accounted for by nonfamily corporations is small and has been relatively stable since 1978, according to data from the Census of Agriculture (fig. 1.3.7).

Figure 1.3.7--Distribution of farms and farm product sales, by business organization, 1978-97



1/Includes cooperatives, estates or trusts, and institutional farms.

Source: USDA, ERS, based on Reimund and Gale, 1992 and 1997 Censuses of Agriculture.

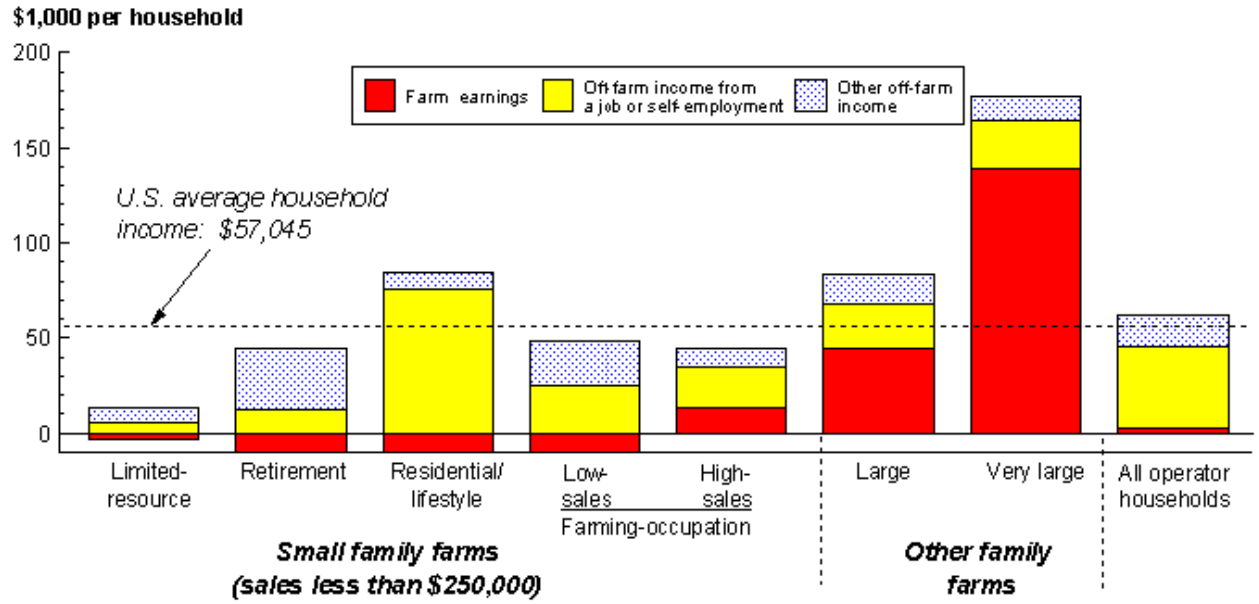
Size Variation Among Typology Groups

Small farms dominate the farm count, making up 92 percent of all U.S. farms (table 1.3.8). In addition, very small farms (sales less than $10,000) make up more than half of the Nation's farms. Very small farms account for a particularly large share of farms in the limited-resource (83 percent), retirement (78 percent), and residential/lifestyle (73 percent) groups. The average acreage operated for farms in these three groups is also small, ranging from 124 to 170 acres.

Although only 35 percent of farming-occupation/low-sales farms have sales less than $10,000, more than two-thirds of the group's farms have sales less than $50,000. On average, low-sales farms operated 444 acres, or at least double the average for the limited-resource, retirement, or residential/lifestyle groups. This average is small, however, compared with those for farming-occupation/high-sales farms, large family farms, and very large family farms. Because their farms are so small, whether measured in sales or acres, farm households in the limited-resource, retirement, residential/lifestyle, and low-sales groups rely heavily on off-farm income (fig. 1.3.8).

The fact that most farms are small has implications for conservation and the environment. For example, a recent ERS study on the adoption of conservation tillage by farms producing corn found that smaller farms are less likely to use conservation tillage than larger farmers (Soule et al., 1999 and 2000). Conservation tillage is more attractive to larger farms because they can spread the cost of equipment over more acres. Limited-resource, retired, and part-time farmers also are less likely to use conservation tillage. (Limited-resource, retired, and part-time farmers are defined here as those operators who had a nonfarm major occupation, were retired, or had gross sales less than $100,000 and total farm assets less than $150,000). Small farms, however, may use conservation practices other than conservation tillage, such as the Conservation Reserve Program (CRP) or WRP.

Figure 1.3.8--Average operator household income by source and by farm typology group, 2000



Note: The standard error for farm earnings exceeds 25 percent, but is no more than 50 percent of the estimate for households operating limited-resource, retirement, or low-sales farms. The standard errors of other estimates are no more than 25 percent of the estimates.

Source: USDA, ERS, based on data from the 2000 Agricultural Resource Management Survey and the Current Population Survey (U.S. Census Bureau, 2001).

Distribution of Conservation Program Payments by Type of Farm

Farming-occupation/high-sales small farms, large family farms, and very large family farms receive a disproportionate share of government payments relative to their share of farms (table 1.3.9). These farms produce most of the program commodities and therefore receive about three-quarters of program commodity payments. However, CRP and WRP are targeted at particular types of land, not commodity production. Since small farms collectively operate 61 percent of the land in farms (table 1.3.8), they play a large role in natural resource and environmental policy.

The retirement, residential/lifestyle, and farming-occupation/low-sales groups each account for between 20 and 25 percent of CRP and WRP payments (table 1.3.9). Twenty percent of retirement farms receive CRP or WRP payments, double the 11-percent participation rate for all farms. In contrast, the participation rate for residential/lifestyle and low-sales groups (7 and 9 percent, respectively) is about the same as the rate for all farms. All three groups, however, enroll large portions of their land (between 21 and 43 percent) when they do participate. The large share of CRP and WRP payments going to residential/lifestyle and low-sales farms is not the result of a high participation rate for these groups. Instead, it reflects their large numbers (42 and 21 percent, respectively, of all farms) and their tendency to enroll large shares of their farms when they do participate.

Table 1.3.8—Farm size, land owned and operated, value of production, and tenure, by farm typology group, 2000

Item	Small farms					Large family farms	Very large family farms	Nonfamily farms	All farms
	Limited-resource	Retirement	Residential/ lifestyle	Farming-occupation					
				Low-sales	High-sales				
					Number				
Total farms	128,674	320,055	913,876	453,791	171,824	78,382	54,886	44,572	2,166,060
					Percent of group				
Sales class:									
Less than $10,000	83.1	78.1	73.2	34.5	na	na	na	d	55.1
$10,000 to $49,999	13.8	18.2	20.5	36.9	na	na	na	27.5	20.5
$50,000 to $99,999	d	d	3.7	28.6	na	na	na	d	8.4
$100,000 to $174,999	na	d	1.8	na	64.7	na	na	d	6.1
$175,000 to $249,999	na	d	*0.8	na	35.3	na	na	d	3.3
$250,000 to $499,999	na	na	na	na	na	100.0	na	9.8	3.8
$500,000 or more	na	na	na	na	na	na	100.0	16.4	2.9
					Million acres				
Land owned	6.8	50.6	114.5	139.7	81.7	50.4	62.9	*84.9	591.3
Land operated	16.0	48.8	155.1	201.5	181.5	132.8	*160.4	*99.0	995.0
					Acres per farm				
Land operated per farm	124	152	170	444	1,056	1,694	*2,922	*2,220	459
Owned	52	158	125	308	476	643	1,145	*1,904	273
Rented in	*76	22	59	176	606	1,077	*1,806	*447	211
Rent out	*4	28	14	*41	27	28	*36	**135	26
					Percent of U.S. Total				
Farms	5.9	14.8	42.2	21.0	7.9	3.6	2.5	2.1	100.0
Acres owned	1.1	8.6	19.4	23.6	13.8	8.5	10.6	14.4	100.0
Acres operated	1.6	4.9	15.6	20.3	18.2	13.3	16.1	9.9	100.0
					Percent of group				
Tenure:									
Full owner	60.9	81.6	64.3	52.0	20.1	17.8	25.9	54.8	57.7
Part owner	20.8	18.0	29.0	40.8	62.9	65.8	61.0	27.0	34.1
Tenant	18.3	na	6.7	7.2	17.0	16.5	13.1	*18.2	8.2

d = Data suppressed due to insufficient observations. na = Not applicable. *= The standard error exceeds 25 percent of the estimate, but is no more than 50 percent of the estimate. **= The standard error exceeds 50 percent of the estimate, but is no more than 75 percent of the estimate. The standard errors of unmarked estimates are no more than 25 percent of the estimates.

Source: USDA, ERS, based on 2000 Agricultural Resource Management Survey data.

Given their life-cycle position, many retired farmers have land available to put into conservation uses. Alternatively, the assured and steady stream of rental payments coming from the CRP may make retirement a more viable option for some farmers. Similar forces could be acting on low-sales operators, since they have an average age of 59 years (fig. 1.3.6) and may be phasing down their operations. Residential/lifestyle operators are younger, but their main job is off-farm, which may make putting land into conservation uses financially attractive. If an advanced age and an off-farm occupation are major determinants of land going into conservation uses, it may be relatively easy to get smaller farms to enroll land in the programs. Getting larger farms to enroll may require more financial incentives, because the opportunity cost of idling their land is higher.

Land Use by Type of Farm

Land use, as reported by ARMS respondents, varies by typology group (table 1.3.10). In the retirement, residential/lifestyle, farming-occupation/low-sales, and nonfamily groups, grazing land predominates, accounting for at least half of the acreage operated, while cropland accounts for one-fourth to one-third of the land operated. The situation is reversed for large and very large farms, where 50-60 percent of the land is in cropland and only 30-40 percent is grazed. The shares of land in the cropland and grazing land categories are more equal in the farming-occupation/high-sales and limited-resource groups.

At least some of the differences in land use among the farm typology groups reflect differences in specialization (table 1.3.11). For example, about 40 percent of retirement and residential farms specialize in beef, which means they can use grazing land. Three-fifths of large and very large farms specialize in crops of various types, which means they need more cropland and less grazing land. Although 61 percent of the high-sales farms also specialize in crops, another 31 percent specialize in dairy or beef, which helps explain why 48 percent of their land is grazed.

Particular groups account for large portions of land in specific uses (table 1.3.10). For example, the high-sales group accounts for 25 percent of cropland, while the low-sales group accounts for a similar 27-percent share of grazing land. The retirement, residential/lifestyle, and low-sales groups hold about 68 percent of idle cropland, including land enrolled in the CRP. The same three groups also hold large shares of cropland used for pasture (67 percent), woodland pastured (77 percent), and woodland that is not pastured (69 percent). Note that ARMS respondents may not necessarily classify their land enrolled in the CRP as idle. If planted to trees under the program, CRP land could be classified as woodland. If grazed during a drought emergency, CRP land could be classified as grazing land.

If crop prices increase enough, some idled cropland would be shifted into crop production (Vesterby and Krupa). Some cropland used for pasture might also shift into crops, but shifts between idled cropland and cropland used for crops are more common, because idled cropland is usually better for producing crops. However, there may be a limit to how rapidly land can be shifted into crop production, given who holds the bulk of idled and pastured cropland. Operators of retirement, residential/lifestyle, and low-sales farms typically do not rely on farming for their income and may not care to shift from grazing or CRP to crop production. If higher prices are perceived as likely to persist long term, or government commodity programs become more lucrative, however, these operators may be willing to rent (or sell) pastured cropland or CRP land with expired contracts to someone who will plant crops.

Table 1.3.9—Conservation and commodity program participation and payments, by farm typology group, 2000

Item	Small family farms					Large family farms	Very large family farms	Nonfamily farms	All farms
	Limited-resource	Retirement	Residential /lifestyle	Farming-occupation					
				Low-sales	High-sales				
					Number				
Total farms	128,674	320,055	913,876	453,791	171,824	78,382	54,886	44,572	2,166,060
					Percent of U.S. total				
Farms	5.9	14.8	42.2	21.0	7.9	3.6	2.5	2.1	100.0
Commodity program payments[1]	0.5	1.4	8.3	13.5	26.1	24.3	21.8	4.1	100.0
Production of program commodities[2]	0.6	0.8	8.2	11.1	26.8	24.4	24.1	4.0	100.0
CRP and WRP payments	3.7	22.1	23.5	18.4	12.4	11.3	3.5	5.1	100.0
Land enrolled in CRP or WRP	4.3	18.2	21.1	20.0	14.2	13.8	3.6	4.8	100.0
					Percent of group				
Receive government payments[3]	23.8	37.2	31.1	51.7	81.2	83.2	70.2	46.3	43.0
Commodity programs	13.7	20.6	26.6	48.6	80.4	82.1	68.3	42.9	37.2
CRP and WRP	12.0	20.3	7.3	8.6	13.2	18.9	11.6	*15.3	10.9
					Percent of land operated				
Land enrolled in CRP or WRP	d	43.3	32.3	20.5	12.4	*10.2	4.7	**10.5	17.1
					$ per participating farm				
Total government payments[3]	3,767	3,980	5,373	9,500	28,897	57,430	85,345	32,788	17,258
Commodity programs	4,012	3,057	5,079	9,049	27,934	55,942	86,307	31,988	18,363
CRP and WRP	2,862	4,101	4,243	5,671	6,588	9,183	6,529	8,915	5,078

d = Data suppressed due to insufficient observations.
*= The standard error exceeds 25 percent of the estimate, but is no more than 50 percent of the estimate.
**= The standard error exceeds 50 percent of the estimate, but is no more than 75 percent of the estimate. The standard errors of unmarked estimates are no more than 25 percent of the estimates.
[1]Includes agricultural disaster payments, loan deficiency payments, and transition payments.
[2]Includes wheat, rice, corn, sorghum, barley, oats, cotton, and soybeans.
[3]Includes EQIP, not shown separately.
Source: USDA, ERS, based on 2000 Agricultural Resource Management Survey data.

Table 1.3.10—Land use, by farm typology group, 1997

Item	Small farms					Large family farms	Very large family farms	Nonfamily farms	All farms
	Limited-resource	Retirement	Residential/ lifestyle	Farming-occupation					
				Low-sales	High-sales				
					Number				
Total farms	195,572	304,293	811,752	396,698	178,210	79,240	45,804	37,816	2,049,384
					Million acres				
Land operated[1]	22.7	80.6	138.5	216.1	199.7	107.2	99.9	67.8	932.5
					Percent of land				
Land use within group:									
Cropland	35.7	27.4	35.2	34.1	48.4	61.6	53.5	25.4	41.4
Cropland used for crops[2]	30.8	16.8	28.1	30.2	46.0	59.2	51.4	22.8	37.2
Idle cropland[3]	*4.9	10.6	7.1	3.9	2.4	2.5	2.1	*2.6	4.2
Grazing land	39.0	57.0	51.1	57.5	47.5	33.8	41.5	69.4	50.4
Cropland used only for pasture	5.4	6.0	7.3	*8.3	*3.0	*2.9	3.2	*3.9	5.3
Pastureland and range[4]	*27.4	44.5	31.9	42.4	41.6	29.7	36.2	64.6	40.0
Woodland pastured[5]	6.2	*6.5	*11.9	*6.7	2.9	1.2	**2.1	*0.9	5.1
Woodland not pastured[5]	**17.7	*9.9	8.1	4.7	1.9	1.8	2.1	*2.2	4.6
All other land[6]	7.6	5.7	5.6	3.7	2.2	2.7	2.9	*3.0	3.7
Land use across groups:									
Cropland	2.1	5.7	12.6	19.1	25.1	17.1	13.8	4.5	100.0
Cropland used for crops[2]	2.0	3.9	11.2	18.8	26.5	18.3	14.8	4.5	100.0
Idle cropland[3]	2.8	21.8	25.0	21.5	12.3	6.7	5.4	4.5	100.0
Grazing land	1.9	9.8	15.1	26.5	20.2	7.7	8.8	10.0	100.0
Cropland used only for pasture	2.5	9.9	20.6	36.8	12.1	6.3	6.5	5.4	100.0
Pastureland and range[4]	1.7	9.6	11.9	24.6	22.3	8.5	9.7	11.8	100.0
Woodland pastured[5]	3.0	11.0	34.7	30.8	12.2	2.7	*4.4	*1.3	100.0
Woodland not pastured[5]	d	18.6	26.3	23.8	9.0	4.6	4.9	d	100.0
All other land[6]	d	13.4	22.7	23.3	12.6	8.5	8.6	d	100.0

d = Data suppressed due to insufficient observations. *The standard error exceeds 25 percent of the estimate, but is no more than 50 percent of the estimate. **The standard error exceeds 50 percent of the estimate, but is no more than 75 percent of the estimate. The standard errors of unmarked estimates are no more than 25 percent of the estimates.

[1]The amount of land operated in this table differs from that in table 1.3.8 because it is based on a different year. For more information, see the box "The Agricultural Resource Management Survey."

[2]Land from which crops were harvested or hay was cut, as well as all land in orchards, citrus groves, vineyards, and nursery and greenhouse crops. Also includes cropland on which all crops failed and land in cultivated summer fallow.

[3]Any acreage which could have been used for crops without any additional land improvements. Includes land used only to grow cover crops for controlling erosion or to be plowed under for soil improvement, as well as land growing crops in 1997 for harvest in subsequent years.

[4]Any pastureland other than pastured cropland and woodland.

[5]All woodlots and timber tracts, natural or planted.

[6]Includes land in house lots, ponds, roads, and wasteland.

Source: USDA, ERS, based on 1997 Agricultural Resource Management Survey data.

Table 1.3.11—Farm specialization, by farm typology group, 1997

Item	Small family farms					Large family farms	Very large family farm	Nonfamily farms	All farms
	Limited-resource	Retirement	Residential/ lifestyle	Farming-occupation					
				Low-sales	High-sales				
					Number				
Total farms	195,572	304,293	811,752	396,698	178,210	79,240	45,804	37,816	2,049,384
					Percent of group				
Specialization:									
Grains and oilseeds	*14.3	12.2	17.2	27.6	43.8	43.1	22.7	*23.1	21.7
Other field crops	*32.5	19.9	15.8	13.3	10.2	9.3	12.1	20.8	16.8
High value crops[1]	*6.0	*9.7	7.3	8.0	6.9	8.3	20.3	29.3	8.4
Beef	30.9	42.8	40.6	33.2	10.7	8.7	9.0	11.8	33.5
Hogs	d	d	d	d	2.9	5.2	6.3	d	1.8
Dairy	d	d	d	6.5	20.5	13.8	14.1	d	4.4
Other livestock	d	13.7	16.9	10.1	5.0	11.7	15.5	*11.2	13.5

d = Data suppressed due to insufficient observations.
*The standard error exceeds 25 percent of the estimate, but is no more than 50 percent of the estimate. The standard errors of unmarked estimates are no more than 25 percent of the estimates.
[1]Vegetables, fruits, and nursery products.
Source: USDA, ERS, based on 1997 Agricultural Resource Management Survey data.

Differences in land use among the typology groups have implications for land management programs. For example, some efforts to improve management of woodland on farms could be targeted at small farms because of the large amount of woodland they control. In effect, the Forest Service is doing this through its Forest Stewardship Program (USDA, Forest Service, 2000). Forestlands have become more fragmented, largely a result of sales to provide recreation and residential sites (Sampson and DeCoster). More effective management of larger tracts of farm woodland might help farmers earn enough income from forestry to resist sales for recreation and residential sites, although the woodland holdings of most farmers are in small tracts amounting to only a few acres. Sixty percent of the 549,000 farms with woodland not used for grazing have fewer than 50 acres of that type of woodland. These farms, however, account for only 15 percent of such woodland.

Differences in land use also have implications for research and extension. Some research could be targeted at grazing on small farms, because of their large share of grazing land. For an example, see "Current Agriforestry Research," in the Summer 2001 issue of *Small Farm Research News*, a publication of the Dale Bumpers Farm Research Center (USDA, Agricultural Research Service). The newsletter summarizes recent research on how to produce grass for grazing or hay in conjunction with pine production. Similarly, State extension education programs could emphasize management techniques easily adopted by small farms in some of their range and pasture management classes.

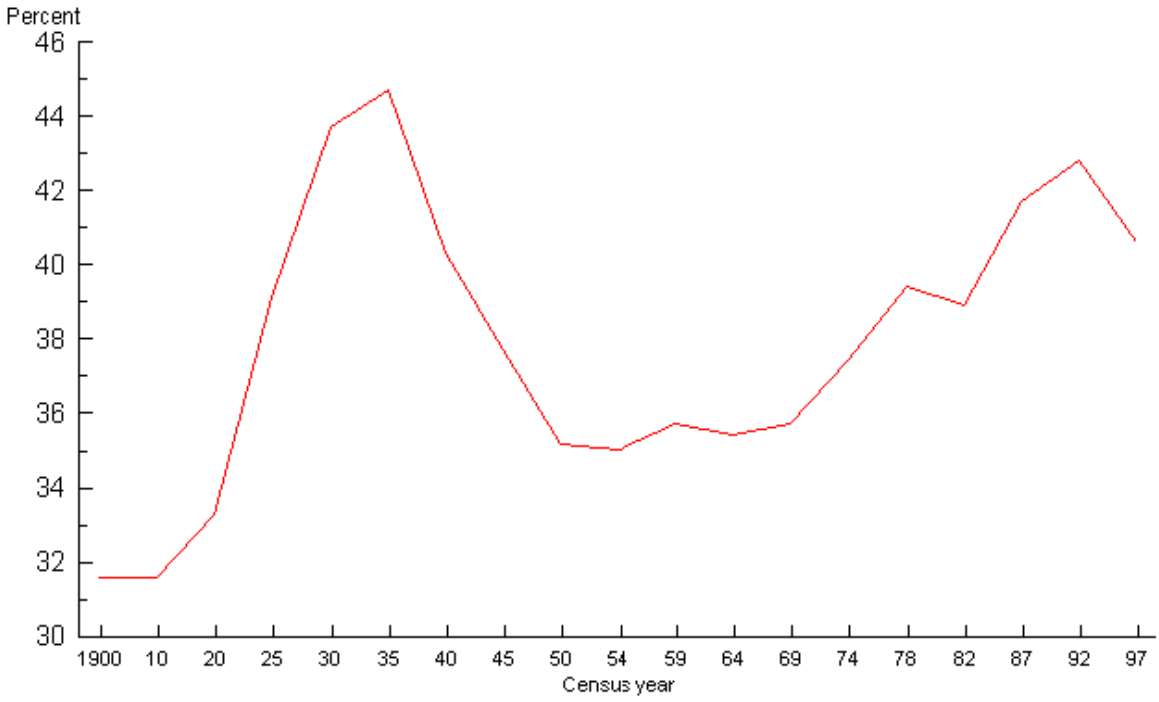
Land Tenure

Farming operations need access to land in order to produce agricultural products. Access may be obtained through renting as well as outright ownership. Farm operators leased 41 percent of total farmland in 1997, down slightly from 43 percent in 1992, but higher than most census years since the turn of the century, except during the Great Depression (fig. 1.3.9). In 1997, 29 percent of rented land was leased to tenants (who rent all the land they farm) and 71 percent was leased to part owners (who own some of the land they operate, but also rent additional land). A century ago, the percentages were reversed. In 1900, for example, about 73 percent of rented land was leased to tenants, and 27 percent was rented to part owners.

Leasing land was traditionally viewed as the bottom rung of the tenure ladder. Young farmers would begin their careers by leasing all their land, often from relatives. As they grew older, they would buy some land, but continue to rent. Older farmers would cut back on farming by no longer leasing and concentrate on the land they owned (Hoppe et al.; Wunderlich, 1994). Land leasing has changed from a way for beginning farmers to enter agriculture to a way for established farmers to access additional land (Wunderlich, 1994, Reimund and Gale). Land rental has some advantages over outright ownership (Wiebe et al., 1997). Through land rental, a farmer can access more land without tying up capital in land purchases. The farmer also avoids the risk associated with asset depreciation and maintains flexibility in the size of the operation and the combination of the types of land used.

Conventional wisdom has long held that owners of a resource will take better care of that resource than will users without a long-term interest in the resource. Previous research on this question has provided inconclusive or contradictory results, however, because it did not adequately address three important dimensions of the relationship between tenure and conservation (Soule et al., 2000). First, tenure's impact may depend on the timing and magnitude of the costs and returns generated by the conservation practice under study. For example, conservation tillage may increase short-term profits fairly rapidly due to cost savings (e.g., on labor and fuel), but it may take several years to generate positive net returns to medium-term practices such as contour farming,

Figure 1.3.9--Leased farmland as a percentage of total farmland, 1910-1997



Source: USDA, ERS, based on Census of Agriculture data and Wunderlich, 1995.

stripcropping, or grassed waterways. Tenure's role in adoption is likely to vary with these differences.

Secondly, different lease arrangements may also influence renters' conservation decisions. For example, share-renters may have an additional incentive, relative to cash-renters, to adopt conservation practices that increase use of inputs for which they bear only a share of the cost. Furthermore, landlords tend to participate more actively in the management of farms rented under share leases. This could induce share-renters to behave more like full owners than cash-renters. Failure to consider such distinctions would obscure tenure's true effect on the adoption of conservation practices.

A third dimension of the relationship between tenure and conservation is the possibility that land characteristics vary between land operated by renters and land operated by owners—specifically, that renters operate land that is more vulnerable to erosion. Using data from the 1977 National Resources Inventory and the 1978 Landownership Survey, however, Bills found that "physical parameters governing soil loss bear no statistical relationship to tenure of operator."

Recent research by Soule et al. (2000) explores these three dimensions both conceptually and empirically using data on corn and soybean production from ARMS, Phase II (see box "The Agricultural Resource Management Survey"). ARMS data provide a valuable opportunity (with farm, land, farmer, and production practices data in a single large sample) to conduct an econometric analysis of tenure and other factors affecting the adoption of conservation practices. The unit of observation was individual fields, so the effect of tenure on the decision to adopt conservation practices on particular fields was captured. Note, however, because these data were field-

and crop-specific, they could not capture how farmers allocate erosive crops between rented and owned land. An earlier study (Bills) found that nearly two-thirds of rented land was planted in erosive row crops, while only half of owner-operated land was in row crops. A larger share of owner-operated land was in pasture and hay, the least erosive uses.

Results indicate that land tenure is an important factor in farmers' decisions to adopt conservation practices, but in ways that may not be revealed in conventional analyses. Among corn producers, cash-renters are less likely than owner-operators to use conservation tillage, although share-renters behave much like owner-operators in adopting conservation tillage. Both share-renters and cash-renters are less likely than owner-operators to adopt at least one of the medium-term practices (contour farming, stripcropping, or grassed waterways). Among soybean producers, share-renters are less likely than owner-operators to adopt conservation tillage, but no tenure-related differences are evident in the adoption of medium-term practices. In terms of land characteristics, farmers were significantly more likely to adopt conservation practices on fields designated as highly erodible, after controlling for other factors.

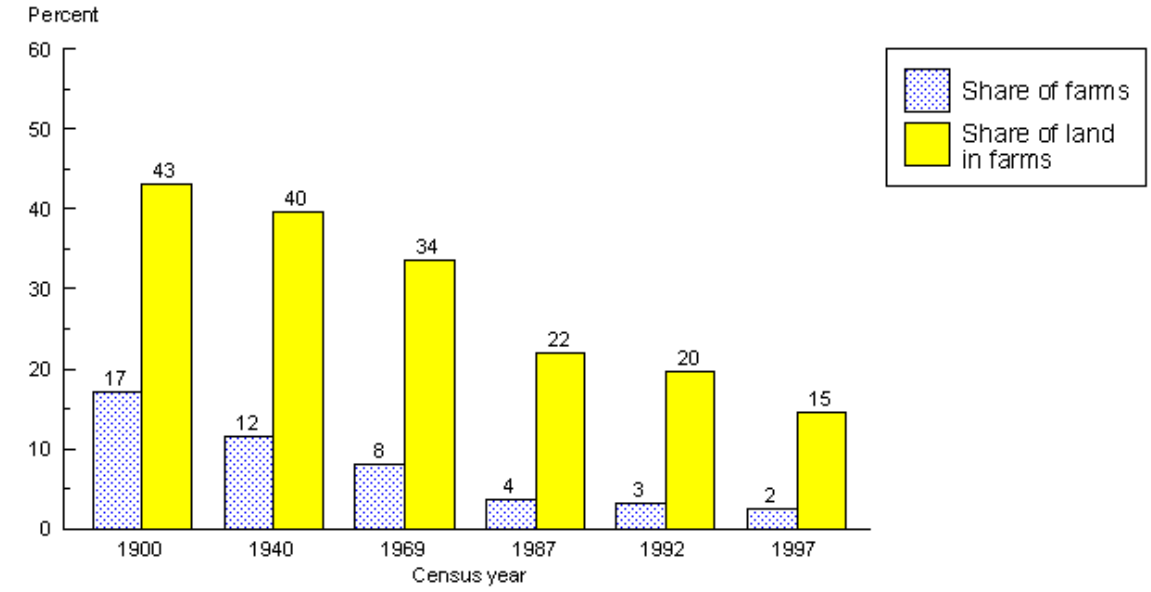
These results suggest that adoption of conservation practices varies with some of the same factors that differ among the ERS farm typology, particularly tenure and farm size (table 1.3.8). Because conservation decisions depend on multiple factors, however, it is not possible to predict in advance how the various typology groups will behave in terms of adopting conservation practices. This is why it is necessary to control for as many relevant factors as possible when analyzing adoption behavior. In general, after controlling for tenure, erodibility, and other factors, Soule et al. (2000) found that corn producers with small operations or those who are limited-resource, retired, or part-time are less likely to adopt conservation practices than are corn producers in the other typology groups. Results may differ for producers of commodities other than corn.

Concentration of Production on Fewer and Larger Farms

Although some concentration of agricultural production existed at the beginning of the 20th century, it has since increased. In 1900, half of farm sales came from approximately 17 percent of farms and 43 percent of the land in farms (fig. 1.3.10). By 1997, concentration had increased to the extent that half of farms sales came from only 2 percent of U.S. farms and 15 percent of the land in farms. Despite this increase in concentration, farming remains much less concentrated than other industries. The 2 percent of U.S. farms accounting for half of agricultural sales in 1997 actually includes 46,100 farm operations, far too many for any individual farmer to hold much market power. In most industries, concentration is not considered a competition policy issue until only two to four firms come to dominate the industry (MacDonald).

Nevertheless, concentration of agricultural production raises concerns about the environment (see Chapter 2.3, *Water Quality*). In the case of livestock, concentration of production means more livestock on fewer farms. For example, the number of farms selling hogs decreased by 92 percent between 1959 and 1997, but sales of hogs increased by 76 percent (fig. 1.3.11a and b). In addition, hog production has become more geographically concentrated among fewer counties, which also raises environmental concerns (McBride, Gollehon et al., 2001). Similar trends have occurred among farms selling dairy products, cattle, and broilers (figs. 1.3.11a,b,and c). Examining an even longer period of time, a majority of farms had chickens, horses, milk cows, and hogs in 1900 (USDA, National Agricultural Statistics Service, 2002). Currently, only a small share of farms raises any of these livestock species.

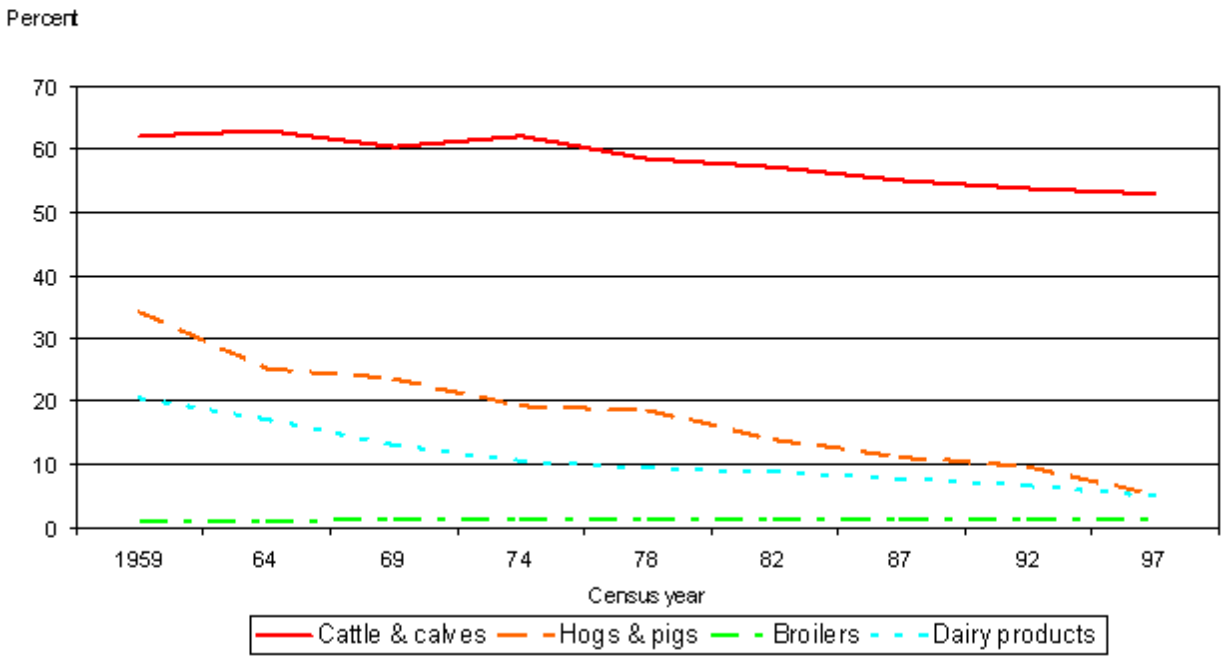
Figure 1.3.10–Percent of U.S. farms and land in farms producing half of the Nation's agricultural sales, selected years from 1900 to 1997



Source: USDA, ERS, based on Census of Agriculture Data and Peterson and Brooks.

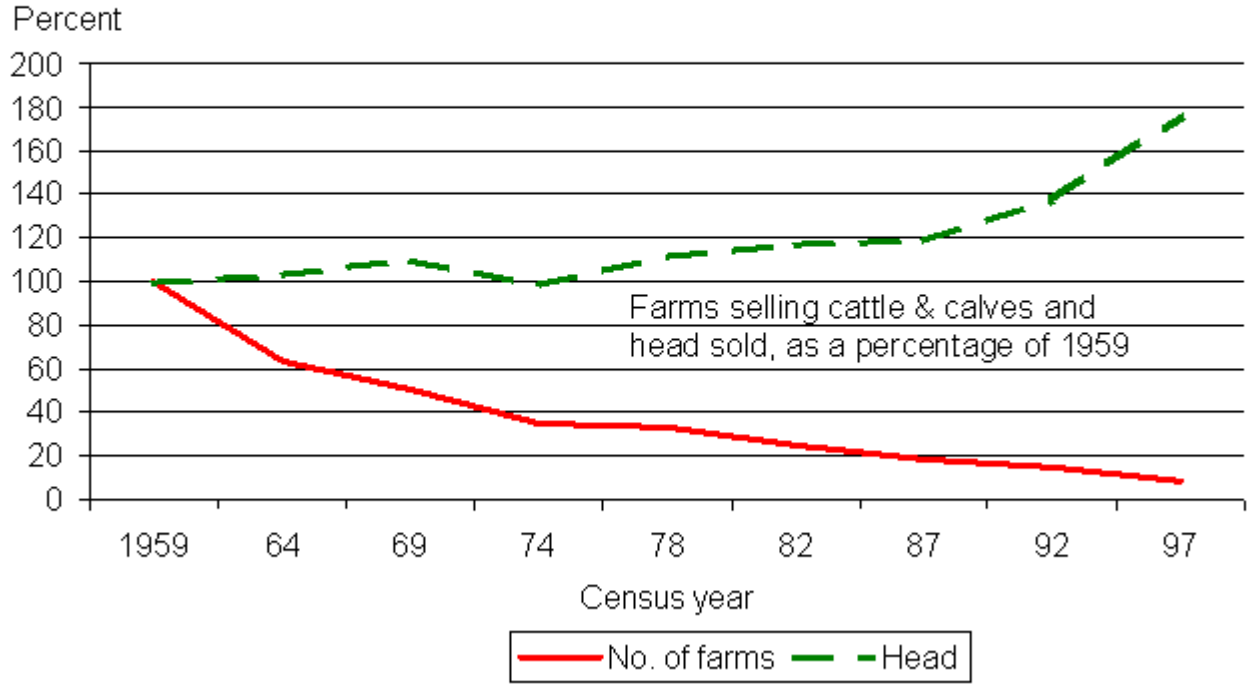
Livestock production cannot be considered separately from livestock processing. The tendency of large livestock farms to be located near slaughtering plants means that the waste from both livestock production and livestock slaughter is concentrated in specific geographic areas. In the case of poultry processing, the concentration of waste has led to problems in environmentally sensitive areas (Ollinger et al.). The growth of large cattle feedlots and hog farms may also be linked to an increase in the size of plants that slaughter cattle or hogs over the past 25 years (MacDonald et al.). Large slaughter plants lose any economies of scale if they cannot operate near full capacity. Slaughter plants need to locate near large producers and establish long-term relationships with these producers to secure a reliable flow of cattle and hogs. These relationships to ensure supply are often formed through the use of marketing or production contracts (Hoppe, 1996a).

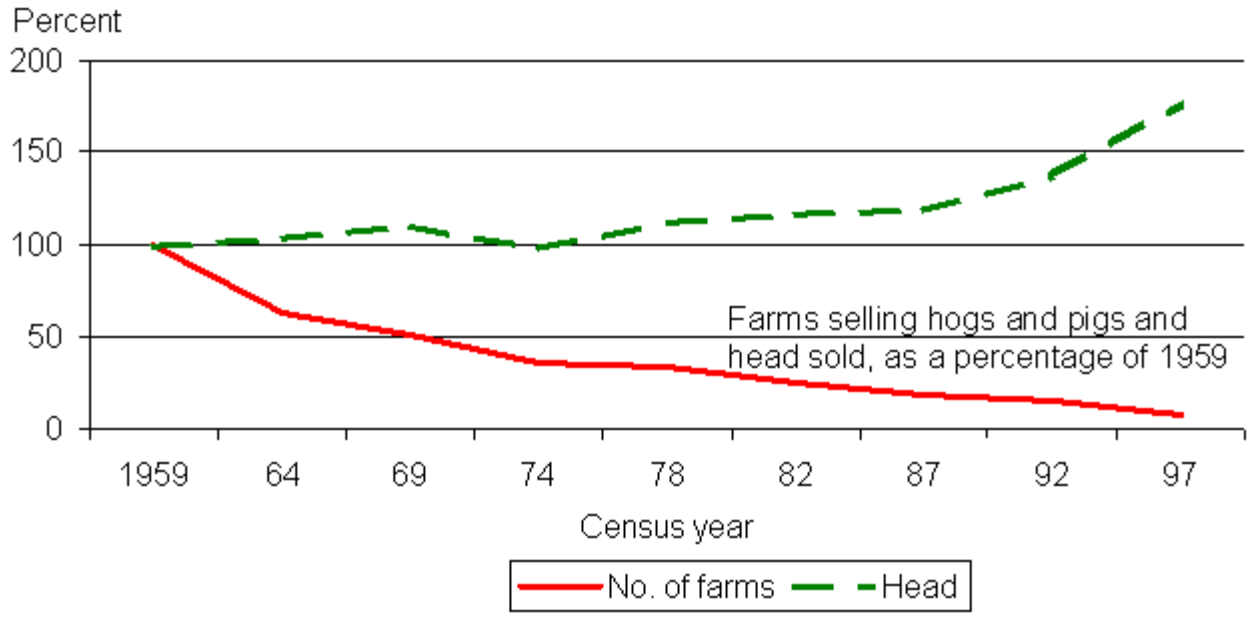
Figure 1.3.11a--Trends in farms selling selected livestock or dairy products, 1959-97



Source: ERS, USDA based on Census of Agriculture data.

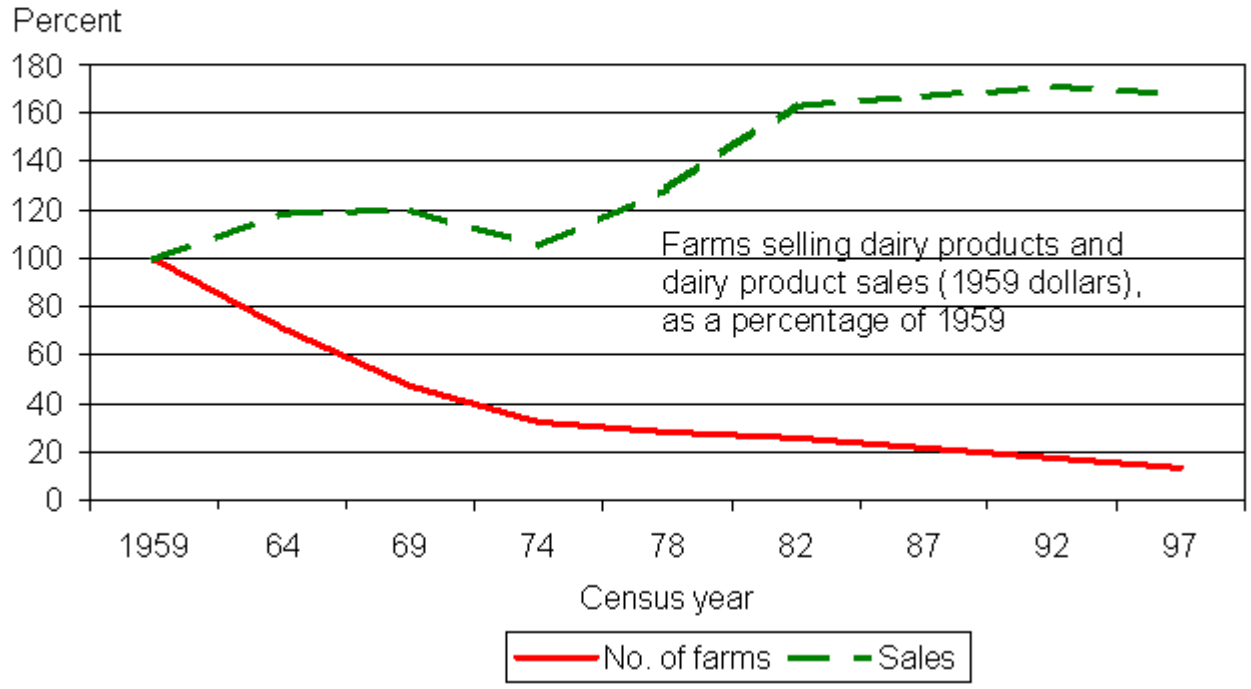
Figure 1.3.11b--Trends in farms selling cattle and hogs, 1959-97

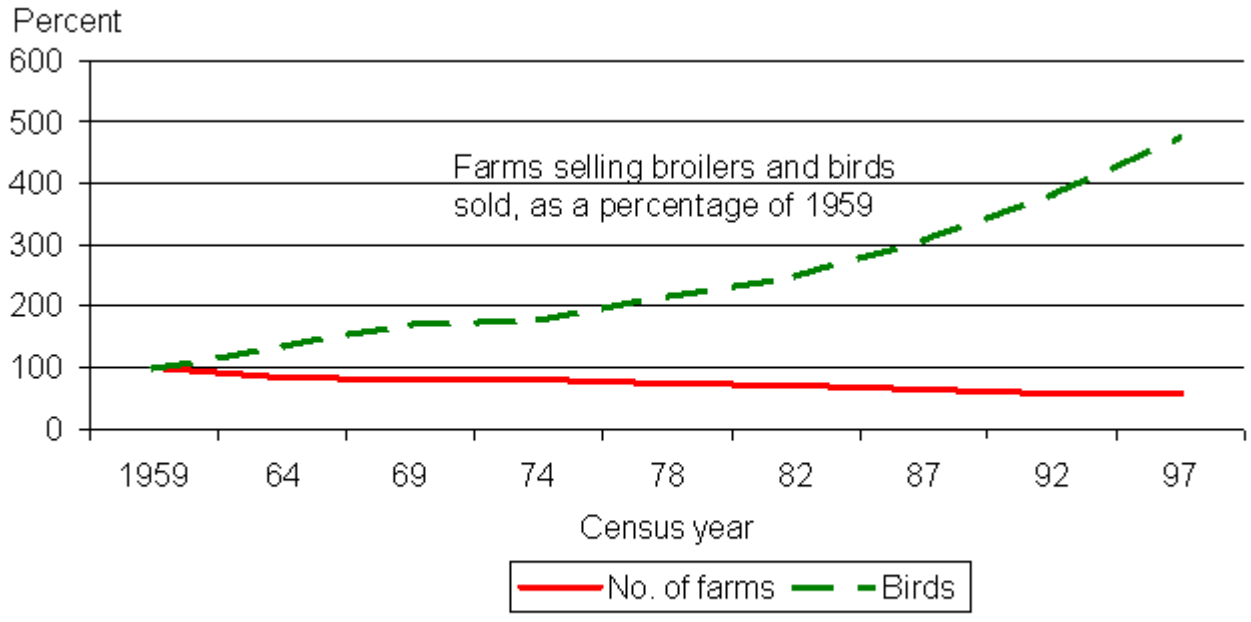




Source: ERS, USDA based on Census of Agriculture data.

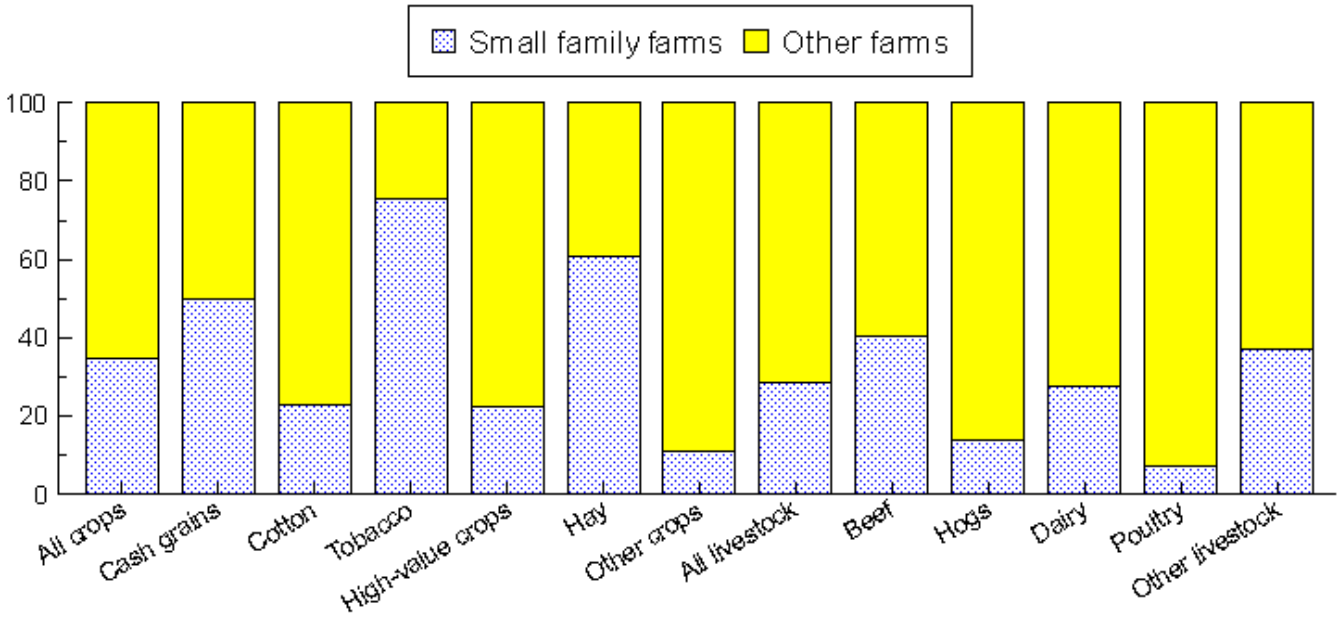
Figure 1.3.11c--Trends in farms selling dairy and poultry, 1959-97





Source: ERS, USDA based on Census of Agriculture data.

Figure 1.3.12--Distribution of the value of production for selected commodities between small family farms and other farms, 2000



Note: Small family farms are in the following typology groups: limited-resource, residential/lifestyle, retirement, low-sales, and high-sales. Large family farms, very large family farms, and nonfamily farms make up other farms.

Source: USDA, ERS, based on 2000 Agricultural Resource Management Survey data.

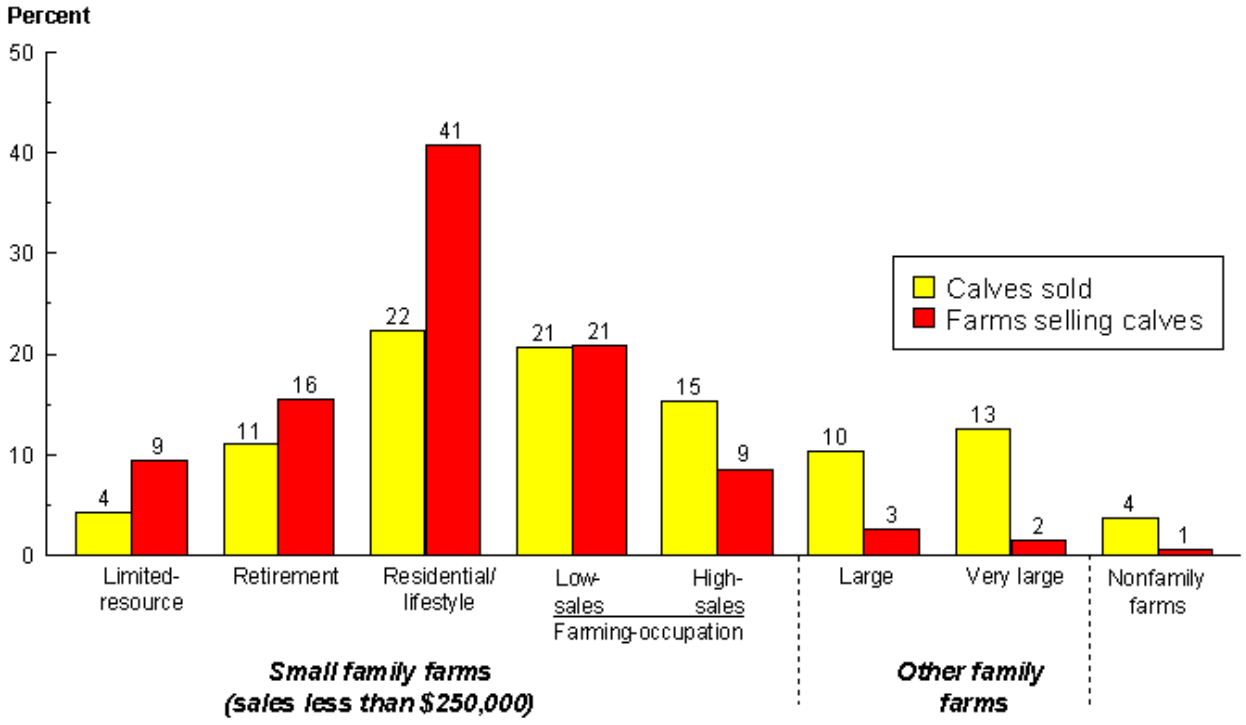
More livestock production on fewer farms may not be a problem if the remaining farms with livestock have enough land to absorb the manure produced. In fact, most farms currently have adequate land to safely use the manure that their livestock produce, applying the manure at agronomic rates (Gollehon et al.; Gollehon and Caswell). Farms that do not have enough land to safely apply all the manure produced, however, account for more than 60 percent of nitrogen from manure and 70 percent of phosphorus from manure. Although most counties with farms producing excess nutrients have enough acres of crops to theoretically absorb the excess manure, about 20 percent of excess manure nitrogen and 23 percent of excess manure phosphorus is produced in counties with insufficient cropland to absorb all the nutrients produced. (For more information, see Chapter 4.5, Livestock and Manure Management.)

The distribution of the value of production among the typology groups also reflects the current concentration of agricultural production. Large, very large, and nonfamily farms—8 percent of all farms—produce about 68 percent of the value of production (table 1.3.12). Production of crops is somewhat less concentrated than livestock, because these three typology groups account for 65 percent of all crops, about seven percentage points less than their 72 percent share of livestock. In fact, small family farms (mostly farming-occupation farms) account for a large share of specific crops. The small farm share of the value of production is about three-fourths for tobacco, three-fifths for hay, and half for cash grain (table 1.3.12 and fig. 1.3.12).

The large share of poultry, hogs, and—to a lesser extent—dairy production accounted for by large, very large, and nonfamily farms, is consistent with the recent trends in livestock production discussed above. Small farms, however, account for a substantial share of the value of production for beef (40 percent) and the miscellaneous "other livestock" category (37 percent). Other livestock includes a variety of livestock, such as horses, sheep, and goats, of interest to small farmers. Small farms' large share of the value of beef production reflects their production of calves: small farms account for 73 percent of calf sales (fig. 1.3.13). In contrast, 76 percent of fattened cattle are produced on very large family farms and nonfamily farms.

Specialization in cow-calf operations makes sense for many small farms. Cow-calf enterprises have relatively low and flexible labor requirements (Holcomb) compatible with off-farm work or retirement. The fact that beef producers in the small farm typology groups are much more likely to sell calves than fattened cattle does not mean they do not present environmental problems, however. For example, overgrazing can be a problem on some small cow-calf farms. In addition, other small farms specializing in crops can also be a source of nonpoint water pollution.

Figure 1.3.13--Distribution of calf sales and farms selling calves by farm typology group, 1997



Source: USDA, ERS, based on 2000 Agricultural Resource Management Survey data.

Summary

Broadly speaking, farm structure is defined as the way farms and resources are organized to produce crops and livestock. This chapter focused on the organization of a resource important to farming—land. Land ownership ranges from fee simple ownership to partial interests including easements and leases by public or private parties. Even fee simple ownership, however, is not absolute, because rights to use land may be restricted.

Most U.S. land was held by the Federal Government in the past, but 60 percent of U.S. land (and nearly all farmland) is currently held privately. Most of the remaining Federal land is managed by four agencies, the USDA's Forest Service and the Department of the Interior's BLM, FWS, and NPS. Despite past concern over foreign ownership of land, foreigners have consistently owned only 1 percent of agricultural land (including forestland) during the past two decades.

Farmers do not necessarily own all the land they farm; they may rent at least some of their land from other private owners, either other farmers or nonfarm landlords. Farmers now rent 41 percent of the land they operate. Conventional wisdom holds that owners of a resource will take better care of that resource than renters without a long-term interest in the resource. Recent research, however, suggests that share-renters may adopt conservation tillage as readily as owner-operators, because conservation tillage increases short-term profits.

The number of farms declined from nearly 7 million in 1935 to about 2 million by 1997, with most of the decline occurring before the 1970s. Although the remaining farms have a higher average acreage than in the past, most farms today are small, when size is measured in acres or sales. Small family farms currently account for only 32 percent of production, but operate 61 percent of the land used in farming, including large shares of the Nation's cropland, grazing land, and woodland. The land holdings of small farms are important to the Nation's conservation and environmental efforts. Retirement, residential/lifestyle, and farming-occupation/low-sales farms together account for three-fifths of CRP and WRP payments.

Agricultural production has become much more concentrated during the past century. By 1997, half of agricultural sales came from 2 percent of all U.S. farms that operated 15 percent of the land in farms. This concentration of production should cause little concern about declines in competition that could affect price-setting. The 2 percent of farms was made up of 46,100 farm operations, too many for any individual farmer—or groups of farmers—to hold much market power. However, concentration of livestock production on fewer farms and less land can lead to environmental problems. Farms that cannot safely apply all the manure that they produce account for more than 60 percent of nitrogen from manure and 70 percent of phosphorus from manure.

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Table 1.3.12—Distribution of the value of production, by farm typology group, 2000

Item	Small family farms					Large family farms	Very large family farms	Nonfamily farms	All farms
	Limited-resource	Retirement	Residential /lifestyle	Farming-occupation					
				Low-sales	High-sales				
					Number				
Total farms	128,674	320,055	913,876	453,791	171,824	78,382	54,886	44,572	2,166,060
					Billion dollars				
Value of production	1.0	2.7	11.3	14.7	26.4	27.1	64.7	29.4	177.3
					Percent of U.S. total				
Farms	5.9	14.8	42.2	21.0	7.9	3.6	2.5	2.1	100.0
Value of production	0.6	1.5	6.4	8.3	14.9	15.3	36.5	16.6	100.0
Crops	0.5	1.1	6.3	8.8	18.0	17.9	29.9	17.5	100.0
Cash grain (includes soybeans)	0.6	0.8	8.5	11.8	27.9	24.9	22.2	3.2	100.0
Cotton	d	d	4.8	2.8	15.1	19.7	44.7	12.5	100.0
Tobacco	2.2	5.6	10.5	20.1	36.9	13.0	10.6	*1.0	100.0
High-value crops[1]	*0.4	1.2	3.4	6.7	10.8	8.2	38.9	30.4	100.0
Hay	1.1	3.3	23.6	17.2	15.7	9.3	21.8	7.9	100.0
Other crops[2]	*0.1	*0.1	*1.1	*2.8	7.1	d	32.3	d	100.0
Livestock	0.6	2.0	6.4	7.8	11.7	12.7	43.2	15.6	100.0
Beef	0.8	2.8	11.7	12.3	12.7	10.1	25.3	24.3	100.0
Hogs	d	d	2.6	2.7	8.7	25.1	57.2	3.6	100.0
Dairy	1.0	*0.3	0.8	6.0	19.6	16.4	47.8	8.2	100.0
Poultry	d	d	1.5	*1.8	*3.6	9.9	70.0	*12.7	100.0
Other livestock[3]	*0.2	*9.9	*12.4	*9.4	*5.1	*5.5	d	d	100.0

d = Data suppressed due to insufficient observations.
*The standard error exceeds 25 percent of the estimate, but is no more than 50 percent of the estimate. The standard errors of unmarked estimates are no more than 25 percent of the estimates.
[1]Vegetables, fruits, and nursery products.
[2]Includes peanuts, sugarbeets, sugar cane, silage canola, seed crops, mint, hops, and all other crops.
[3]Includes sheep, goats, horses, mules, ponies, fur-bearing animals, bees, fish, and all other livestock.
Source: USDA, ERS, based on 2000 Agricultural Resource Management Survey data.

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What Is a Farm?

Since 1850, when minimum criteria defining a farm for census purposes were first established, the definition of a farm has changed nine times as the Nation has grown and agricultural production has changed. A farm is currently defined, for statistical purposes, as any place from which $1,000 or more of agricultural products (crops and livestock) were sold or normally would have been sold during the year under consideration. This definition has been in place since August 1975, by joint agreement among USDA, the Office of Management and Budget, and the Bureau of the Census (Sommer et al.)

However, minor differences existed between the Census and USDA versions of the definition. The Census Bureau excluded Christmas tree farms and farms wholly enrolled in the Conservation Reserve Program (CRP). At the same time, the USDA's National Agricultural Statistics Service (NASS) excluded farms having five or more horses or ponies that sold no other farm products (U.S. Department of Agriculture, National Agricultural Statistics Service, 1999a). After the responsibility for the Census of Agriculture was transferred to NASS from the Census Bureau, the NASS and Census definitions were standardized. The 1997 Census included Christmas tree and CRP farms and NASS surveys began to include horse farms in 1995. Two new types of farms, maple syrup and short rotation wood crops, were added to both counts starting in 1997, due to the implementation of the new North American Industry Classification System (NAICS). For more information on NAICS, see the Census Bureau's NAICS website (http://www.census.gov/epcd/www/naics.html).

The 1997 Census count of farms (1,911,859) and the 1997 NASS initial count of farms (2,057,910) still differed because of Census net undercoverage of farms (U.S. Department of Agriculture, National Agricultural Statistics Service, 1999b). The count of farms in the Agricultural Resource Management Survey (ARMS) is weighted to correspond to the official NASS count, excluding "abnormal farms" (institutional, experimental, and research farms) and farms in Alaska and Hawaii.

Defining the Farm Typology Groups

Small Family Farms (sales less than $250,000)*

Limited-resource. Any small farm with gross sales less than $100,000, total farm assets less $150,000, and total operator household income less than $20,000. Limited-resource farmers may report farming, a nonfarm occupation, or retirement as their major occupation.

Retirement. Small farms whose operators report they are retired (excludes limited-resource farms operated by retired farmers). Retired operators are generally elderly, work very little on (or off) their farms, and consider themselves to be retired and out of the labor force. Nevertheless, they continue to farm on a small scale. They sell enough farm products (at least $1,000 worth) for their operations to qualify as farms under the current farm definition (Hoppe, 1996b).

Residential/lifestyle. Small farms whose operators report they had a major occupation other than farming (excludes limited-resource farms with operators reporting a nonfarm major occupation).

Farming-occupation farms. Small farms whose operators report they have a major occupation other than farming. Larger and smaller farms in this group differ in their characteristics, so the group is divided into two subgroups based on gross sales:

- **Low-sales.** Farming-occupation farms with sales less than $100,000 (excludes limited-resource farms whose operators report farming as their major occupation).
- **High-sales.** Farming-occupation farms with sales between $100,000 and $249,999. Compared with other small farms, high-sales farms are more likely to operate as commercial enterprises. In this respect, they are similar to large and very large family farms (discussed below).

Other Family Farms

Large family farms. Farms with sales between $250,000 and $499,999.

Very large family farms. Farms with sales of $500,000 or more.

Nonfamily Farms

Farms organized as nonfamily corporations or cooperatives, as well as farms operated by hired managers.

*The $250,000 cutoff for small farms was suggested by the National Commission on Small Farms (U.S. Department of Agriculture, National Commission on Small Farms).

Source: Hoppe and MacDonald.

The Agricultural Resource Management Survey

The Agricultural Resource Management Survey (ARMS) is a sample survey designed and conducted each year by the Economic Research Service (ERS) and the National Agricultural Statistics Service (NASS), both agencies of the U.S. Department of Agriculture (USDA, National Agricultural Statistics Service, 2001a). ARMS replaced the former Cropping Practices Survey (CPS) and the Farm Costs and Returns Survey (FCRS). The CPS provided enterprise-level chemical use, production practices, and integrated pest management data on selected field crops. The FCRS provided two types of data: whole farm economic data and enterprise-level cost of production data for particular crop and livestock commodities. Combining the surveys avoids the same type of information on chemical use and production practices being collected by both the CPS and the cost of production component of the FCRS. Combining the surveys also allows more detailed analyses of the relationships between various enterprise-level production practices and farm operation characteristics.

ARMS is conducted in three phases:
Phase I. Phase I is conducted between May and July. It screens sampled farms to make sure they are in business as farms. Phase I also checks to see if farms produce the targeted commodities that are the focus of Phase II and Phase III. In 2000, targeted commodities were rice, sugarbeets, and dairy. Different commodities are covered in different years.
Phase II. Phase II is conducted during the fall and early winter and collects information on chemical use, production practices, and variable input costs for farms producing the targeted crop commodities. It also collects data on production practices data for crops not targeted that year.
Phase III. This phase of the survey is conducted in the late winter and early spring of the calendar year after Phase I. The purpose of Phase III is to: collect whole farm economic data and information about the farm operator and the operator household, and to collect enterprise-level information for targeted livestock commodities. The Cost and Returns Report (CRR) questionnaire collects data from sample farms identified in Phase I that were not contacted in Phase II. Separate questionnaire versions are used for farms that also participated in Phase II and for farms producing targeted livestock commodities. Note that Phase II farms not producing a targeted crop commodity are not interviewed in Phase III.

Information about the farm typology presented in this chapter is from Phase III of the 2000 and 1997 ARMS. ARMS data for 2000 were the most current available when the chapter was being completed in early 2002. The slightly older 1997 ARMS is also used because the survey that year asked detailed questions about land use and the number and types of cattle sold. The study by Soule et al. (2000) cited in this chapter used Phase II data from the 1996 ARMS.

For more information about the survey, see the ARMS Briefing Room (http://www.ers.usda.gov/briefing/ARMS/)

Glossary

Cropland—Farmland in crop rotations, including cropland used for crops, idle cropland, and cropland used for pasture only (Vesterby and Krupa).

Family farm—There is no generally accepted definition of "family farm," and a variety of definitions, implicit and explicit, have been used by Congress, researchers, and others. Some of these definitions are summarized on the ERS website (http://www.ers.usda.gov/briefing/FarmStructure/familyfa.htm). ERS defines family farms as those organized as proprietorships, partnerships, and family corporations. Family farms exclude farms organized as nonfamily corporations or cooperatives, as well as farms with hired managers. Family farms are closely held (legally controlled) by their operator and the operator's family.

Farm—Any place from which $1,000 or more of agricultural products were sold or normally would have been sold during a particular year. (For more information, see box "What is a Farm?")

Farmland—Land in farms (see below) as determined by the Census of Agriculture, totaled 931 million acres in 1997 (fig. 1.3.4).

Forestland—The Forest Service defines forestland as any land stocked with trees at a rate of 10 percent or more. The trees may be of any size, and forestland includes land that had such tree cover in the past, if the cover will be regenerated by natural or artificial means (Vesterby and Krupa, 2001, p. 29).

Grassland pasture and range—Grassland pasture and range includes all open land used mainly primarily for pasture or grazing (Vesterby and Krupa).

Land in farms—Used interchangeably with farmland (see above).

Other land uses—This category encompasses a variety of special and miscellaneous land uses. Other land uses include: urban land; industrial, commercial, and residential land in rural areas; highways and airports; cemeteries, golf courses; mining areas; and marshes, swamps, sand dunes, bare rock, deserts, tundra, and other unclassified land uses (Vesterby and Krupa).

Privately owned agricultural land—All private lands less transportation and urban lands (Barnard and Stokes, 1998). Includes cropland, pastureland, forestland, and rangeland.

Recent ERS Reports on Land Ownership and Farm Structure

Structural and Financial Characteristics of U.S. Farms: 2001 Family Farm Report, AIB-768, ERS, USDA, May 2001 (Robert A. Hoppe, editor). Family farms vary widely in size and other characteristics, ranging from very small retirement and residential farms to establishments with sales in the millions of dollars. The farm typology developed by the Economic Research Service (ERS) categorizes farms into groups based primarily on occupation of the operator and sales class of the farm. The typology groups are reflective of operators' expectations from farming, position in the life cycle, and dependence on agriculture.

"Land Tenure and the Adoption of Conservation Practices," *American Journal of Agricultural Economics,* 82(4), Nov. 2000 (Meredith J. Soule, Abebayehu Tegene, and Keith D. Wiebe). Cash-renters are less likely than share-renters and owner-operators to adopt conservation tillage in U.S. corn production. Both cash-renters and share-renters are less likely than owner-operators to adopt conservation practices such as contour farming, strip cropping, and grassed waterways.

"Finding Common Ground on Western Lands," *Rural Development Perspectives,* 14(2), ERS, USDA, Aug. 1999 (Keith Wiebe, Abebayehu Tegene, and Betsey Kuhn). Voluntary agreements between individuals and public and private agencies increasingly shape the use of public and private lands, including the half-billion acres in Western States, to meet a variety of economic, social, and environmental objectives.

"Changes in the Farm Sector," *Financing Agriculture into the Twenty-first Century,* edited by Marvin Duncan and Jerome M. Stam, (ed.) Boulder Co., Westview Press, 1998 (David H. Harrington, Robert A. Hoppe, R. Neal Peterson, David Banker, and H.Frederick Gale, Jr.). The distribution of farms and agricultural output by size, tenure, and legal organization has changed, along with the composition of farm household income, business arrangements (contracting), and Government involvement in farming. These changes have altered the performance and financial characteristics of farms. Current trends in trade, commodity, environmental, and resource policy will affect the sector into the 21st century.

Foreign Ownership of U.S. Agricultural Land Through December 31, 1997, SB-943, ERS, USDA, Sept. 1998 (Charles H. Barnard and Jacqueline Stokes). Foreign persons owned 14.3 million acres of U.S. agricultural land as of December 31, 1997. This is slightly more than 1 percent of all privately held agricultural land and 0.63 percent of all land in the United States.

Change in U.S. Livestock Production, 1969-92, AER-754, ERS, USDA, July 1997 (William D. McBride). Fed cattle and broiler production were the most highly concentrated livestock industries from 1969 through 1992. The geographic location of these farms was relatively stable, however. Hog and milk production, on the other hand, experienced substantial geographic change, with hog production expanding in the Southeast while milk production expanded in the West. Hog and milk production expanded into nontraditional areas through large operations using newer technology to increase efficiency and productivity.

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