

1.1 Land Use

The three major uses of land in the contiguous 48 States are grassland pasture and range, forest-use land, and cropland, in that order. Total cropland (used for crops, used for pasture, and idled) has trended down slightly since the late 1960's. Greater variation has occurred in cropland used for crops, largely reflecting changes in cropland idled in Federal crop programs. Also, weather, such as the drought in 1988 and the heavy rains in 1993, can strongly influence the mix and acreage of cropland used for crops.

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The total land area of the contiguous 48 States is approximately 1.9 billion acres, with an additional 365 million acres in Alaska and a little over 4 million acres in Hawaii (table 1.1.1). Because Alaska has very little crop area and Hawaii grows primarily crops that are not grown elsewhere in the United States, the discussion in this chapter focuses on the contiguous 48 States.

Land is the first factor of production. Land's potential uses and its location determine its economic value. Land use can affect the environment and the sustainability of production. Competition and conflicts occur among users of land because land used in one way often prevents or reduces other uses (see box, "Land Use Choice: Theory and Practice").

Major Land Uses in the Contiguous States

Grassland pasture and range, the largest use of land, accounted for 589 million acres (31 percent of major land uses in the 48 States) in 1992 (latest year data are available, table 1.1.2, fig. 1.1.1). (For definitions of land use terms, see "Glossary of Land Use Categories," p. 24.) However, grassland pasture and range has declined since the mid-1960's, when it was 636 million acres. One reason for this decline has

been that farmers—with assistance from the Cooperative State Research, Education and Extension Service, the Natural Resources Conservation Service, and other agencies—have improved the forage quality and productivity of grazing lands. A second reason is

Table 1.1.1—Major uses of land, United States, 1992

Land use ¹	Acreage		Proportion of land	
	48 States	United States	48 States	United States
	<i>Million acres</i>		<i>Percent</i>	
Cropland	460	460	24.3	20.3
Grassland pasture and range	589	591	31.1	26.1
Forest-use land	559	648	29.5	28.6
Special uses	194	340	10.2	15.0
Miscellaneous other land	92	224	4.9	9.9
Total land area ²	1,894	2,263	100.0	100.0

¹ See the Glossary, p. 24, for definitions of land-use categories.

² Distributions by major use may not add to totals due to rounding.

Source: USDA, ERS, based on Daugherty, 1995.

Land-Use Choice: Theory and Practice

In theory, land-use choice is straightforward: Land is devoted to the use that provides the greatest value to its owner, as measured by the present value of the stream of returns *expected* in future years. In reality, land-use choice often involves a complex interaction of factors, including the characteristics of the land, the landowner, and the economic and policy contexts in which the choice is made.

Complexity arises in part because land is a highly differentiated economic resource. The location of land—as measured by proximity to the city center, transportation links, or recreational and aesthetic amenities—is a key determinant of its value for residential or commercial development. Productivity, erodibility, and topography largely determine future returns to crop production, pasture, and forestry. Moreover, land may simultaneously pose characteristics that are favorable to and detract from its value for a particular use, creating tradeoffs in land-use decisions. For example, highly productive land may also be highly erodible. Using such land for crops will result in high yields, but may also mean high erosion control costs or, if erosion is unchecked, loss of future productivity. Finally, technological change may ameliorate land-related limitations to specific uses. One example is the development of rolling land for irrigated crop production following the introduction of center-pivot irrigation technology.

Exactly how these factors are assessed depends on the inclinations, circumstances, and economic expectations of individual landowners. For example, landowners who are optimistic about future returns to crop production will use more land for crops than those who are pessimistic. Other factors that affect land-use choices include management skills; discount of future income (where initial land conversion costs are high or for land uses where returns are delayed, e.g. forestry); risk aversion; and the age, occupation, or residence of the landowners.

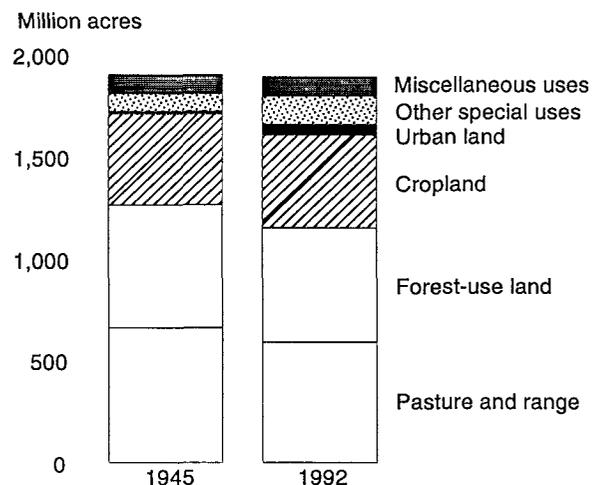
Landowner expectations and actions are affected by government policies and programs. Federal farm commodity programs have long been suspected of encouraging crop production on marginally productive or environmentally sensitive land. Under the Sodbuster and Swampbuster provisions of the 1985 Farm Bill, payments are now withheld from farmers who crop highly erodible land without an approved conservation plan or who drain wetlands. Zoning rules and land taxation may be important in urban fringe areas where rural land is being rapidly developed for residential or commercial purposes. For example, a jurisdiction seeking to retain open space may zone land for agricultural purposes or provide "use value" taxation to landowners who use land for agriculture.

that the number of domestic animals, particularly sheep and draft animals, has been declining in recent years.

Forest-use land, the second largest area among major uses, declined from about 32 percent of total land in 1945 to less than 30 percent in 1992. All land with a forest cover comprises an even larger area—nearly 606 million acres (32 percent) in 1992. However, much forested land is in special uses (parks, wilderness areas, and wildlife areas) that prohibits forestry uses such as timber production. These areas increased from 22 million acres in 1945 to 89 million acres in 1992. As a result, land defined as forest-use declined consistently from the 1960's to 1987, while special uses increased rapidly (table 1.1.2). There was a slight increase in forest-use land from 1987 to 1992, primarily in commercial timberland.

Cropland comprises the third largest use of land (24 percent in 1992) (table 1.1.1). Total cropland in the contiguous States varied about 8 percent between 1945 and 1992—ranging from 478 million acres in

Figure 1.1.1--Major uses of land in the contiguous 48 States



Source: USDA, ERS, based on Krupa and Daugherty, 1990; Daugherty, 1995.

Table 1.1.2—Major uses of land in the contiguous 48 States, 1945-92

Land use ¹	1945	1949	1954	1959	1964	1969	1974	1978	1982	1987	1992
	<i>Million acres</i>										
Cropland²	450.7	477.8	465.3	457.5	443.8	471.7	464.7	470.5	468.9	463.6	459.7
Cropland used for crops	363.2	382.9	380.5	358.4	334.8	332.8	361.2	368.4	382.6	330.7	337.4
Cropland idled	40.1	25.6	18.7	33.6	51.6	50.7	20.8	26.0	21.3	68.0	55.5
Cropland used for pasture	47.4	69.3	66.1	65.4	57.4	88.2	82.7	76.1	65.0	64.9	66.8
Grassland pasture and range	659.5	631.1	632.4	630.1	636.5	601.0	595.2	584.3	594.3	588.8	589.0
Forest-use land	601.7	605.6	615.4	610.9	611.8	602.8	598.5	583.1	567.2	558.2	558.7
Forestland grazed	345.0	319.5	301.3	243.6	223.8	197.5	178.9	171.3	157.5	154.6	145.0
Forestland not grazed	256.7	286.1	314.1	367.3	388.0	405.3	419.6	411.8	409.7	403.6	413.7
Special uses²	100.0	105.3	110.2	124.4	144.5	143.1	148.0	167.2	176.9	191.2	194.4
Urban land	15.0	18.3	18.6	27.1	29.2	30.8	34.6	44.2	49.6	55.9	58.0
Transportation	22.6	22.9	24.5	25.1	25.8	25.7	26.0	26.3	26.4	25.2	24.8
Recreation and wildlife areas	22.6	27.6	27.5	31.9	49.7	53.4	56.9	66.0	71.1	84.1	86.9
National defense areas	24.8	21.5	27.4	28.9	29.3	22.9	22.4	22.3	21.8	18.9	18.6
Misc. farmland uses	15.1	15.1	12.2	11.3	10.5	10.3	8.0	8.4	8.0	7.1	6.2
Miscellaneous other land	93.4	84.0	80.5	78.9	63.0	78.4	90.6	91.9	88.5	93.9	92.4
Total land, 48 States^{2,3}	1,905.4	1,903.8	1,903.8	1,901.8	1,899.6	1,897.0	1,897.0	1,897.0	1,895.7	1,895.7	1,894.1

¹ See the Glossary, p. 24, for definitions of land-use categories.

² Distribution may not add to totals due to rounding.

³ Totals differ over time due to remeasurement of the U.S. land area

Source: USDA, ERS, based on Krupa and Daugherty, 1990; Daugherty, 1995.

1949 to 444 million acres in 1964 (table 1.1.2). The 1992 cropland base of 460 million acres was the lowest since 1964.

The cropland base includes cropland used for crops, cropland idled, and cropland used only for pasture. These components vary more than total cropland. The amount of cropland used for crops has ranged from 383 million acres in 1949 to 331 million acres in 1987 (table 1.1.2). There has been no trend, but instead seemingly two major cycles, with cropland moving from idle into crop use and back again.

Between 1945 and the 1949 peak, cropland used for crops expanded rapidly to meet increased foreign demand for U.S. grain. After the postwar agricultural recovery in these foreign nations, cropland used for crops gradually declined until the early 1970's, when a second round of strong foreign demand occurred for U.S. grains. In 1982, a severe recession in the United States and in other major markets weakened the demand for U.S. agricultural products and grain

surpluses piled up. Annual Federal crop programs and the long-term Conservation Reserve Program (starting in 1986) idled additional cropland, again reducing the acreage used for crops.

Cropland is idled every year for reasons other than government programs, including weather or soil conditions at planting time, low crop prices, or holding for eventual conversion to nonagricultural uses.

Between 1945 and 1992, cropland used for pasture ranged from 47 million acres in 1945 (10 percent of total cropland) to 88 million acres (19 percent) in 1969 (table 1.1.2). Cropland pasture averaged about 14 percent of total cropland.

Special uses include urban; rural transportation; rural parks and wildlife; defense and industrial uses; and farmstead, farm roads and lanes, and other miscellaneous onfarm uses (table 1.1.2). These uses increased from 100 million acres (5 percent of the

Table 1.1.3—Major uses of land in the contiguous 48 States, by region, 1992

Land use ¹	North-east	Lake States	Com Belt	Northern Plains	Appalachian	South-east	Delta States	Southern Plains	Mountain	Pacific	United States
	<i>Million acres</i>										
Cropland²	14.3	42.5	99.6	106.6	29.1	18.1	23.7	55.1	46.7	23.9	459.7
Cropland used for crops	11.1	34.7	80.7	84.5	16.6	10.4	16.5	31.6	33.0	18.2	337.3
Cropland idled	1.2	5.2	8.8	11.5	3.4	3.4	3.0	8.0	7.9	3.1	55.5
Cropland used for pasture	2.0	2.6	10.1	10.6	9.1	4.2	4.3	15.5	5.7	2.6	66.8
Grassland pasture and range	3.0	5.3	12.3	69.7	6.0	9.8	6.4	118.7	303.5	54.5	589.0
Forest-use land	68.5	48.3	31.3	3.7	71.6	73.4	48.3	21.7	112.7	79.3	558.7
Forestland grazed	1.4	3.1	6.6	1.6	5.2	7.3	15.9	11.6	66.7	25.6	145.0
Forestland not grazed	67.1	45.2	24.7	2.1	66.4	66.1	32.4	10.1	46.0	53.7	413.7
Special uses²	20.0	13.0	14.9	7.5	13.2	17.3	6.4	12.8	58.4	30.7	194.2
Urban land	10.5	4.0	7.6	1.1	5.6	8.0	2.7	6.4	4.5	7.4	57.8
Transportation	1.9	2.9	3.6	3.5	2.0	2.2	1.2	2.3	3.2	1.9	24.8
Recreation and wildlife areas	7.0	5.3	2.0	1.8	4.1	5.1	1.9	2.7	37.7	19.3	86.9
National defense areas	.4	.1	.3	.2	.9	1.6	.2	.7	12.6	1.6	18.6
Misc. farmland uses	.3	.7	1.3	.8	.6	.4	.4	.8	.5	.5	6.2
Miscellaneous other land	5.6	12.9	6.5	6.9	3.9	4.8	6.4	3.3	26.6	15.5	92.5
Total land, 48 States²	111.4	122.1	164.6	194.3	123.7	123.4	91.2	211.6	547.9	203.9	1,894.1

¹ See the Glossary, p. 24, for definitions of land-use categories.

² Distribution may not add to totals due to rounding.

Source: USDA, ERS, based on Daugherty, 1995.

land area of the contiguous United States) in 1945 to 194 million acres (10 percent) in 1992.

In response to expanding U.S. population, land in urban uses—for homes, schools, office buildings, shopping sites, and other commercial and industrial uses—increased 285 percent from 15 million acres in 1945 to an estimated 58 million acres in 1992. While the U.S. population nearly doubled, the amount of land urbanized almost quadrupled. However, urban uses still amount to only 3 percent of total land area (table 1.1.2). (See "Preservation of Agricultural Lands," later in this chapter, for a more detailed discussion of recent urbanization of land in the United States.)

Land in transportation uses (highways and roads, railroads, and airports in rural areas) increased by 4 million acres (17 percent) between 1945 and 1982. Transportation uses declined by 2 million acres from 1982 to 1992 (table 1.1.2) due to the abandonment of

railroad facilities and rural roads, and the inclusion of some transportation uses into urban areas.

Land used for recreation and wildlife areas expanded 285 percent from 1945 to 1992 (86.9 million acres) mostly from conversion of Federal lands to meet greater public demand for such areas. Land in defense and industrial uses declined 25 percent from 1945 to 1992 (18.6 million acres), with some conversion to urban use. Miscellaneous farmland uses declined 9 million acres between 1945 and 1992 (6.2 million acres). Behind this decline were fewer farms; a trend toward larger, consolidated farms; and an increasing tendency for farm families to live off the farm.

Miscellaneous other land uses changed very little during 1945-1992. These uses include marshes and open swamps that have very little surface use and comprise only a small portion of the Nation's wetlands, which are distributed over other land uses.

Table 1.1.4—Net change in major uses of land in the contiguous 48 States, by region, 1945-92

Land use ¹	North-east	Lake States	Corn Belt	Northern Plains	Appalachian	South-east	Delta	Southern Plains	Mountain	Pacific	United States
<i>Million acres</i>											
Cropland²	-10.7	-3.7	+7.4	+11.1	-5.9	-8.9	+1.5	+3.3	+14.3	+5	+9.0
Cropland used for crops	-9.8	-4.5	+2.7	+0.9	-6.3	-9.7	+0.2	-11.0	+8.8	+3.0	-25.8
Cropland idled	-6	+3.0	+5.9	+2.8	-3	-1.0	+6	+5.2	+1.7	-1.8	+15.4
Cropland used for pasture	-2	-2.3	-1.3	+7.4	+8	+1.8	+7	+9.1	+3.9	-6	+19.3
Grassland pasture and range	-7.1	-4.8	-14.0	-12.6	-7.7	+1.1	-9	+13.6	-35.7	-2.3	-70.5
Forest-use land²	+6.6	-6.1	+2.3	-.4	+7.9	+.4	-3.1	-24.6	-8.8	-17.3	-43.0
Forestland grazed	-7.6	-12.2	-11.0	-1.7	-34.4	-46.3	-27.2	-30.8	-17.9	-10.8	-200.0
Forestland not grazed	+14.3	+6.1	+13.3	+1.3	+42.4	+46.8	+24.0	+6.2	+9.1	-6.4	+156.9
Special uses²	+9.7	+6.0	+4.9	-.1	+6.3	+10.8	+2.7	+6.9	+30.4	+16.7	+94.2
Urban land	+6.5	+2.5	+5.0	+.7	+4.5	+6.8	+2.1	+5.5	+3.9	+5.5	+42.8
Transportation	.0	+.2	+.1	-.5	+.3	+.6	+.4	+.6	+.3	+.3	+2.1
Recreation and wildlife areas	+4.2	+4.7	+1.8	+1.1	+2.9	+4.4	+1.5	+1.8	+29.0	+13.0	+64.3
National defense areas	-.1	-.3	-.5	-.4	-.1	-.2	-.7	-.4	-1.9	-1.6	-6.2
Misc. farmland uses	-.8	-1.0	-1.5	-.9	-1.3	-.8	-.5	-.5	-1.0	-.5	-8.9
Miscellaneous other land	+5	+7.9	-1.4	+.8	-1.9	-4.5	-2.0	-.6	-1.2	+1.4	-.9
Total change, 48 States²	-1.0	-.6	-.9	-1.1	-1.2	-1.1	-1.8	-1.5	-1.1	-1.0	-11.3

¹ See the Glossary, p. 24, for definitions of land-use categories.

² Distribution may not add to totals due to rounding. Totals of net change do not add to 0 due to periodic remeasurement of the U.S. land area (see table 1.1.2).

Source: USDA, ERS, based on Krupa and Daugherty, 1990; and Daugherty, 1995.

Regional Changes in Land Use

While land in every use occurs in all 10 regions of the contiguous States, some uses are more concentrated in some regions than others (table 1.1.3). Regions with the largest cropland acreages are the Northern Plains, Corn Belt, and Southern Plains. Grassland pasture and range is concentrated in the Mountain and Southern Plains regions. Acreages in forest-use and special uses are highest in the Mountain region.

Some regional shifts in total cropland and cropland used for crops have occurred since 1945. The largest increases occurred in the Corn Belt, Northern Plains, and Mountain regions with smaller increases in the Delta States, Southern Plains, and Pacific regions.

The Northeast, Appalachian, Southeast, and Lake States regions lost cropland between 1945 and 1992 (table 1.1.4). Eastern regions lost cropland because of climatic and geographic constraints; inability to capture economies of scale (that is, prevalence of small farms); and increased urbanization, which drives up land prices and reduces agricultural profit margins. Western increases resulted in part from federally subsidized irrigation water.

Eight of the 10 regions lost grassland pasture and range between 1945 and 1992. These losses ranged from 2.3 million acres in the Pacific region to 35.7 million acres in the Mountain region (table 1.1.4). The Northeast region lost more than 70 percent of its grassland pasture and range, the Appalachian and Corn Belt regions more than 50 percent. The Northeast and Appalachian regions saw the natural reforestation of grassland on abandoned small farms,

loss of grassland to urbanization, and concentration of the dairy industry. Decreases in the Corn Belt, Northern Plains, and Mountain regions were likely associated with the conversion of some grassland pasture or range to cropland as demand for grain intensified.

In most regions, the changes in forest-use land were relatively small. The Northeast and Appalachian regions gained 7 million and 8 million acres of forest land, mainly from farm fields reverting to forest. The Pacific and Mountain regions lost forest-use land to recreation and wildlife areas. One-quarter of forest-use lands were grazed in 1992, down from over half in 1945. The proportional decline was greatest in the more heavily forested Northeast, Lake States, Appalachian, and Southeast regions. The decline in grazing derives from an increased emphasis on improving and managing farm woodlands. In the 1940's and 1950's, the Cooperative Extension Service encouraged farmers to fence livestock out of farm woodlands and to manage these areas for increased productivity of timber and other wood products. In some areas, such as the Appalachian region, many small farms ceased crop and livestock production and became forested. These reforested areas were generally not grazed.

The reduced grazing of forest-use land also reflects major changes in livestock production, including

increased emphasis on improved grassland pastures; greater use of controlled, rotation grazing; and increased concentration and specialization in the dairy and beef cattle industry (as opposed to earlier general farming practices). Byproducts of other industries—such as beet and citrus pulp—now substitute for forage. Also, some of the larger, more concentrated dairy farms have moved to confined animal operations, where the cows are not pastured during their production cycle.

The location of special-use lands shifted considerably during 1945-92. Urban-use lands expanded most rapidly in the warmer Sunbelt States of the South and Southwest. Land in rural transportation uses increased in 8 of the 10 farm production regions, while land in recreation and wildlife areas increased in all regions. In contrast, land in national defense areas and miscellaneous farm uses declined in all regions.

Cropland Use and Programs

Total cropland consists of cropland used for crops, cropland idled, and cropland used for pasture (tables 1.1.2-1.1.4). While total cropland has varied up and down and generally declined since 1969, even greater shifts have occurred between cropland used for crops and cropland idled, mostly because of Federal programs. Cropland used for pasture has shown less variation.

Table 1.1.5—Major uses of cropland, United States, 1986-96¹

Cropland	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996 ²
	<i>Million acres</i>										
Cropland used for crops³	357	331	327	341	341	337	337	330	339	332	346
Cropland harvested ⁴	316	293	287	306	310	306	305	297	310	302	314
Crop failure	9	6	10	8	6	7	8	11	7	8	10
Cultivated summer fallow	32	32	30	27	25	24	24	22	22	22	22
Cropland idled by all Federal programs³	48	76	78	61	62	65	55	60	49	55	34
Annual programs	46	60	53	31	28	30	20	23	13	18	0
Conservation Reserve Program ⁵	2	16	25	30	34	35	35	36	36	36	34
Total, specified uses^{3,6}	405	407	405	402	403	402	392	389	388	388	380

¹ Includes the 48 contiguous States. Fewer than 200,000 acres were used for crops in Alaska and Hawaii.

² Preliminary, subject to revision.

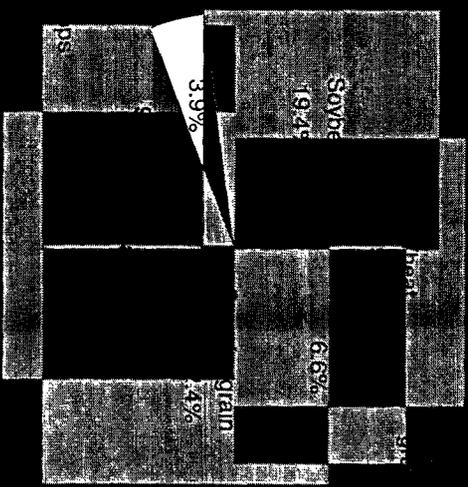
³ Breakdown may not add to totals due to rounding.

⁴ A double-cropped acre is counted as 1 acre.

⁵ Numbers are gross before subtracting CRP terminations which, by the end of 1996, totaled approximately 1.5 million acres.

⁶ Does not include cropland pasture or idle land not in Federal programs that is normally included in the total cropland base.

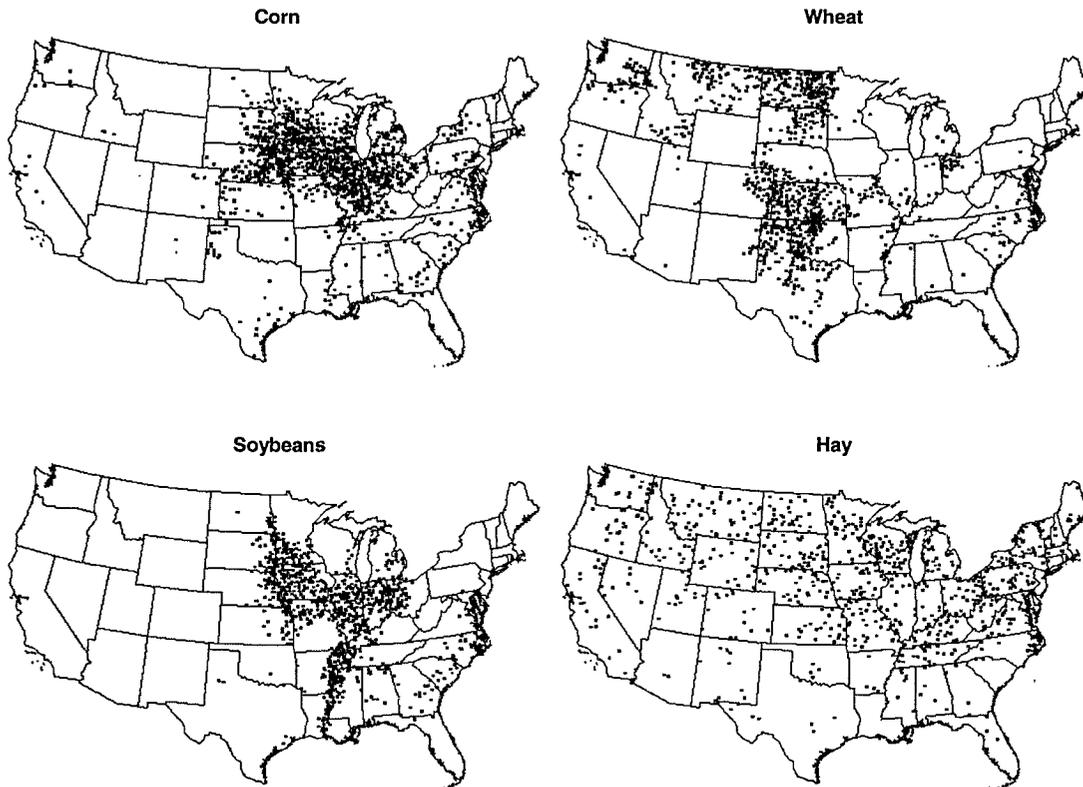
Source: USDA, ERS, based on a variety of published and unpublished data from FSA (formerly ASCS), ERS, and NASS.



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Figure 1.1.3—Geographic location of corn, wheat, soybean, and hay production, 1992.



One dot = 75,000 acres

Source: USDA, ERS, based NRCS 1992 National Resources Inventory.



fruits, nuts, melons, and all other crops accounted for just 4 percent of crop area harvested in 1996.

In 1996, harvested acreage of corn, sorghum, barley, wheat, and soybeans increased, while the acreage of oats, rice, and cotton decreased (table 1.1.7). Total cropland harvested was up nearly 12 million acres from 1995. The increase in harvested acreage was due to the decrease in land idled in Federal programs.

Food crop acres have tended to increase over the past 30 years, while feed and other crops have declined (Daugherty, 1995). Wheat acreage is higher now than

in the 1960's, but down from the early 1980's. Soybean and rice production followed a similar pattern. Peanuts have increased throughout the period while rye has decreased. Sunflower production increased until the early 1980's, declined for a few years and has been increasing again in the 1990's. Sugarcane, while still accounting for less than 1 million harvested acres, has increased consistently since the 1960's. Several other principal crops—dry edible beans and peas, potatoes, and sugarbeets—occupy comparatively small acreages and have exhibited no major trends.

Table 1.1.7—Harvested area of major crops, by region, 1990-96

Crop and period	Northeast	Lake States	Corn Belt	Northern Plains	Appalachian	Southeast	Delta States	Southern Plains	Mountain	Pacific	United States ¹
<i>Million acres</i>											
Corn:²											
1990-94 avg.	2.2	11.1	34.3	13.1	3.1	1.2	0.5	1.8	1.1	0.3	68.7
1995	2.2	11.4	31.3	12.6	2.7	0.9	.6	2.0	1.0	0.3	65.0
1996 ³	2.4	12.2	34.1	15.1	3.1	1.3	1.4	2.0	1.2	0.4	73.1
Sorghum:²											
1990-94 avg.	-	-	0.8	4.6	0.1	0.1	0.5	3.4	0.4	⁴	9.8
1995	-	-	0.7	4.2	⁴	⁴	0.3	2.7	0.3	-	8.3
1996 ³	-	-	0.8	5.8	⁴	⁴	0.4	4.3	0.5	-	11.9
Barley:											
1990-94 avg.	0.2	0.8	-	3.0	0.1	⁴	-	⁴	2.4	0.8	7.3
1995	0.2	0.7	-	2.4	0.1	⁴	-	⁴	2.3	0.6	6.3
1996 ³	0.2	0.6	-	2.8	0.1	⁴	-	⁴	2.3	0.8	6.8
Oats:											
1990-94 avg.	0.3	1.2	0.8	1.6	⁴	0.1	⁴	0.2	0.2	0.1	4.6
1995	0.3	0.8	0.5	0.9	⁴	0.1	⁴	0.1	0.2	0.1	3.0
1996 ³	0.2	0.6	0.4	0.9	⁴	⁴	⁴	0.1	0.2	0.1	2.7
Wheat:											
1990-94 avg.	0.6	3.3	4.7	27.6	1.6	0.9	1.5	9.1	9.7	3.9	62.8
1995	0.6	3.0	4.5	27.0	1.7	0.7	1.2	8.0	10.2	4.0	61.0
1996 ³	0.7	3.2	4.4	27.3	1.8	0.7	1.6	7.8	10.9	4.4	62.8
Soybeans:											
1990-94 avg.	1.2	7.2	30.1	7.2	4.0	1.6	6.5	0.5	-	-	58.2
1995	1.2	8.1	32.5	8.2	3.8	1.1	6.2	0.5	-	-	61.6
1996 ³	1.1	8.4	33.2	8.5	4.0	1.3	6.3	0.6	-	-	63.4
Cotton:											
1990-94 avg.	-	-	0.3	⁴	1.0	1.2	3.1	5.2	0.5	1.1	12.4
1995	-	-	0.4	⁴	1.6	2.5	3.6	6.1	0.5	1.3	16.0
1996 ³	-	-	0.4	⁴	1.3	2.3	3.0	4.3	0.4	1.2	12.8
Rice:											
1990-94 avg.	-	-	0.1	-	-	-	2.1	0.3	-	0.4	3.0
1995	-	-	0.1	-	-	-	2.2	0.3	-	0.5	3.1
1996 ³	-	-	0.1	-	-	-	1.9	0.3	-	0.5	2.8

- = None reported.

¹ Includes the 48 contiguous States. Because of rounding, regional acres may not sum to U.S. totals.

² Corn and sorghum for grain.

³ Preliminary, subject to revision.

⁴ Less than 50,000 acres.

Source: USDA, ERS, compiled from USDA, NASS, *Crop Production*, Annual Summary and monthly reports.

Among feedgrains, corn increased from the 1960's to the early 1980's, decreased for a few years, and has trended upward again since the late 1980's. Sorghum and barley fluctuated year-to-year until the mid-1980's when they increased to 30-year highs. Both crops have declined since 1986. Oats has trended down over the last 30 years, while acreage of all hay has changed very little.

Harvested acreage of cotton hit a low of less than 8 million acres in 1983 and has trended upward since.

Tobacco has indicated little trend in acreage harvested.

The demand for vegetable oils has led to increased production of some special oilseed crops. Special oilseeds currently reported by NASS include canola, rapeseed, safflower, and mustard seed (USDA, NASS, 1997a). In addition, the Federal commodity programs until 1996 promoted the production of industrial and other crops by allowing these crops to be planted on acreage diversion program lands (see box, "Cropland Programs and Definitions"). The crops allowed in

1995 included castor beans, chia, crambe, crotalaria, cuphea, guar, guayule, hesperaloe, kenaf, lesquerella, meadowfoam, milkweed, plantago ovato, and sesame. Deficiency payments were not reduced when these crops were planted on diverted acreage.

Cropland Idled Under Federal Programs

The Federal Agriculture Improvement and Reform Act of 1996 (the 1996 Farm Act) eliminated the authority of USDA to implement an annual Acreage Reduction Program (ARP) and other annual acreage diversions. As a result, no land was idled under annual commodity programs in 1996. This, combined with the expiration of some CRP contracts, reduced total land idled under Federal programs to about 34 million acres in 1996 (table 1.1.5, table 1.1.9) down from 1995 and well below the 1983 peak of 78 million acres (fig. 1.1.4, table 1.1.14). The extent of idled acres from participation in the CRP varied by farm production region (fig. 1.1.5). In 1995, land idled in annual programs totaled 18 million acres, compared with a range of 13 to 60 million acres idled since 1986.

The CRP was initiated in 1986 to help owners and operators of highly erodible cropland conserve and

improve the soil and water resources on their farms and ranches through long-term land retirement. CRP pays farmers to retire highly erodible and other environmentally sensitive lands from crop production for 10-15 years and to convert them to perennial vegetation. Since its authorization, 37 million acres of cropland have been enrolled in the CRP. With some producers opting lands out of the CRP in 1995-96 and some terminating prior to early-out, the program in December 1996 stood at just under 33 million acres (for more detail on the CRP, see chapter 6.3).

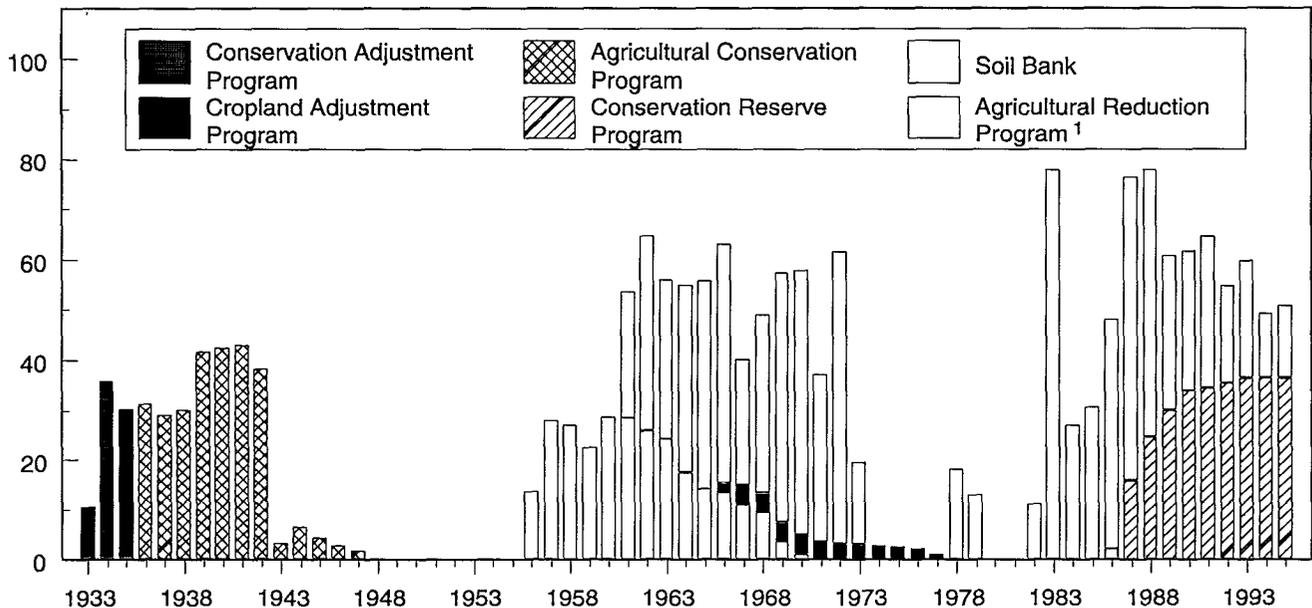
Prior to 1996, producers of corn, rice, sorghum, oats, barley, wheat, and cotton under USDA commodity programs had to idle a proportion of the crop acreage base and place it in the Acreage Reduction Program (ARP) (see box "Cropland Programs and Definitions," p. 12). These proportions (ARP requirements) varied by crop and year from 0 to 35 percent (table 1.1.8).

Agricultural Land Use Issues

Agricultural uses of land are being affected, and in some cases challenged, by factors other than changing demand for agricultural products and changing agricultural programs. Some continuing or emerging

Figure 1.1.4--Cropland acreage reductions by type of program, 1933-95

Million acres



For yearly detail of programs since 1974, see table 1.1.14.

¹ Includes Acreage Conservation Reserve, 0,50/85-92 Programs, Paid Land Diversion, and Payment-in-Kind programs in applicable years (see table 1.1.14).

Source: USDA, ERS, based on various published and unpublished data from FSA (formerly ASCS).

Table 1.1.8—Acreage Reduction Program (ARP) requirements for participation in major program crops, 1985-96

Program crop	Proportion of crop acreage base to be idled from program crop and placed in a conserving use											
	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996
	<i>Percent</i>											
Feed grains:												
Corn	10	17.5	20	20	10	10	7.5	5	10	0	7.5	*
Sorghum	10	17.5	20	20	10	10	7.5	5	5	0	0	*
Oats	10	17.5	20	5	5	5	0	0	0	0	0	*
Barley	10	17.5	20	20	10	10	7.5	5	0	0	0	*
Wheat	20	22.5	27.5	27.5	10	5	15	5	0	0	0	*
Upland cotton	20	25	25	12.5	25	12.5	5	10	7.5	11	0	*
Rice	20	35	35	25	25	20	5	0	5	0	5	*

*Authority for ARP eliminated by the 1996 Farm Act.
Source: USDA, ERS, based on unpublished material from the FSA (formerly ASCS).

issues include farmland preservation from urbanization, conflicts with other uses of Federal lands, conflicts with environmental preservation, the use of agricultural lands for fuel and biomass production, and potential impacts of global climate change.

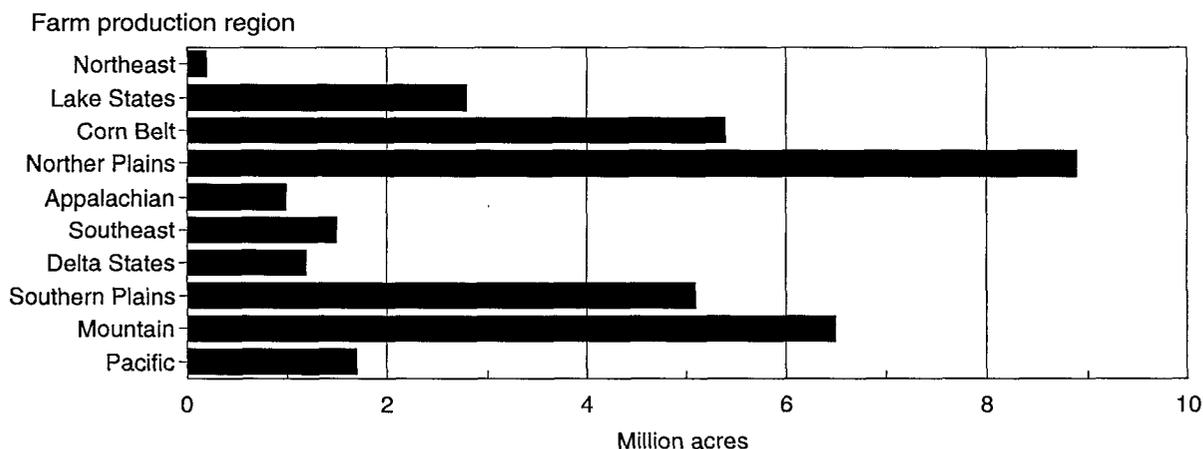
Preservation of Agricultural Lands

Preservation of agricultural lands for future food and fiber production and for open space is a concern because conversion, particularly to urban and other special uses, is largely irreversible. Urban and builtup land in the United States constitutes less than 3.5 percent of total land area. However, 75 percent of the

U.S. population lives in urban areas (table 1.1.10). Even with large increases in urban area, percentage decreases in rural area are small because rural area is much larger than urban area. The rate of expansion in urban area has decreased from 39 percent during the 1950's to 18 percent during the 1980's (The Natural Resources Inventory (USDA, SCS, 1994) shows a 26-percent increase from 1982-92.)

Land converted to urban uses comes from several different major land uses. From 1982 to 1992, 46 percent of new urban development came from cropland and pasture (fig. 1.1.6). The average annual expansion in urban area was about 1.3 million acres

Figure 1.1.5--Cropland idled under the Conservation Reserve Program, by region, 1996



Source: USDA, ERS, based on various published and unpublished data from FSA (formerly ASCS).

Cropland Programs and Definitions

Conservation Reserve Program (CRP) was designed to voluntarily retire from crop production about 40 million acres of highly erodible or environmentally sensitive cropland for 10-15 years. In exchange, participating producers receive annual rental payments up to \$50,000 and 50 percent cost-share assistance for establishing vegetative cover on the land. The Federal Agriculture Improvement and Reform Act (1996 Farm Act) of 1996 limited CRP enrollment to 36.4 million acres.

Acreage Reduction Program (ARP) was a voluntary land retirement program in which farmers reduced their planted acreage of a program crop by a specified proportion of that crop's acreage base to become eligible for deficiency payments, loan programs, and other USDA commodity program benefits. Crops under this program included corn, sorghum, oats, barley, wheat, cotton, and rice. The 1996 Farm Act eliminated the authority of USDA to implement an annual ARP.

0/85-92 Provision, an optional, Federal acreage diversion program, allowed wheat and feedgrain producers to devote all or a portion of their permitted acreage to conservation uses or to a minor oilseed crop, sesame, or crambe and, under some conditions, receive deficiency payments. At least 8 but no more than 15 percent of the producer's maximum payment acres had to be maintained in conserving uses or other allowable crop use. Eliminated by the 1996 Farm Act.

50/85-92 Provision, an optional, Federal acreage diversion program, allowed upland cotton and rice producers to underplant their permitted acreage and, under some conditions, receive deficiency payments on part of the underplanted acreage. At least 50 percent of the crop's maximum payment acreage had to be planted. An additional 8 percent but no more than 15 percent had to be designated for conserving use. Minor oilseeds could not be planted on the 50/92 conservation-use acres but sesame or crambe could be planted, with producers still qualifying for deficiency payments. Eliminated by the 1996 Farm Act.

Crop acreage base, for 1995 wheat and feedgrains, was the average of the acreage planted and considered planted to each program crop in the 5-year-period, 1990-94. For upland cotton and rice, the crop acreage base in 1995 was the average acreage planted and considered planted for 1992-94, with no adjustment for years with zero planted or considered planted acreage. The 1996 Farm Act used crop acreage base only in determining eligible production flexibility contract acreage.

Deficiency payments were payments made to farmers who participated in feedgrain (corn, sorghum, oats, or barley), wheat, rice, or upland cotton programs up to 1996. The payment rate per unit crop production was based on the difference between a target price and the market price or loan rate, whichever difference was less. The total payment a farm received was the payment rate multiplied by the eligible production. Eliminated by the 1996 Farm Act and replaced by production flexibility contract payments in 1996.

Production flexibility contract payments are authorized under provisions of the 1996 Farm Act as a replacement for deficiency payments, and cover the 1996 through 2002 crops of wheat, feed grains, upland cotton, and rice of landowners or producers with eligible cropland. In exchange for a series of annual contract payments for the 7-year period based on a predetermined total dollar amount for each year, the owner or producer agrees to comply with specified conservation requirements concerning the use of highly erodible cropland and wetlands; to comply with planting flexibility requirements of the Act; and to use contract acreage for agricultural or related activities, not for nonagricultural commercial or industrial use.

Production flexibility contract acreage is equal to a farm's crop acreage base for 1996 calculated under the provisions of the previous farm program, plus any returning CRP base acreage and less any new CRP acreage enrollment. A landowner or producer can enroll less than the maximum eligible acreage. In 1996, contracted acreage totaled just over 207.5 million acres, 98.8 percent of the eligible 210.2 million acres (USDA, FSA, 1996).

Table 1.1.9—Cropland idled under Federal acreage reduction programs, 1986-96

Program and crop	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996
<i>Million acres</i>											
Annual programs, base acres:											
Corn	14.2	23.2	20.5	10.8	10.7	7.4	5.2	10.7	2.0	7.5	0
Sorghum	2.9	4.1	3.9	3.3	3.3	2.4	2.0	2.2	1.6	1.6	0
Barley	2.0	3.0	2.8	2.3	2.9	2.1	2.3	2.2	2.1	2.4	0
Oats	0.5	0.8	0.3	0.3	0.2	0.5	0.6	0.8	0.5	0.7	0
Wheat	21.0	23.9	22.5	9.6	7.5	15.6	7.3	5.4	4.6	5.5	0
Cotton	4.0	3.9	2.2	3.5	2.0	1.2	1.7	1.4	1.7	0.2	0
Rice	1.5	1.6	1.1	1.2	1.0	0.9	0.4	0.7	0.3	0.5	0
Total, annual programs ¹	46.1	60.5	53.3	30.9	27.7	30.1	19.5	23.4	12.8	18.4	0
CRP base acres: ²											
Corn	0.2	2.3	2.8	3.4	3.8	3.9	4.1	4.3	4.3	4.3	4.0
Sorghum	0.2	1.2	1.9	2.2	2.4	2.4	2.4	2.5	2.5	2.5	2.4
Barley	0.1	1.1	1.9	2.4	2.7	2.8	2.8	2.8	2.8	2.8	2.7
Oats	0.1	0.5	0.9	1.1	1.3	1.3	1.4	1.4	1.4	1.4	1.3
Wheat	0.6	4.2	7.1	8.8	10.3	10.4	10.6	10.8	10.8	10.8	10.5
Cotton	0.1	0.7	1.0	1.2	1.3	1.3	1.4	1.4	1.4	1.4	1.4
Rice	³										
Total CRP-idled base acres ^{1,2}	1.2	10.0	15.5	19.0	21.8	22.0	22.6	23.3	23.3	23.3	22.3
Total base acres idled ^{1,2}	47.4	70.5	68.8	49.9	49.5	52.1	42.1	46.7	36.1	41.7	22.3
Total CRP-idled nonbase acres ²	0.7	5.7	8.9	10.9	12.1	12.4	12.8	13.2	13.2	13.2	12.1
Total cropland idled under Federal programs ^{1,2}	48.1	76.2	77.7	60.8	61.6	64.5	54.9	59.8	49.2	54.8	34.4

¹ Because of rounding, crop acreages may not sum to totals. Base acreages idled under 0/92 and 50/92 programs from 1986 through 1992 are included in annual program data. However, base acres of feed grains and wheat enrolled in 0/92 and planted to oilseeds or other permitted crops in 1991 (0.5 million acres), in 1992 (0.7 million acres), in 1993 (1.0 million acres), in 1994 (1.6 million acres), and in 1995 (1.5 million acres) are not included.

² CRP began in 1986. Small acreages of peanut and tobacco base were bid into CRP in addition to the crops listed. Numbers are gross before subtracting CRP terminations which, by the end of 1996, totaled approximately 1.5 million acres.

³ Less than 50,000 acres.

Source: USDA, ERS, based on various published and unpublished data from FSA (formerly ASCS).

(table 1.1.11). Even so, losing farmland to urban uses does not threaten total cropland or the level of agricultural production, which should be sufficient to meet food and fiber demand into the next century (Vesterby, Heimlich, and Krupa, 1994).

Land use change is dynamic. With the exception of urban land, changes occur to and from major land uses (table 1.1.11). For example, 26.4 million acres (of prime and nonprime land) left cropland and pasture from 1982 to 1992 but 16.3 million acres came into the category, resulting in a net loss of 10.1 million acres. Forestland lost 14.2 million acres, but gained 15.2 million acres for a net gain of 1 million acres.

Prime agricultural land has the growing season, moisture supply, and soil quality needed to produce sustained high yields when treated and managed according to modern farming methods (Heimlich, 1989). About 24 percent of rural non-Federal land is prime. Of land converted to urban, 28 percent is prime, so that urban conversion takes prime land in a slightly greater proportion than its occurrence. Of total cropland and pasture, 48 percent is prime and prime cropland is converted to urban uses at about the same rate as nonprime cropland.

Concerns about preserving agricultural lands and open areas have resulted in the use of a variety of instruments, including property, income, and estate tax incentives; and the use of easements and land

Table 1.1.10—Population and urban area, contiguous 48 States, 1950-90

Year	U.S. population			Urban area ¹	Urban area increase ²
	Total	Urban	Portion urban		
	<i>--Million--</i>		<i>Percent</i>	<i>Million acres</i>	<i>Percent</i>
1950	151	97	64	18	--
1960	178	124	70	26	39
1970	202	149	74	35	36
1980	225	165	74	47	37
1990	247	185	75	56	18

¹ Data differ somewhat from table 1.1.11 due to different data sources and different time periods.

² Percent increase over that of 10 years past.

Source: USDA, ERS, based on USDC, 1991; Frey, 1983.

Table 1.1.11—Land-use changes from 1982 to 1992, contiguous 48 States

Land use ¹	In 1992--						
	1982 land use totals	Cropland and pasture ²	Range-land	Forest-land	Other ³	Urban and built-up	Federal land
	<i>Million acres</i>						
1992 land use totals ^{3,4}	1,891.1	542.3	398.9	395.0	81.6	65.4	408.0
Prime land in 1982: ⁵							
Cropland and pasture	267.8	259.2	0.7	2.7	1.7	2.9	.6
Rangeland	20.0	1.4	18.2	.1	.1	.1	--
Forest land	45.6	1.1	--	43.3	.2	.7	.2
Other ^{2,3}	6.2	.7	--	.2	5.3	--	--
Nonprime land in 1982--							
Cropland and pasture	284.3	266.4	2.8	8.7	2.4	3.2	.7
Rangeland	388.6	7.4	373.5	1.4	1.3	1.8	3.3
Forest land	348.3	3.3	1.1	336.3	1.4	4.4	1.8
Other ^{2,3}	73.0	1.7	.3	1.4	69.0	.2	.3
Urban and built-up	51.9	--	--	--	--	51.9	--
Federal land	404.7	.7	2.0	.7	.2	--	401.1

¹ Numbers in bold indicate the acres that remained in the same use. Nonbold numbers across rows represent land moving out of the 1982 land uses. Nonbold numbers down columns represent land moving into the 1992 land uses.

² Includes land in the CRP.

³ Includes rural transportation, marshland, and barren land.

⁴ Distribution by use may not add to totals due to rounding.

⁵ Prime land is land that has the growing season, moisture supply, and soil quality needed to sustain high yields when treated and managed according to modern farming methods.

Source: USDA, ERS, based on USDA, SCS, 1994.

trusts (see chapter 1.2, *Land Tenure*, for more discussion).

Conflicts Among Uses of Federal Lands

Nearly 29 percent of the Nation’s surface area, some 650 million acres, is owned by the Federal Government (U.S. General Services Administration, 1995). Most of this land is administered by USDA’s Forest Service (FS) and the Department of the Interior’s Bureau of Land Management (BLM), with lesser amounts by the Fish and Wildlife Service (FWS) and National Park Service.

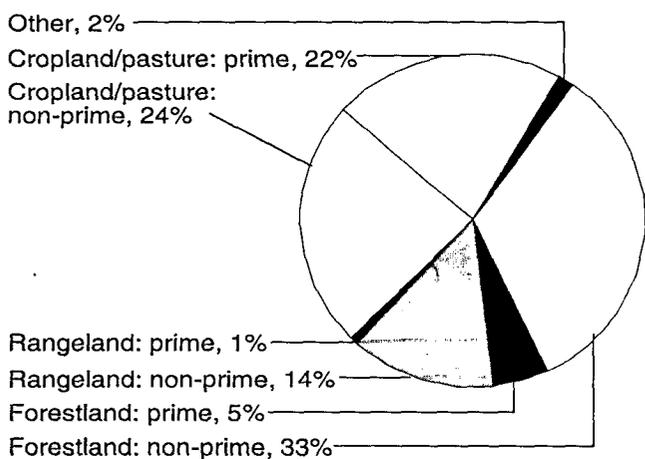
National Forest System (NFS) lands total 191.6 million acres (table 1.1.12 and USDA, FS, 1996). By law, NFS lands are managed to promote multiple uses. Logging and grazing are the principal commercial activities. The NFS includes about 85 million acres of timberland and 96 million acres of rangeland. FY 1995 production from these resources included 3.9 billion board feet of timber (about 13 percent of the national harvest) and almost 9.3 million animal-unit months (AUM’s—1 AUM is forage for a 1,000 lb. cow, or the equivalent, for 1 month) of livestock grazing. Other commercial activities include oil, gas, and mineral production. Recreation and conservation are also major uses. The Forest Service manages over 18,000 recreational facilities within the NFS, along with over 125,000 miles of trails and 4,385 miles of wild and scenic rivers. FY 1995 recreational use of NFS lands exceeded 4 billion visitor hours (USDA, FS, 1996). The NFS also

includes 35 million acres of designated wilderness. Within the continental United States, NFS lands provide habitat for 113 animal species and 87 plant species listed by the Federal Government as threatened or endangered (BioData, Inc., 1995). The NFS also accounts for about one half of the West’s water supply (USDA, FS, 1996).

Bureau of Land Management (BLM) lands total 264 million acres, most of which are in Alaska and 11 Western States (table 1.1.12 and USDI, BLM, 1996). BLM lands are managed for multiple uses, primarily commercial production. The main commercial activity is grazing, with 19,048 grazing permits or leases covering 166.9 million acres in FY 1993 (USDI, BLM, 1996). About 8 million acres of BLM land are classified as timberland. BLM’s recreation management efforts target high-use areas that cover about 10 percent of agency lands. These areas contain 4,869 miles of trails and about 2,000 miles of wild and scenic rivers. FY 1995 recreational use of BLM lands was about 880 million visitor hours. As with the Forest Service, BLM has given increasing importance to conservation uses—protecting wetlands and riparian areas, endangered species, and important wildlife habitat. Within the 48 States, BLM lands provide habitat for 61 federally listed threatened or endangered animal species and 77 listed plant species (BioData, Inc., 1995). BLM lands include 5.2 million acres of designated wilderness and 17.4 million acres that are being studied for future designation.

Debate over the use of public lands, particularly those under FS and BLM jurisdiction (that is, those explicitly managed under multiple-use objectives), has become increasingly contentious over the last 20-30 years. Critics argue that FS and BLM give grazing, logging, and mining priority over other land uses (primarily environmental uses but also, to a lesser extent, recreational uses). Federal grazing fees, for example, are generally well below fees charged by private landowners in nearby areas. In 1995, the Federal grazing fee was \$1.61 per AUM. For the 11 Western States where BLM and FS lands are concentrated, private land grazing fees (for cattle) averaged \$10.30 per AUM (USDA, NASS, 1995a). (See chapter 1.4, *Farm Real Estate Values, Rents, and Taxes*, for more detail on grazing fees and recent proposals to raise fees on public lands.) Similarly, the FS often pays for construction of access roads, which is a major cost component in bringing NFS lands into timber production. With respect to mining, Federal law allows prospectors to take title to public lands, and the minerals they contain, for as little as \$2.50 per acre.

Figure 1.1.6--Land urbanized, by prior land use, 1982-92



Source: USDA, ERS, based on USDA, SCS, 1994.

promote conservation objectives, these efforts generally met with stiff opposition, and no major reforms affecting commercial or conservation activities on Federal lands were signed into law.

While the debate over the use of Federal lands is unlikely to be resolved in the near future, elements of the debate have been reflected in land-use patterns. Both NFS and BLM lands saw a marginal decrease in the amount of grazing allowed during 1983-95 (table 1.1.12). Both agencies also sharply decreased their timber sales, largely due to court injunctions brought to address environmental issues, but also reflecting changes in forest management objectives and policy within BLM and FS. Recreation and conservation uses of BLM and FS lands increased significantly between 1983 and 1995. For the two agencies combined, the number of recreational visitor days rose almost 64 percent while the area of designated wilderness expanded 14.6 million acres. There were also significant increases in the number of trail miles and wild and scenic river miles on both FS and BLM lands.

Conflicts With Environmental Preservation

Virtually all of the Nation's 460 million acres of cropland and much of its 591 million acres of grassland pasture and range were once wetlands, forest, native grassland, or some other natural ecosystem. In converting these lands to agricultural uses, many of their environmental goods and services have been damaged or lost. Additionally, incidental consequences of crop and livestock production, such as soil erosion and farm chemical runoff, can stress connected ecosystems. Conservation has become a recurring issue in agricultural policy for two reasons. First, government policies have often encouraged the conversion of natural areas to agriculture and the use of production practices with negative environmental impacts (for example, chemical-intensive monoculture systems). Second, the private benefits of conservation are often insufficient to induce farmers and ranchers to protect natural resources at levels that are optimal from a social perspective. This section briefly discusses five areas where conflicts between agricultural and environmental uses of land are likely to become important policy issues.

Endangered Species. As of September 30, 1995, 663 plant and animal species inhabiting the contiguous 48 States (during at least some part of their life cycle) were listed by the Federal Government as threatened or endangered. Of these species, 380 are listed, at least in part, due to activities typically associated with agriculture (table

1.1.13). Agricultural development (that is, the conversion of land to agricultural production) and grazing threaten the most species, 272 and 171. Exposure to fertilizers and pesticides is a factor in the listing of 115 species. While farm production accounts for the large majority of such listings, some listings are due to nonfarm uses of these chemicals. Of the species listed due to the use of fertilizers and pesticides, 28 have been linked to fertilizers, 85 to herbicides, and 80 to other pesticides.

Competition between agriculture and endangered species for land has heightened due to the Endangered Species Act (ESA) of 1973. The stated purpose of the ESA is to provide a means for protecting ecosystems upon which threatened and endangered (T&E) species depend and to provide a program for the conservation of such species. Several sections of the ESA have important implications for agriculture.

Section 6 prohibits State laws protecting federally listed T&E species from being less restrictive than the ESA. Hence, States have limited ability to grant exemptions to ESA restrictions regardless of compliance costs. Section 7 requires Federal agencies to ensure that actions they fund, authorize, or carry out are not likely to jeopardize the survival of T&E species. Potentially, this brings commodity program participants, users of federally supplied irrigation water, and holders of Federal grazing permits and leases within reach of the ESA. Additionally, Section 11 allows private agents to sue Federal agencies to force their compliance with ESA provisions. This has caused concern that the ESA may be used to restrict pesticide use because these products can be distributed in the United States only if they have been registered or exempted from registration by the Environmental Protection Agency. Finally, Section 9 makes it illegal to take, possess, transport, or traffic in listed animals except by permit; for plants it is illegal to collect or maliciously damage endangered species on Federal lands. For listed animal species then, the ESA can affect land-use decisions on both public and private lands; for listed plant species, it can affect land-use decisions only on Federal lands.

Wildlife Habitat. Agriculture affects the welfare of wildlife populations beyond endangered species. While a few species have adapted well to farm systems (for example, white-tail deer, Canada geese, raccoons, and coyotes), agriculture has negatively impacted most species. Over the last 30 years, habitat loss due to conversion of land to agriculture has reduced wild species numbers more than any other human activity (McKenzie and Riley, 1995). In prairie regions between 1980 and 1989, for example,

In recent years, the full range of ecological functions and economic benefits associated with wetlands has become much better understood; these include critical wildlife habitat, temporary stormwater storage, groundwater recharging, pollution control, sport hunting and fishing opportunities, wildlife viewing, and breeding grounds and nurseries for many commercially important fish, fur, and game species. As a result, Federal wetlands policy has increasingly emphasized conservation, and much of this policy shift has been directed at agriculture. Swampbuster provisions of the Food, Agriculture, Conservation, and Trade Act of 1990, for example, denied crop subsidy payments to farmers who converted wetlands to boost commodity program acreage—even if the converted wetlands were not directly used to produce program crops (U.S. Congress, OTA, 1993). Violation of Swampbuster regulations can mean the loss of eligibility for all farm program benefits—including commodity program participation, crop insurance, and disaster payments—until the violation is remedied. The Wetlands Reserve Program and the Emergency Wetlands Reserve Program pay farmers to preserve their wetlands and offer cost shares to encourage wetlands restoration.

Agriculture's role in converting wetlands to other uses has been declining. Between 1954 and 1974, agriculture accounted for 81 percent of all gross wetlands losses; between 1982 and 1992, it accounted for only 20 percent (see table 6.5.2 in chapter 6.5, *Wetlands Programs*). Furthermore, this percentage change reflects a decrease in conversions of land to agriculture rather than an increase in wetlands losses due to other activities.

About 90 percent of the 124 million acres of wetlands remaining in 1992 in the 48 States was on rural nonfederal lands. Given its ownership of these land resources, the farm sector will likely remain a primary target of wetlands conservation efforts. (See chapter 6.5, *Wetlands Programs*, for more detail.)

Water Quality. Agriculture threatens many wetland and aquatic ecosystems via the discharge of runoff laden with sediments and chemical residues. Nationally, runoff from agricultural land accounts for 60 percent of the sediment and about half of the phosphorus and nitrogen reaching freshwater systems (Crutchfield and others, 1993). This can create a variety of environmental problems in aquatic ecosystems. Nutrients from fertilizer applications can increase algae and plant growth, which in extreme cases can promote eutrophication of streams, lakes, and estuaries. Residues from pesticide applications can have toxic effects on freshwater and marine

species as well as their predators. Soil sediments can decrease sunlight penetration in water bodies, deteriorate spawning grounds, and reduce supplies of dissolved oxygen.

Because of the widespread nature of environmental problems associated with agricultural runoff, water quality will continue to be an important source of conflicts between the farm sector and the environment. (For more detail, see chapter 2.2, *Water Quality*, and chapter 6.2, *Water Quality Programs*).

Air Quality. Onfarm air pollution has recently received increased attention. Principal concerns include crop damage, noxious odors, particulate matter or dust, and wildfires. Crop damages occur due to off-farm pollution, such as ozone and other airborne pollutants, drifting into agricultural areas reducing growth and seed formation of field crops. These yield reductions of 5-10 percent are concentrated in areas near large population centers (Westenbarger and Frisvold, 1995). While airborne pollutants do not directly cause a severe reduction in yields, they can weaken plants and make them more susceptible to disease or insect damage.

Onfarm odors have brought about legal action by nearby property owners, who have seen their quality of life and property values suffer. These odors are generally a problem around large-scale livestock facilities, as well as near farms that fertilize with stored manure sludge. Anticipated odor problems have delayed or prevented construction of some livestock or poultry operations. The backlash against noxious odors has prompted some farmers to band together to create "right-to-farm" zones that protect farm operators against lawsuits by newcomers who were aware of the farms' existence before purchasing their property.

Particulate matter, or "fugitive dust," is a problem in dry areas where wind erosion is high. The Agricultural Research Service (ARS) and the Natural Resources Conservation Service (NRCS) are working with the Environmental Protection Agency (EPA) to study conditions that lead to excessive airborne particulate pollution.

Wildfires affect respiratory health in rural areas, and the Forest Service and other agencies manage controlled burning programs to reduce their incidence. In a controlled burn, dry brush and dead trees are removed by burning to remove the kindling that contributes to uncontrolled wildfires.



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Potential Impacts of Global Climate Change

The potential for emissions of greenhouse gases to change Earth's climate has been the subject of concerted Federal research since the late 1970's. The United Nations Framework Convention on Climate Change was signed by representatives from 155 countries, including the United States, at the United Nations Conference on Environment and Development (the Rio Earth Summit) in 1992. Ratification of the Convention by more than 50 nations occurred in late 1994, putting the agreement into force. The United States was among the early nations to ratify the Convention. The key provision for land use is Article 2: "The ultimate objective of this Convention ... is to achieve stabilization of greenhouse gas concentrations in the atmosphere at a level that would prevent dangerous anthropogenic interference with the climate system. Such a level should be achieved within a time-frame sufficient to allow ecosystems to adapt naturally to climate change, to ensure that food production is not threatened and to enable economic development to proceed in a sustainable manner."

Recent research conducted at ERS links world land and water resources with climate conditions and economic activity to analyze how four climate change scenarios might affect world agriculture and land use (Darwin and others, 1995). Under the scenarios, reduced productivity on Earth's existing agricultural lands, because of new temperature and precipitation patterns, would be more than offset by expanding agricultural production in new areas. Global food production would increase. However, if climate change were relatively severe, increased food production might not counter losses in other sectors and global economic activity could decrease. Only the effects of changes in atmospheric concentrations of CO₂ on climate were considered. The beneficial effects of greater atmospheric concentrations of CO₂ on plant growth and the effects of changes in the atmospheric concentrations of other gases like ozone and sulphur dioxide on both the climate and plant growth are still under study.

In the United States, all climate change scenarios result in land use changes on at least 48 percent of existing cropland. In two scenarios, more than half of all U.S. cropland ends up with a shorter growing season and 8-19 percent is abandoned (40-90 million acres). Some farm communities would be severely disrupted, particularly in areas where the only economically viable adaptation would be to abandon agriculture. Forest losses in some areas would be offset by gains in others. Likewise, net change in

pasture could be negative or positive (from -0.1 to 7.4 percent). The environmental effects of such land use changes have yet to be determined, but will depend on the rate of change in the climate and the speed at which ecosystems migrate.

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Recent ERS Reports on Land-Use Issues

Industrial Uses of Agricultural Materials, Situation and Outlook Report, IUS-6, Aug. 1996 (Lewrene Glaser, Coordinator). Research and market demand open new opportunities for agriculturally based industrial materials. Industrial uses of corn are expected to total 622 million bushels in 1995/96 (Sept./Aug.), down 18 percent from the previous year due to a lower use for ethanol. A special article examines possible biodiesel demand in three niche fuel markets that might be commercialized—Federal fleets, mining, and marine/estuary areas.

Agricultural Adaptation to Climate Change, AER-740, June 1996 (David Schimmelpfennig, Jan Lewandrowski, John Reilly, Marinos Tsigas, and Ian Parry). This report, which highlights ERS research on the effects of climate change on agriculture, focuses on economic adaptation and concludes there is considerably more sectoral flexibility and adaptability than found in other analyses. The report frames the discussion of economic adjustments within the context of global agricultural environmental sustainability.

Major Land Uses, Data Product Stock #890003, Feb. 1996 (Kenneth Krupa and Arthur Daugherty). This electronic data product contains 3 ASCII files containing explanatory and reference material and 16 Lotus 1-2-3 (.WK1) spreadsheet files containing State, regional, and national estimates for separate land uses for census of agriculture years 1945 through 1992. This product updates one with the same title and stock number prepared in 1990 covering the 1945-87 period.

Major Uses of Land in the United States, 1992, AER-723, Sept. 1995 (Arthur Daugherty). This report categorizes the Nation's nearly 2.3 billion acres of land area into major uses by State and farm production region, with national totals for 1992. Similar geographic detail provided for a number of subcategories of cropland, grassland pasture and range, forest-use land, and special land uses.

1995 Cropland Use, AREI Update, 1995, No. 12 (Arthur Daugherty). This annual update of cropland use and Federal commodity program participation indicates that cropland use was down, crop failure and program-idled cropland up in 1995 from 1994. Nearly 3.7 million base acres of the 7 major program crops were "flexed" to non-program crops, of which 2.8 million acres were soybeans.

World Agriculture and Climate Change, Economic Adaptations, AER-703, June 1995 (Roy Darwin, Marinos Tsigas, Jan Lewandrowski, and Anton Ranses). Analysis of four popular climate change scenarios suggests that farmer adaptation and international trade will allow world agriculture to respond to global climate change without imperiling world food production. Regionally, agricultural production possibilities expand in arctic and mountainous areas and contract in tropical and some other areas. In the United States, soil moisture losses may reduce agricultural production possibilities in the Southeast and the Corn Belt.

Urbanization of Rural Land in the United States, AER-673, March 1994 (Marlow Vesterby, Ralph Heimlich, and Kenneth Krupa). Land conversion to urban use has remained constant at about a half acre per household in fast-growth counties since 1960. Urbanization of farmland poses no threat to U.S. food and fiber production in the near future.

Agricultural and Water-Quality Conflicts: Economic Dimensions of the Problem, AIB-676, July 1993 (Steve Crutchfield, LeRoy Hansen, and Marc Ribaud). Off-farm effects of farm production practices impose costs on society, including damage to fish and wildlife resources, costs of avoiding potential health hazards and protecting natural ecosystems, and lost recreational opportunities. Policies that stress economic and technical assistance can encourage adoption of pollution-reducing farm practices.

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Glossary of Land Use Categories

Cropland—Total cropland includes five components: cropland harvested, crop failure, cultivated summer fallow, cropland used only for pasture, and idle cropland. *Cropland harvested* includes row crops and closely sown crops; hay and silage crops; tree fruits, small fruits, berries, and tree nuts; vegetables and melons; and miscellaneous other minor crops. Farmers double-cropped nearly 4 percent of this acreage. *Crop failure* consists mainly of the acreage on which crops failed because of weather, insects, and diseases, but includes some land not harvested due to lack of labor, low market prices, or other factors. The acreage planted to cover and soil-improvement crops not intended for harvest is excluded from crop failure and is considered idle. In recent years, crops have failed on 2-3 percent of acreage planted for harvest.

Cultivated summer fallow refers to cropland in subhumid regions of the West cultivated for one or more seasons to control weeds and accumulate moisture before small grains are planted. This practice is optional in some areas, but it is necessary for crop production in the drier cropland areas of the West. Other types of fallow, such as cropland planted to soil-improvement crops but not harvested and cropland left idle all year, are not included in cultivated summer fallow but are included as idle cropland. *Cropland used only for pasture* generally is considered to be in long-term crop rotation. However, some land classed as cropland pasture is marginal for crop uses and may remain in pasture indefinitely. This category also includes land that was used for pasture before crops reach maturity and some land used for pasture that could have been cropped without additional improvement. Cropland pasture and permanent grassland pasture have not always been clearly distinguished in agricultural surveys.

Land idled under annual Federal crop programs could have been pastured except during a consecutive 5-month period between April 1 and October 31 designated by the State Agricultural Stabilization and Conservation Committee. If such acreage conservation reserve or conservation use acres were pastured at any time during the year, the Census requested that they be reported as cropland pasture. Land in the CRP could not be pastured. Idle cropland includes land in cover and soil-improvement crops and cropland on which no crops were planted. Some cropland is idle each year for various physical and economic reasons. Acreages diverted from crops to soil-conserving uses (if not eligible for and used as cropland pasture) under Federal farm programs are included in this component.

Cropland used for crops—Three of the cropland acreage components—cropland harvested, crop failure, and cultivated summer fallow—are collectively termed cropland used for crops, or the land input to crop production.

Grassland pasture and range—Grassland pasture and range comprise all open land used primarily for pasture and grazing, including shrub and brushland types of pasture, grazing land with sagebrush and scattered mesquite, and all tame and native grasses, legumes, and other forage used for pasture or grazing. Because of the diversity in vegetative composition, grassland pasture and range are not always clearly distinguishable from other types of pasture and range. At one extreme, permanent grassland may merge with cropland pasture, or grassland may often be found in transitional areas with forested grazing land. This category does not include any land currently in the CRP.

Forest land grazed—Forested pasture and range consist mainly of forest, brushgrown pasture, arid woodlands, and other areas within forested areas that have grass or other forage growth. The total acreage of forested grazing land includes woodland pasture in farms plus rough estimates of forested grazing land not in farms. For many States, the estimates include significant areas grazed only lightly or sporadically.

Forest land—As defined by the Forest Service, forest land is "land at least 10% stocked by trees of any size, including land that formerly had such tree cover and that will be naturally or artificially regenerated. Forest land includes transition zones, such as areas between heavily forested and nonforested lands that are at least 10% stocked with forest trees and forest areas adjacent to urban and built up lands. Also included are pinyon-juniper and chaparral areas in the West and afforested areas" (Powell and others, 1993, p. 117).

Forest-use land—A modified total used in this inventory of 648 million acres of forest land that excludes an estimated 89 million acres in parks, wildlife areas, and similar special-purpose uses. To eliminate all overlap with other uses is not feasible, but this reduced area is a more realistic approximation of the land that may be expected to serve normal forest uses as opposed to having forest cover. Forest-use land includes forested grazing land in this report.

Special-use areas—Special uses in this report include urban areas; highway, road, and railroad rights-of-way and airports; Federal and State parks, wilderness areas, and wildlife refuges; national defense and industrial areas; and miscellaneous farmland uses.

Miscellaneous other land—Includes miscellaneous special uses such as industrial and commercial sites in rural areas, cemeteries, golf courses, mining areas, quarries, marshes, swamps, sand dunes, bare rocks, deserts, tundra, and other unclassified land.

Table 1.1.14—Cropland idled by Federal program and commodity, 1978-95¹

Item	1978	79	80	81	82	83	84	85	86	87	88	89	90	91	92	93	94	95
<i>Million acres</i>																		
Acreage Conservation Reserve:																		
Com	3.2	1.7			2.1	4.4	3.9	5.4	10.4	14.7	14.4	6.3	6.1	4.7	3.1	6.6	0.0	4.7
Sorghum	1.1	0.9			0.7	0.8	0.6	0.9	2.1	2.4	2.2	1.1	1.0	0.8	0.5	0.6	0.0	0.0
Barley	0.6	0.3			0.4	0.5	0.5	0.7	1.6	2.2	1.9	0.8	0.7	0.7	0.4	0.0	0.0	0.0
Oats	0.0	0.0			0.1	0.1	0.1	0.1	0.3	0.5	*	0.1	*	0.0	0.0	0.0	0.0	0.0
Feed grains ²	4.9	2.9			3.3	5.9	5.1	7.2	4.5	19.8	18.6	8.2	7.9	6.2	4.1	7.2	0.0	4.7
Wheat	8.3	7.4			5.8	8.8	10.4	11.9	15.8	20.2	19.2	6.1	2.2	10.1	3.3	0.0	0.0	0.0
Cotton	0.0	0.0			1.6	2.5	2.5	2.3	3.3	3.2	1.5	3.1	1.5	0.6	1.3	1.0	1.5	0.0
Rice	0.0	0.0			0.4	0.6	0.8	0.7	1.3	1.3	0.9	0.9	0.7	0.2	0.0	0.2	0.0	0.2
Total ²	13.1	10.3			11.1	17.8	18.7	22.1	34.8	44.5	40.3	18.4	12.3	17.1	8.6	8.4	1.5	4.9
0,50/85-92 Programs:³																		
Com									0.6	1.4	2.9	4.5	4.6	2.7	2.2	4.3	2.4	3.0
Sorghum									0.4	0.5	1.1	2.2	2.3	1.7	1.5	1.7	1.6	1.7
Barley									0.2	0.3	0.6	1.5	2.2	1.5	1.9	2.5	2.7	2.9
Oats									0.1	0.1	0.2	0.3	0.2	0.6	0.7	0.8	0.6	0.8
Feed grains ²									1.3	2.3	4.8	8.5	9.3	6.5	6.3	9.3	7.2	8.4
Wheat									1.3	3.7	3.2	3.5	5.3	5.8	4.0	5.7	0.2	6.1
Cotton									0.8	0.7	0.6	0.4	0.5	0.6	0.4	0.4	0.2	0.2
Rice									0.2	0.2	0.1	0.2	0.3	0.7	0.4	0.5	0.3	0.3
Total ²									3.5	7.0	8.8	12.6	15.3	13.6	11.2	15.9	12.9	15.0
Long-term programs:⁴																		
Com									0.2	2.3	2.8	3.4	3.8	3.9	4.1	4.3	4.3	4.3
Sorghum									0.2	1.2	1.9	2.2	2.4	2.4	2.4	2.5	2.5	2.5
Barley									0.1	1.1	1.9	2.4	2.7	2.8	2.8	2.8	2.8	2.8
Oats									0.1	0.5	0.9	1.1	1.3	1.3	1.4	1.4	1.4	1.4
Feed grains ²									0.6	5.1	7.4	9.0	10.2	10.3	10.6	11.0	11.0	11.0
Wheat									0.6	4.2	7.1	8.8	10.3	10.4	10.6	10.8	10.8	10.8
Cotton									0.1	0.7	1.0	1.2	1.3	1.3	1.4	1.4	1.41	1.4
Rice									*	*	*	*	*	*	*	*	*	*
Non-base acres									0.7	5.7	8.9	10.9	12.1	12.4	12.8	13.2	13.2	13.2
Total ²									1.9	15.7	24.4	29.9	33.8	34.4	35.4	36.4	36.4	36.4
Paid Land Diversion:																		
Com	2.9	1.2			5.9	0.0	0.0	1.8	7.0	3.2								
Sorghum	0.3	0.3			1.3	0.0	0.0	0.4	1.2	0.6								
Barley	0.2	0.0			0.6	0.0	0.0	0.2	0.4	0.3								
Oats	0.0	0.0			0.2	0.0	0.0	0.1	0.2	0.0								
Feed grains ²	3.4	1.5			8.0	0.0	0.0	2.4	8.8	4.1								
Wheat	0.0	0.0			3.5	5.7	6.9	3.9	0.0	0.0								
Cotton	0.3	0.0			*	0.0	1.3	0.0	0.0	0.0								
Rice	0.0	0.0			0.2	0.0	0.6	0.0	0.0	0.0								
Total ²	3.7	1.5			11.7	5.7	8.8	6.4	8.8	4.1								
Payment-In-Kind:																		
Com					21.9	0.0												
Sorghum					3.6	0.0												
Barley					0.0	0.0												
Oats					0.0	0.0												
Feed grains ²					25.2	0.0												
Wheat					17.7	3.6												
Cotton					4.2	0.0												
Rice					1.1	0.0												
Total ²					48.6	3.6												

See footnotes at end of table.

Table 1.1.14—Cropland idled by Federal program and commodity, 1978-95, continued¹

Item	1978	79	80	81	82	83	84	85	86	87	88	89	90	91	92	93	94	95
	<i>Million acres</i>																	
All programs:²																		
Com	6.1	2.9			2.1	32.2	3.9	5.4	12.9	25.5	23.3	14.1	14.5	11.3	9.3	15.2	6.6	12.0
Sorghum	1.4	1.2			0.7	5.7	0.6	0.9	3.1	5.3	5.8	5.4	5.7	4.8	4.5	4.7	4.1	4.2
Barley	0.8	0.3			0.4	1.1	0.5	0.7	2.2	4.1	4.7	4.7	5.6	4.9	5.2	5.3	5.5	5.7
Oats					0.1	0.3	0.1	0.1	0.6	1.3	1.1	1.4	1.5	1.9	2.0	2.2	2.0	2.2
Feed grains ²	8.3	4.4	0.0	0.0	3.3	39.4	5.1	7.2	18.8	36.1	34.9	25.6	27.3	22.9	21.0	27.5	18.2	24.1
Wheat	8.3	7.4			5.8	30.0	19.6	18.8	21.6	28.1	29.6	18.4	17.8	26.3	17.9	16.5	16.0	16.9
Cotton	0.3				1.6	6.8	2.5	3.6	4.1	4.5	3.2	4.7	3.3	2.6	3.1	2.8	3.1	1.6
Rice					0.4	1.8	0.8	1.3	1.5	1.6	1.1	1.2	1.0	0.9	0.4	0.7	0.3	0.5
Non-base acres					0.0	0.0	0.0	0.0	0.7	5.7	8.9	10.9	12.1	12.4				
Total ²	16.8	11.8	0.0	0.0	11.1	78.0	28.0	30.9	46.6	76.0	77.7	60.8	61.5	65.1	55.2	60.7	50.8	56.3
Cropland used for crops	369	378	382	387	383	333	373	372	357	331	327	341	341	337	337	330	339	333

* = Less than 50,000 acres

¹ A blank cell indicates program was not in effect that year for that crop.

² Distributions may not add to totals due to rounding.

³ Includes cropland participating in the 0,50/85-92 programs but planted to allowed minor oilseeds or industrial/other crops.

⁴ Data represent the Conservation Reserve Program (CRP) from 1986-94. There was no long-term retirement program between 1977 and 1986.

Source: USDA, ERS, compiled from unpublished materials provided by the Farm Service Agency.