

## Purchased Seed Use, Purchase Value, and Trade Have Grown in Recent Decades

Demand for seed is primarily determined by the profitability of the crop that the seed produces. Seed use by U.S. farmers depends on several factors, including the acreage under cultivation, the seeding rate per cultivated acre, cropping practices, and variations in geographic location and agroclimatic conditions.

### Seed Market Size and Value

The U.S. seed market is rapidly growing in size and value. U.S. farmers used over 6.5 million tons of seed for major field crops in the 1996/97 crop marketing year (table 1). In 1997, the estimated total value of the commercial U.S. seed market was \$5.7 billion, roughly 20 percent of the world market in seed (table 2) (FIS/ASSINSEL, 2001). The U.S. seed market is the largest seed market worldwide. China, at \$3.0 billion, and Japan, at \$2.5 billion, are the next largest seed markets.

Total seed expenditures by U.S. farmers rose from about \$500 million in 1960 to over \$6.7 billion in 1997 (table 3, fig. 9). In real terms, seed expenditures climbed about 2.5-fold in the same period, despite minimal real increases in the index of seed prices paid by farmers (about 7 percent in 38 years, table 3). Similarly, when measured as a share of total farm expenditures, seed expenditures increased from 2 percent in 1970 to 4 percent in 1997 (fig. 10).

A large portion of the increase in real seed expenditures may be explained by increases in the share of seed purchased by U.S. farmers from seed, particularly for major field crops, which account for the largest share of seed purchased (tables 4, 5). In 1997, 81 percent of all U.S. soybean acreage (up from 55 percent in 1982) and 78 percent of all U.S. cotton acreage (up from 50 percent in 1982) were cultivated with purchased seed. These increases, in turn, can be explained by increases in seed productivity attributable to scientific improvements in plant breeding. Seeding rates have also increased (tables 6, 7).

### Seeding Rates and Costs for Major Field Crops

Seeding rates, acreage used in crop production, and share of seed purchased are the key agricultural factors affecting the demand for purchased seed in U.S. agriculture. Seeding rates, seed prices, and seed costs per acre for corn, soybeans, cotton, and wheat over time are presented in tables 6 and 7. For 1972-95, the average seed cost per acre is derived by multiplying seeding rate per acre and seed price. For 1986-97, average seeding rate and seed cost per acre are based on data from the Cropping Practices Surveys and the Agricultural Resource Management Survey (ARMS).

Seeding rates per acre can vary, depending on geographic location and cropping practices. Seeding rates tend to change slowly over time but the acreage

**Table 1—U.S. seed use for major field crops, by crop and marketing year**

| Crops          | Seed use             |         |         |         |         |         |         |         |         |         |         |
|----------------|----------------------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|
|                | 1986/87              | 1987/88 | 1988/89 | 1989/90 | 1990/91 | 1991/92 | 1992/93 | 1993/94 | 1994/95 | 1995/96 | 1996/97 |
|                | <i>Thousand tons</i> |         |         |         |         |         |         |         |         |         |         |
| Corn           | 468                  | 482     | 523     | 529     | 540     | 566     | 528     | 563     | 510     | 571     | 580     |
| Sorghum        | 44                   | 36      | 42      | 36      | 34      | 48      | 39      | 34      | 34      | 45      | 39      |
| Soybeans       | 1,653                | 1,684   | 1,766   | 1,664   | 1,701   | 1,705   | 1,726   | 1,914   | 1,877   | 1,929   | 2,064   |
| Barley         | 429                  | 376     | 360     | 324     | 350     | 310     | 314     | 283     | 266     | 283     | 278     |
| Oats           | 608                  | 505     | 433     | 374     | 306     | 290     | 285     | 240     | 205     | 194     | 219     |
| Wheat          | 2,520                | 2,550   | 3,090   | 3,009   | 2,787   | 2,931   | 2,973   | 2,889   | 2,679   | 3,123   | 3,075   |
| Rice           | 130                  | 150     | 150     | 180     | 180     | 195     | 180     | 210     | 205     | 186     | 185     |
| Cotton, upland | 93                   | 106     | 89      | 94      | 110     | 120     | 115     | 117     | 118     | 144     | 125     |
| Total          | 5,945                | 5,889   | 6,453   | 6,210   | 6,013   | 6,165   | 6,160   | 6,250   | 5,894   | 6,475   | 6,566   |

Sources: ERS estimates, based on data from the Agricultural Resource Management Survey and the Cropping Practices Surveys (USDA, ERS, 2002).

**Table 2—Estimated values of commercial markets for seed**

| Country                                         | Internal commercial market <sup>1</sup> |
|-------------------------------------------------|-----------------------------------------|
|                                                 | <i>Million dollars</i>                  |
| United States                                   | 5,700                                   |
| China                                           | 3,000                                   |
| Japan                                           | 2,500                                   |
| Commonwealth of Independent States <sup>2</sup> | 2,000                                   |
| France                                          | 1,370                                   |
| Brazil                                          | 1,200                                   |
| Germany                                         | 1,000                                   |
| Argentina                                       | 930                                     |
| India                                           | 900                                     |
| Italy                                           | 650                                     |
| United Kingdom                                  | 570                                     |
| Canada                                          | 550                                     |
| Poland                                          | 400                                     |
| Mexico                                          | 350                                     |
| Spain                                           | 300                                     |
| Netherlands                                     | 300                                     |
| Australia                                       | 280                                     |
| Hungary                                         | 200                                     |
| Denmark                                         | 200                                     |
| Sweden                                          | 200                                     |
| Other                                           | 1,967                                   |
| <b>Total</b>                                    | <b>24,567</b>                           |

<sup>1</sup> Data provided in this table are the most recent figures (available at the Secretariat of the International Seed Federation). Data refer to different years depending on the countries. Data include planting materials. The total represents the sum of the commercial seed markets of the countries listed by FIS/ASSINSEL. See source for details. The commercial world seed market is assessed by FIS/ASSINSEL at approximately US\$30 billion.

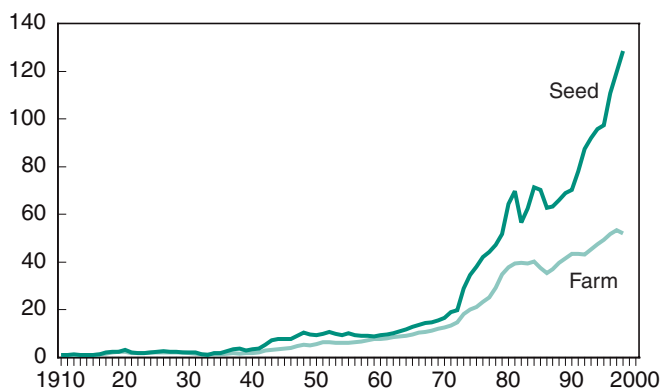
<sup>2</sup> States from the former Soviet Union (Armenia, Azerbaijan, Belarus, Georgia, Kazakhstan, Kyrgyzstan, Moldova, Russia, Tajikistan, Turkmenistan, Ukraine, and Uzbekistan).

Source: FIS/ASSINSEL (2000).

Figure 9

### Farm and seed expenditure indices

Expenditures index (1910 = 1.00)

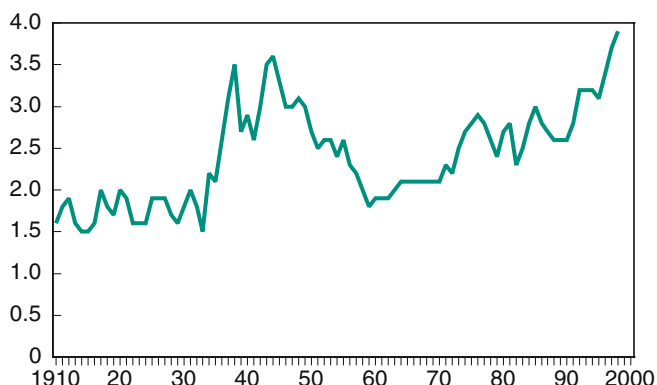


Source: Data sources provided in table 3.

Figure 10

### Seed expenditures' share of total farm expenditures

Percent



Source: Data sources provided in table 3.

planted with a particular crop can vary from year to year. For example, in 1996-97, planted acreage for soybeans, corn, and oats increased while acreage for cotton, sorghum, and wheat decreased. Demand for purchased seed may also be affected by decreases in the use of saved seed for such crops as soybeans. As a result, seed use for each of the crops varies from year to year (table 1). But, total seed consumption for the major field crops remained fairly constant between the 1986-87 and 1996-97 marketing years, ranging from 5.9 to 6.6 million tons per year.

**Corn.** Corn seeding rates and costs vary substantially by State. States where crops are mostly irrigated, such as California, or receive abundant rainfall, such as in the eastern Corn Belt, support heavier seeding rates, and consequently, higher seed costs per acre than other States. Within the Corn Belt, average seeding rates and seed costs per acre in selected States vary considerably, primarily because of differences in soil productivity, moisture availability, and seed price (table 6). For example, in 1989, Minnesota had the highest seeding rate (25,800 kernels) per acre. As a result, Minnesota had the highest average cost per acre at \$21.44. South Dakota had typically lower and more variable precipitation than other corn-growing States, resulting in lower seeding rates.

The price of seed per unit also affects seeding costs. For example, in 1988 and 1989, the average corn seeding rate was constant at 24,100 kernels per acre, but the average seeding cost per acre for the 10 leading corn-producing States rose from \$18.64 in 1988 to

**Table 3—U.S. farm seed expenditures and farm seed price index**

| Year | Expenditures<br>on seed | Total farm<br>production<br>expenditures | Share of total<br>farm<br>production<br>expenditures | Farm seed<br>price index<br>1984=100 | Prices paid<br>by farmers,<br>index<br>1984=1.00 | Real farm<br>seed price<br>index<br>(relative to<br>prices paid<br>by farmers) | Real<br>expenditures<br>on seed |
|------|-------------------------|------------------------------------------|------------------------------------------------------|--------------------------------------|--------------------------------------------------|--------------------------------------------------------------------------------|---------------------------------|
|      | —Million dollars—       |                                          | Percent                                              |                                      |                                                  |                                                                                | Million 1989<br>dollars         |
| 1960 | 519                     | 27,376                                   | 1.9                                                  | 0.2247                               | 0.2657                                           | 0.8456                                                                         | 1,953                           |
| 1961 | 545                     | 28,590                                   | 1.9                                                  | 0.2226                               | 0.2675                                           | 0.8321                                                                         | 2,037                           |
| 1962 | 565                     | 30,279                                   | 1.9                                                  | 0.2311                               | 0.2719                                           | 0.8499                                                                         | 2,078                           |
| 1963 | 619                     | 31,598                                   | 2.0                                                  | 0.2460                               | 0.2764                                           | 0.8902                                                                         | 2,240                           |
| 1964 | 661                     | 31,812                                   | 2.1                                                  | 0.2439                               | 0.2772                                           | 0.8797                                                                         | 2,384                           |
| 1965 | 720                     | 33,650                                   | 2.1                                                  | 0.2524                               | 0.2852                                           | 0.8850                                                                         | 2,524                           |
| 1966 | 760                     | 36,508                                   | 2.1                                                  | 0.2492                               | 0.2967                                           | 0.8398                                                                         | 2,561                           |
| 1967 | 814                     | 38,181                                   | 2.1                                                  | 0.2535                               | 0.3020                                           | 0.8392                                                                         | 2,695                           |
| 1968 | 831                     | 39,525                                   | 2.1                                                  | 0.2630                               | 0.3091                                           | 0.8509                                                                         | 2,688                           |
| 1969 | 871                     | 42,115                                   | 2.1                                                  | 0.2684                               | 0.3242                                           | 0.8278                                                                         | 2,687                           |
| 1970 | 928                     | 44,452                                   | 2.1                                                  | 0.2843                               | 0.3384                                           | 0.8404                                                                         | 2,743                           |
| 1971 | 1,072                   | 47,107                                   | 2.3                                                  | 0.3131                               | 0.3543                                           | 0.8837                                                                         | 3,026                           |
| 1972 | 1,115                   | 51,688                                   | 2.2                                                  | 0.3419                               | 0.3764                                           | 0.9081                                                                         | 2,962                           |
| 1973 | 1,617                   | 64,554                                   | 2.5                                                  | 0.4228                               | 0.4349                                           | 0.9722                                                                         | 3,718                           |
| 1974 | 1,941                   | 70,980                                   | 2.7                                                  | 0.5453                               | 0.4942                                           | 1.1032                                                                         | 3,927                           |
| 1975 | 2,138                   | 75,043                                   | 2.8                                                  | 0.6198                               | 0.5430                                           | 1.1415                                                                         | 3,938                           |
| 1976 | 2,366                   | 82,742                                   | 2.9                                                  | 0.6113                               | 0.5784                                           | 1.0569                                                                         | 4,091                           |
| 1977 | 2,484                   | 88,884                                   | 2.8                                                  | 0.6613                               | 0.6103                                           | 1.0837                                                                         | 4,070                           |
| 1978 | 2,638                   | 103,250                                  | 2.6                                                  | 0.6922                               | 0.6599                                           | 1.0490                                                                         | 3,998                           |
| 1979 | 2,904                   | 123,304                                  | 2.4                                                  | 0.7252                               | 0.7511                                           | 0.9656                                                                         | 3,866                           |
| 1980 | 3,220                   | 133,139                                  | 2.7                                                  | 0.7838                               | 0.8397                                           | 0.9335                                                                         | 3,835                           |
| 1981 | 3,428                   | 139,444                                  | 2.8                                                  | 0.9137                               | 0.9167                                           | 0.9967                                                                         | 3,739                           |
| 1982 | 3,172                   | 140,306                                  | 2.3                                                  | 0.9340                               | 0.9548                                           | 0.9782                                                                         | 3,322                           |
| 1983 | 2,987                   | 139,608                                  | 2.5                                                  | 0.9350                               | 0.9779                                           | 0.9562                                                                         | 3,055                           |
| 1984 | 3,548                   | 141,876                                  | 2.8                                                  | 1.0000                               | 1.0000                                           | 1.0000                                                                         | 3,548                           |
| 1985 | 3,941                   | 132,433                                  | 3.0                                                  | 1.0106                               | 0.9894                                           | 1.0215                                                                         | 3,983                           |
| 1986 | 3,511                   | 125,084                                  | 2.8                                                  | 0.9776                               | 0.9681                                           | 1.0098                                                                         | 3,627                           |
| 1987 | 3,259                   | 130,992                                  | 2.7                                                  | 0.9819                               | 0.9832                                           | 0.9987                                                                         | 3,315                           |
| 1988 | 4,060                   | 139,907                                  | 2.6                                                  | 0.9915                               | 1.0549                                           | 0.9399                                                                         | 3,849                           |
| 1989 | 4,397                   | 146,662                                  | 2.6                                                  | 1.0937                               | 1.1169                                           | 0.9792                                                                         | 3,937                           |
| 1990 | 4,518                   | 153,302                                  | 2.6                                                  | 1.0777                               | 1.1603                                           | 0.9288                                                                         | 3,894                           |
| 1991 | 5,113                   | 153,279                                  | 2.8                                                  | 1.0469                               | 1.1816                                           | 0.8860                                                                         | 4,327                           |
| 1992 | 4,913                   | 152,940                                  | 3.2                                                  | 1.0394                               | 1.1940                                           | 0.8705                                                                         | 4,115                           |
| 1993 | 5,163                   | 160,506                                  | 3.2                                                  | 1.0671                               | 1.2232                                           | 0.8724                                                                         | 4,221                           |
| 1994 | 5,373                   | 167,504                                  | 3.2                                                  | 1.1406                               | 1.2542                                           | 0.9094                                                                         | 4,284                           |
| 1995 | 5,462                   | 174,120                                  | 3.1                                                  | 1.1587                               | 1.2879                                           | 0.8997                                                                         | 4,241                           |
| 1996 | 6,212                   | 182,439                                  | 3.0                                                  | 1.2162                               | 1.3561                                           | 0.8968                                                                         | 4,581                           |
| 1997 | 6,711                   | 188,443                                  | 3.7                                                  | 1.2556                               | 1.3942                                           | 0.9006                                                                         | 4,814                           |

Sources: Expenditures for 1910-80 from Lucier et al. (1986); expenditures for 1981-97 from *Agricultural Statistics* (USDA, NASS, various years). Price indices from *Agricultural Statistics* (USDA, NASS, various years).

**Table 4—Estimated U.S. market and purchased seed value, 1982**

| Seed stock         | Total market value of seed <sup>1</sup> | Share of total market value of seed | Share of acres planted with purchased seed | Market value of purchased seed | Share of market value of purchased seed |
|--------------------|-----------------------------------------|-------------------------------------|--------------------------------------------|--------------------------------|-----------------------------------------|
|                    | <i>Million dollars</i>                  | <i>Percent</i>                      | <i>Percent</i>                             | <i>Million dollars</i>         | <i>Percent</i>                          |
| Corn               | 1,294                                   | 27.8                                | 95.0                                       | 1,230                          | 40.2                                    |
| Soybeans           | 954                                     | 20.5                                | 55.0                                       | 525                            | 17.2                                    |
| Cotton             | 144                                     | 3.1                                 | 50.0                                       | 72                             | 2.4                                     |
| Wheat              | 888                                     | 19.1                                | 10.0                                       | 89                             | 2.9                                     |
| Total, major crops | 3,280                                   | 70.6                                | 58.4                                       | 1,915                          | 62.6                                    |
| Other crops        | 1,369                                   | 29.4                                | 83.4                                       | 1,142                          | 37.4                                    |
| Total              | 4,649                                   | 100.0                               | 65.8                                       | 3,057                          | 100.0                                   |

<sup>1</sup> Including the market value of saved seed.

Source: McMullen (1987b, pp. 86-87).

**Table 5—Estimated U.S. market and purchased seed values, major crops, 1997**

| Seed stock         | Acres planted        | Seeding rate per acre <sup>1</sup> | Seed cost per acre <sup>2</sup> | Total market value of seed <sup>3</sup> | Share of total market value of seed | Share of acres planted with purchased seed | Market value of purchased seed | Share of market value of purchased seed |
|--------------------|----------------------|------------------------------------|---------------------------------|-----------------------------------------|-------------------------------------|--------------------------------------------|--------------------------------|-----------------------------------------|
|                    | <i>Million acres</i> | <i>Kernels or lbs</i>              | <i>Dollars</i>                  | <i>Million dollars</i>                  | <i>Percent</i>                      | <i>Percent</i>                             | <i>Million dollars</i>         | <i>Percent</i>                          |
| Corn               | 80.2                 | 27,665                             | 28.87                           | 2,316                                   | 35.1                                | 100.0                                      | 2,316                          | 40.2                                    |
| Soybeans           | 70.9                 | 70                                 | 18.78                           | 1,331                                   | 20.2                                | 81.0                                       | 1,078                          | 18.7                                    |
| Cotton             | 13.3                 | 14                                 | 10.49                           | 139                                     | 2.1                                 | 78.0                                       | 109                            | 1.9                                     |
| Wheat <sup>4</sup> | 71.0                 | 83                                 | 12.21                           | 867                                     | 13.1                                | 37.0                                       | 321                            | 5.6                                     |
| Total, major crops | 235.3                |                                    |                                 | 4,653                                   | 70.6                                |                                            | 3,823                          | 66.3                                    |

<sup>1</sup> For corn, kernels per acre was used; for soybeans, wheat, and cotton, pounds per acre was used. Based on figures from select States, from USDA, Agriculture Resource Management Survey (ARMS), 1998.

<sup>2</sup> Seed cost per acre is based on USDA's ARMS data.

<sup>3</sup> Including the market value of saved seed.

<sup>4</sup> Compiled from statistics provided in this report on winter wheat, spring wheat, and durum wheat. Seeding rate, seed cost per acre, and share of acres planted with purchased seed are based on the weighted averages of the three types of wheat. For durum, the seed cost per acre was not available and was estimated according to the percent change in the unit price of the crop.

Source: Acres planted from *Agricultural Statistics* (USDA, NASS, 1998); other data from ARMS.

\$20.40 in 1989, due to an 11-percent increase (nominal; 5 percent in real terms) in corn seed price.

*Soybeans.* Soybean seeding rates per acre showed little year-to-year variation. For example, the seeding rate per acre was constant at 57 pounds from 1980 to 1985; the rate increased to 59 pounds in 1986 and 60 pounds in 1989 (table 6). Seeding costs per acre, however, varied significantly due to changes in the average seed price of soybeans. Seeding rates per acre were the same (70 pounds) in 1995 and 1996, but seeding costs per acre were higher in 1996 (\$18.62) than in 1995 (\$16.80) due to higher seed prices. Soybean seeding rates tend to be lower in Southern States, such as Arkansas, Georgia, Mississippi, Tennessee, and Louisiana. Northern States, on the other hand, have

higher seeding rates and yields, and therefore have higher seed costs per acre than Southern States.

From 1986 to 1996, farmers in the major soybean-producing States used purchased seed on more than 70 percent of the planted acreage and consequently had higher production costs per acre. The choice of purchased versus homegrown seed is influenced by many factors, such as difference in seed price and yield. Although homegrown seed is cheaper than purchased seed, homegrown seed requires cleaning, inoculation before planting, and germination tests, and in some instances, the seeding rate may have to be increased. Furthermore, the yield potential of new purchased varieties may exceed that of (older) homegrown varieties.

**Table 6—Seeding rate, cost per acre, and share of acres with purchased seed, major field crops in surveyed States**

| Year   | Corn          |               |                     |                  | Soybeans      |               |                     |                  | Cotton        |               |                     |                  | Deflator:<br>(Index of prices paid by U.S. farmers)<br>1984=1.00 |                        | Real price of seed |                    |
|--------|---------------|---------------|---------------------|------------------|---------------|---------------|---------------------|------------------|---------------|---------------|---------------------|------------------|------------------------------------------------------------------|------------------------|--------------------|--------------------|
|        | Average       |               | Acres               |                  | Average       |               | Acres               |                  | Average       |               | Acres               |                  | Seed price per bushel                                            | Prices paid per bushel | Corn per bushel    | Soybean per bushel |
|        | rate per acre | cost per acre | with purchased seed | price per bushel | rate per acre | cost per acre | with purchased seed | price per bushel | rate per acre | cost per acre | with purchased seed | price per bushel |                                                                  |                        |                    |                    |
|        | Kernels       | Dollars       | Percent             | Dollars          | Pounds        | Dollars       | Percent             | Dollars          | Pounds        | Dollars       | Percent             | Dollars          |                                                                  |                        |                    | —1984 dollars—     |
| 1972   | 20,955        | 4.90          | NA                  | 21.50            | 68            | 5.90          | NA                  | 5.21             | 25.00         | 4.35          | NA                  | 17.40            | 0.38                                                             |                        | 57.11              | 13.84              |
| 1973   | 20,955        | 5.03          | NA                  | 22.20            | 68            | 9.89          | NA                  | 8.75             | 25.00         | 4.56          | NA                  | 18.30            | 0.43                                                             |                        | 51.05              | 20.12              |
| 1974   | 20,955        | 5.66          | NA                  | 25.00            | 68            | 10.74         | NA                  | 9.50             | 25.00         | 6.33          | NA                  | 25.30            | 0.49                                                             |                        | 50.58              | 19.22              |
| 1975   | 22,110        | 8.74          | NA                  | 36.50            | 63            | 11.03         | NA                  | 10.50            | 26.00         | 8.74          | NA                  | 33.60            | 0.54                                                             |                        | 67.22              | 19.34              |
| 1976   | 22,110        | 8.74          | NA                  | 36.50            | 63            | 7.77          | NA                  | 7.40             | 26.00         | 7.41          | NA                  | 28.50            | 0.58                                                             |                        | 63.11              | 12.79              |
| 1977   | 22,110        | 9.57          | NA                  | 40.00            | 63            | 13.65         | NA                  | 13.00            | 26.00         | 7.88          | NA                  | 30.30            | 0.61                                                             |                        | 65.54              | 21.30              |
| 1978   | 22,110        | 10.29         | NA                  | 43.00            | 63            | 12.10         | NA                  | 11.50            | 26.00         | 8.06          | NA                  | 31.00            | 0.66                                                             |                        | 65.16              | 17.43              |
| 1979   | 22,110        | 10.88         | NA                  | 45.50            | 63            | 12.60         | NA                  | 12.00            | 26.00         | 8.61          | NA                  | 33.10            | 0.75                                                             |                        | 60.58              | 15.98              |
| 1980   | 21,945        | 12.46         | NA                  | 52.50            | 57            | 9.88          | NA                  | 10.40            | 26.00         | 9.15          | NA                  | 35.20            | 0.84                                                             |                        | 62.52              | 12.39              |
| 1981   | 21,945        | 14.23         | NA                  | 60.00            | 57            | 13.30         | NA                  | 14.00            | 24.00         | 9.74          | NA                  | 40.60            | 0.92                                                             |                        | 65.45              | 15.27              |
| 1982   | 21,879        | 15.12         | NA                  | 63.70            | 57            | 10.17         | NA                  | 10.70            | 24.00         | 9.98          | NA                  | 41.60            | 0.95                                                             |                        | 66.71              | 11.21              |
| 1983   | 21,896        | 15.26         | NA                  | 64.60            | 57            | 9.60          | NA                  | 10.10            | 24.00         | 10.27         | NA                  | 42.80            | 0.98                                                             |                        | 66.06              | 10.33              |
| 1984   | 21,900        | 16.67         | NA                  | 70.20            | 57            | 12.73         | NA                  | 13.40            | 24.00         | 11.52         | NA                  | 48.00            | 1.00                                                             |                        | 70.20              | 13.40              |
| 1985   | 21,912        | 16.96         | NA                  | 71.80            | 57            | 13.31         | NA                  | 11.90            | 24.00         | 11.57         | NA                  | 48.20            | 0.99                                                             |                        | 72.57              | 12.03              |
| 1986   | 23,800        | 19.09         | 100                 | 65.60            | 59            | 10.44         | 73                  | 10.80            | 18.13         | 7.81          | 68                  | 46.60            | 0.97                                                             |                        | 67.76              | 11.16              |
| 1987   | 24,000        | 18.30         | 100                 | 64.90            | 59            | 10.05         | 73                  | 11.30            | 19.09         | 8.46          | 81                  | 48.10            | 0.98                                                             |                        | 66.01              | 11.49              |
| 1988   | 24,100        | 18.64         | 100                 | 64.20            | 62            | 12.86         | 73                  | 11.90            | 18.00         | 8.36          | 86                  | 47.70            | 1.05                                                             |                        | 60.86              | 11.28              |
| 1989   | 24,100        | 20.40         | 100                 | 71.40            | 60            | 15.52         | 68                  | 14.70            | 18.00         | 8.17          | 67                  | 50.10            | 1.12                                                             |                        | 63.93              | 13.16              |
| 1990   | 24,700        | 20.50         | 100                 | 69.90            | 62            | 14.20         | 71                  | 12.50            | 17.00         | 7.80          | 70                  | 54.30            | 1.16                                                             |                        | 60.24              | 10.77              |
| 1991   | 24,906        | 20.79         | 100                 | 70.20            | 64            | 15.07         | 73                  | 12.80            | 17.00         | 8.11          | 66                  | 58.20            | 1.18                                                             |                        | 59.41              | 10.83              |
| 1992   | 25,304        | 21.35         | 100                 | 71.80            | 65            | 15.40         | 73                  | 12.40            | 16.00         | 8.74          | 74                  | 59.70            | 1.19                                                             |                        | 60.14              | 10.39              |
| 1993   | 25,564        | 22.72         | 100                 | 72.70            | NA            | 16.29         | 73                  | 12.40            | 16.00         | 9.39          | 69                  | 62.70            | 1.22                                                             |                        | 59.43              | 10.14              |
| 1994*  | 25,824        | 23.54         | 100                 | 73.40            | NA            | 17.25         | 72                  | 13.60            | 16.00         | 9.49          | 66                  | 63.50            | 1.25                                                             |                        | 58.52              | 10.84              |
| 1995*  | 26,588        | 24.50         | 100                 | 77.10            | 70            | 16.80         | 71                  | 13.40            | 15.00         | 9.67          | 64                  | 68.20            | 1.29                                                             |                        | 59.87              | 10.40              |
| 1996** | 27,500        | 25.97         | 100                 | 77.70            | 70            | 18.62         | 76                  | 14.80            | 14.00         | 9.85          | 66                  | 73.00            | 1.36                                                             |                        | 57.30              | 10.91              |
| 1997** | 27,665        | NA            | 100                 | 83.50            | 70*           | NA            | 81                  | 16.10            | 14.00         | NA            | 78                  | 74.90            | 1.39                                                             |                        | 60.07              | 11.58              |

\* States included: corn: IL, IN, IA, MI, MN, MO, NE, OH, SD, and WI; soybeans: IL, IN, IA, MN, MO, NE, OH, AR, GA, KY, LA, MS, NC, and TN; cotton: AR, GA, CA, LA, MS, and TX.

\*\*States included: corn: IL, IN, IA, MI, MN, MO, NE, OH, SD, and WI; soybeans: IL, IN, IA, MN, MO, NE, OH, AR, LA, MS, and TN; cotton: AR, CA, GA, LA, MS, TN, and TX.

NA = not available

Sources: Average rate per acre is based on data from Cropping Practices Surveys and Agricultural Resource Management Survey (ARMS). Cost per acre for 1972-85 is computed by multiplying rate per acre (pounds) with the price of seed per pound; cost per acre for 1987-96 is based on data from Cropping Practices Surveys and ARMS. Seed prices and deflator are from *Agricultural Statistics* (USDA, NASS, various years).

Table 7—Seeding rate, cost per acre, and share of acres with purchased wheat seed in surveyed States

| Year   | Winter wheat                |                           |         |                        |                             | Spring wheat                |                           |         |                        |                             | Durum wheat                 |                           |         |                                                 | Deflator:                      |                                | Real price of seed |
|--------|-----------------------------|---------------------------|---------|------------------------|-----------------------------|-----------------------------|---------------------------|---------|------------------------|-----------------------------|-----------------------------|---------------------------|---------|-------------------------------------------------|--------------------------------|--------------------------------|--------------------|
|        | Average<br>rate per<br>acre | Acres                     |         | Price<br>per<br>bushel | Average<br>rate per<br>acre | Average<br>cost<br>per acre | Acres                     |         | Price<br>per<br>bushel | Average<br>rate per<br>acre | Average<br>cost<br>per acre | Acres                     |         | prices paid<br>by U.S.<br>farmers)<br>1984=1.00 | Winter<br>wheat,<br>per bushel | Spring<br>wheat,<br>per bushel |                    |
|        |                             | with<br>purchased<br>seed | Percent |                        |                             |                             | with<br>purchased<br>seed | Percent |                        |                             |                             | with<br>purchased<br>seed | Percent |                                                 |                                |                                |                    |
|        | Pounds                      | Dollars                   | Percent | Dollars                | Pounds                      | Dollars                     | Percent                   | Dollars | Pounds                 | Dollars                     | Pounds                      | Dollars                   | Percent |                                                 |                                |                                |                    |
| 1972   | 68                          | 3.36                      | NA      | 2.97                   | 73                          | 3.21                        | NA                        | 2.63    | NA                     | NA                          | NA                          | NA                        | NA      | 0.38                                            | 7.89                           | 6.99                           |                    |
| 1973   | 66                          | 7.92                      | NA      | 7.20                   | 74                          | 3.97                        | NA                        | 3.20    | NA                     | NA                          | NA                          | NA                        | NA      | 0.43                                            | 16.56                          | 7.36                           |                    |
| 1974   | 68                          | 8.55                      | NA      | 7.50                   | 75                          | 10.5                        | NA                        | 8.40    | NA                     | NA                          | NA                          | NA                        | NA      | 0.49                                            | 15.17                          | 17.00                          |                    |
| 1975   | 74                          | 7.50                      | NA      | 6.10                   | 75                          | 10.4                        | NA                        | 7.70    | NA                     | NA                          | NA                          | NA                        | NA      | 0.54                                            | 11.23                          | 14.18                          |                    |
| 1976   | 74                          | 7.38                      | NA      | 6.00                   | 81                          | 8.78                        | NA                        | 6.50    | NA                     | NA                          | NA                          | NA                        | NA      | 0.58                                            | 10.37                          | 11.24                          |                    |
| 1977   | 70                          | 5.15                      | NA      | 4.40                   | 86                          | 7.44                        | NA                        | 5.20    | NA                     | NA                          | NA                          | NA                        | NA      | 0.61                                            | 7.21                           | 8.52                           |                    |
| 1978   | 69                          | 6.79                      | NA      | 5.90                   | 81                          | 6.89                        | NA                        | 5.10    | NA                     | NA                          | NA                          | NA                        | NA      | 0.66                                            | 8.94                           | 7.73                           |                    |
| 1979   | 67                          | 8.21                      | NA      | 7.40                   | 72                          | 6.48                        | NA                        | 5.40    | NA                     | NA                          | NA                          | NA                        | NA      | 0.75                                            | 9.85                           | 7.19                           |                    |
| 1980   | 69                          | 8.72                      | NA      | 7.40                   | 79                          | 8.71                        | NA                        | 6.60    | NA                     | NA                          | NA                          | NA                        | NA      | 0.84                                            | 8.81                           | 7.86                           |                    |
| 1981   | 73                          | 8.89                      | NA      | 7.41                   | 79                          | 0.53                        | NA                        | 7.22    | NA                     | NA                          | NA                          | NA                        | NA      | 0.92                                            | 8.08                           | 7.88                           |                    |
| 1982   | 73                          | 9.10                      | NA      | 7.42                   | 79                          | 9.10                        | NA                        | 6.89    | NA                     | NA                          | NA                          | NA                        | NA      | 0.95                                            | 7.77                           | 7.22                           |                    |
| 1983   | 72                          | 8.74                      | NA      | 7.28                   | 87                          | 9.70                        | NA                        | 6.69    | NA                     | NA                          | NA                          | NA                        | NA      | 0.98                                            | 7.44                           | 6.84                           |                    |
| 1984   | 73                          | 8.51                      | NA      | 7.40                   | 69                          | 7.33                        | NA                        | 6.37    | NA                     | NA                          | NA                          | NA                        | NA      | 1.00                                            | 7.40                           | 6.37                           |                    |
| 1985   | 72                          | 8.23                      | NA      | 7.16                   | 79                          | 8.03                        | NA                        | 6.10    | NA                     | NA                          | NA                          | NA                        | NA      | 0.99                                            | 7.24                           | 6.17                           |                    |
| 1986   | 70                          | 7.22                      | 43      | NA                     | 89                          | 7.67                        | 52                        | 5.94    | 93                     | 7.13                        | 93                          | 7.13                      | 33      | 0.97                                            | NA                             | 6.14                           |                    |
| 1987   | 73                          | 6.20                      | 40      | NA                     | 88                          | 6.97                        | 49                        | 5.56    | 102                    | 7.62                        | 102                         | 7.62                      | 44      | 0.98                                            | NA                             | 5.66                           |                    |
| 1988   | 75                          | 7.67                      | 53      | 7.55                   | 90                          | 8.58                        | 46                        | 5.89    | 99                     | 8.05                        | 99                          | 8.05                      | 47      | 1.05                                            | 7.16                           | 5.58                           |                    |
| 1989   | 77                          | 9.59                      | 41      | 6.57                   | 89                          | 8.82                        | 40                        | 6.71    | 99                     | 10.13                       | 99                          | 10.13                     | 47      | 1.12                                            | 5.88                           | 6.01                           |                    |
| 1990   | 74                          | 8.61                      | 39      | 8.01                   | 88                          | 8.40                        | 39                        | 6.05    | 97                     | 7.50                        | 97                          | 7.50                      | 27      | 1.16                                            | 6.90                           | 5.21                           |                    |
| 1991   | 74                          | 8.65                      | 36      | 6.89                   | 89                          | 6.52                        | 32                        | 4.72    | 100                    | 6.66                        | 100                         | 6.66                      | 27      | 1.18                                            | 5.83                           | 3.99                           |                    |
| 1992   | 74                          | 8.65                      | 36      | 7.41                   | 91                          | 8.39                        | 41                        | 6.06    | 96                     | 7.56                        | 96                          | 7.56                      | 36      | 1.19                                            | 6.21                           | 5.08                           |                    |
| 1993   | 72                          | 8.25                      | 40      | 7.73                   | 93                          | 8.54                        | 40                        | 5.98    | 100                    | 7.69                        | 100                         | 7.69                      | 40      | 1.22                                            | 6.32                           | 4.89                           |                    |
| 1994*  | 71                          | 7.68                      | 39      | 7.90                   | 95                          | 10.11                       | 38                        | 7.37    | 103                    | 12.60                       | 103                         | 12.60                     | 37      | 1.25                                            | 6.30                           | 5.88                           |                    |
| 1995*  | 74                          | 9.10                      | 33      | 7.80                   | 96                          | 10.24                       | 36                        | 7.12    | 109                    | 12.24                       | 109                         | 12.24                     | 41      | 1.29                                            | 6.06                           | 5.53                           |                    |
| 1996** | 69                          | 8.27                      | 32      | 8.50                   | 101                         | 14.61                       | 21                        | 8.10    | 107                    | 13.88                       | 107                         | 13.88                     | 20      | 1.36                                            | 6.27                           | 5.97                           |                    |
| 1997*  | 73                          | NA                        | 36      | 10.00                  | 98                          | NA                          | 41                        | 7.30    | 112                    | NA                          | 112                         | NA                        | 12      | 1.39                                            | 7.19                           | 5.25                           |                    |

\* States included: winter wheat: CO, ID, IL, KS, MO, MT, NE, OH, OK, OR, SD, TX, and WA; spring wheat: MN, MT, ND, and SD.

\*\* States included: winter wheat: CO, ID, KS, MT, NE, OH, OK, OR, SD, TX, and WA; spring wheat: MN, MT, and ND.

NA = not available.

Sources: Average rate per acre is based on data from the Cropping Practices Surveys and Agricultural Resource Management Survey (ARMS). Cost per acre for 1972-85 is computed by multiplying rate per acre (pounds) with the price of seed per pound; cost per acre for 1987-96 is based on Cropping Practices Surveys and ARMS. Seed prices and deflator are from *Agricultural Statistics* (USDA, NASS, various years).

*Cotton.* Average cotton seeding rates and seed costs per acre vary from year to year. From 1972 to 1985, average seeding rates per acre ranged from 24 to 26 pounds. However, average cost per acre was highest in 1985 (\$11.57) due to a higher cotton seed price of \$48.20 per 100 pounds. From 1986 to 1996, cotton seeding costs per acre were lower due to lower seeding rates. Although cotton seed price over the same period was much higher than in previous years, lower seeding rates offset the higher cost of producing cotton. From 1986 to 1997, the share of the cotton acres planted with purchased cotton seed ranged from 64 to 81 percent.

*Wheat.* The average seeding rates per acre for winter wheat vary from year to year (table 7). From 1972 to 1996, the average seeding rates per acre ranged from 66 to 77 pounds. Areas where moisture is plentiful in the growing season, due to either heavy rain or irrigation, support heavier seeding rates. Seeding costs per acre reflect either seed price or seeding rate per acre or both. Average share of winter wheat acres planted with purchased seed also varied from year to year. The type of winter wheat (white, soft red, and hard red), as well as local economic situations, seed prices, and yield of purchased seed, apparently account for much of the variation. For example, in 1993, Washington, Idaho, Oregon, Ohio, and Illinois used purchased seed on more than 60 percent of the winter wheat acreage. In the rest of the producing States, the share of acreage planted from purchased seed ranged from 21 to 51 percent (USDA, 1993). The average seed cost per acre of spring and durum wheat also varied across geographic regions and from year to year due to changes in seeding rate and seed price. Farmers used homegrown spring and durum wheat seed on more than 50 percent of their acreage.

## International Seed Markets

The United States is a net exporter of seed, with a seed trade surplus of \$384 million in 1996 (table 8). The value of U.S. seed exports grew from \$305 million in 1982 to \$698 million in 1996. This increase primarily reflects increases in exports of seed for forage crops, vegetables, flowers, and corn. Mexico, Canada, Italy, Japan, France, the Netherlands and, more recently, Argentina, are the largest importers of U.S. seed. Together, these countries accounted for approximately 72 percent of total U.S. seed exports in 1996 (table 9). On a regional basis, North America and Central America (39 percent), Western Europe (29 percent), Middle East and Asia (18 percent), and South America (10 percent)

accounted for 96 percent of the total value of U.S. exports in 1996.

Some demand for seed in the United States is met by imports, which compete with U.S.-grown seed in quality, price, and other factors. While both exports and imports of seeds grew substantially over the past two decades, the growth rate of seed imports has exceeded that of seed exports in the United States. The value of total seed imports increased from \$87 million in 1985 to \$314 million in 1996, a growth rate more than three times that of exports (table 8). This increase is largely reflected in increased seed imports for corn, forage, vegetables, flowers, and other crops. Moreover, the United States also takes part in an extensive amount of multidirectional trade in international seed markets, in which the seeds for many of the same crops are exported and imported.

In 1996, U.S. demand for imported seed was met by a number of different countries. Canada (28 percent), Chile (18 percent), and the Netherlands (9 percent) had the highest shares of total value of U.S. seed imports. On a regional basis, the leading suppliers of seed to the United States were North America and Central America, followed by South America, Asia, and Western Europe (table 10).

In terms of volume, the six leading importing countries of U.S. field corn seed are Italy, Mexico, Canada, France, the Netherlands, and Spain. Shares of these countries' imports of U.S. field corn, which vary from year to year, dropped from 79 percent in 1995 to 63 percent in 1996 (table 11). Over the same period, the volume of U.S. corn seed exports to the six leading importers fell to 53,955 metric tons, a 19-percent decline. Despite this drop, total U.S. corn seed exports to all countries reached 86,183 metric tons in 1996, an increase of 2 percent over 1995 (table 11).

The top three importing countries of U.S. soybean seed by volume are Mexico, Italy, and Japan. In 1996, volume of U.S. soybean seed exports to these three leading trading partners was 63,881 metric tons, an increase of 11 percent from 1995. Together these countries accounted for 86 percent of total U.S. soybean seed exports. From 1995 to 1996, soybean seed exports to Japan increased 41 percent but exports to Italy declined 12 percent and exports to Mexico remained unchanged. Over the same period, however, the volume of total U.S. soybean seed exports to all countries increased 16 percent, from 63,982 metric tons to 73,911 metric tons.

**Table 8—Exports and imports of U.S. seed for planting**

| Item                                                | 1982  | 1983  | 1984  | 1985  | 1986  | 1987  | 1988  | 1989  | 1990  | 1991  | 1992  | 1993  | 1994  | 1995  | 1996  |
|-----------------------------------------------------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|
| <i>Million dollars</i>                              |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |
| <i>Exports:</i>                                     |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |
| Forage                                              | 66    | 65    | 70    | 59    | 74    | 75    | 94    | 96    | 104   | 101   | 114   | 116   | 120   | 115   | 139   |
| Vegetables                                          | 115   | 122   | 135   | 120   | 128   | 138   | 167   | 153   | 176   | 220   | 221   | 218   | 240   | 242   | 231   |
| Flowers                                             | 5     | 6     | 9     | 8     | 9     | 8     | 9     | 11    | 13    | 14    | 19    | 19    | 22    | 27    | 32    |
| Corn <sup>1</sup>                                   | 55    | 73    | 46    | 89    | 77    | 63    | 66    | 68    | 138   | 181   | 177   | 168   | 181   | 165   | 144   |
| Grain sorghum                                       | 28    | 32    | 33    | 33    | 29    | 16    | 29    | 55    | 27    | 28    | 34    | 34    | 20    | 12    | 19    |
| Soybeans                                            | 22    | 12    | 19    | 17    | 19    | 36    | 26    | 54    | 45    | 41    | 30    | 28    | 23    | 25    | 25    |
| Trees/shrubs                                        | 2     | 2     | 2     | 2     | 2     | 2     | 3     | 4     | 2     | 2     | 3     | 2     | 2     | 2     | 4     |
| Sugarbeets                                          | 4     | 4     | 3     | 2     | 2     | 1     | 2     | 1     | 2     | 3     | 3     | 3     | 4     | 2     | 3     |
| Other                                               | 8     | 14    | 5     | 28    | 31    | 33    | 26    | 68    | 81    | 82    | 68    | 31    | 41    | 77    | 101   |
| Total exports                                       | 305   | 330   | 322   | 358   | 371   | 372   | 422   | 510   | 588   | 672   | 669   | 619   | 652   | 667   | 698   |
| Deflator, index<br>of prices received<br>by farmers | 0.938 | 0.948 | 1.000 | 0.901 | 0.854 | 0.867 | 0.966 | 1.015 | 1.017 | 0.974 | 0.965 | 0.991 | 0.977 | 0.995 | 1.097 |
| Exports in 1984 \$                                  | 325.0 | 348.2 | 322.0 | 397.2 | 434.6 | 428.8 | 436.8 | 502.3 | 578.2 | 690.1 | 693.6 | 624.8 | 667.4 | 670.1 | 636.2 |
| <i>Imports:</i>                                     |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |
| Forage                                              | 17    | 34    | 17    | 18    | 39    | 65    | 52    | 43    | 35    | 31    | 45    | 45    | 39    | 44    | 52    |
| Vegetables                                          | 31    | 31    | 32    | 34    | 42    | 49    | 58    | 56    | 60    | 79    | 82    | 83    | 85    | 97    | 107   |
| Flowers                                             | 12    | 10    | 18    | 18    | 18    | 21    | 21    | 24    | 23    | 24    | 27    | 31    | 35    | 43    | 56    |
| Corn <sup>2</sup>                                   | 12    | 6     | 22    | 14    | 9     | 5     | 10    | 37    | 18    | 15    | 35    | 29    | 44    | 35    | 63    |
| Trees/shrubs                                        | 1     | 1     | 1     | 1     | 1     | 1     | 2     | 2     | 2     | 2     | 2     | 2     | 1     | 2     | 4     |
| Other                                               | 3     | 2     | 1     | 2     | 3     | 4     | 4     | 6     | 9     | 14    | 10    | 17    | 23    | 22    | 32    |
| Total imports                                       | 76    | 84    | 90    | 87    | 112   | 146   | 147   | 168   | 147   | 165   | 201   | 208   | 227   | 243   | 314   |
| Imports in 1984 \$                                  | 81.0  | 88.6  | 90.0  | 96.5  | 131.2 | 168.3 | 152.2 | 165.5 | 144.6 | 169.4 | 208.4 | 209.9 | 232.4 | 244.1 | 286.2 |
| Trade balance                                       | 229   | 246   | 231   | 271   | 258   | 226   | 275   | 342   | 441   | 507   | 463   | 411   | 425   | 424   | 384   |
| Trade balance<br>in 1984 \$                         | 244.0 | 259.6 | 231   | 300.6 | 303.4 | 260.5 | 284.6 | 336.8 | 433.7 | 520.6 | 485.2 | 414.8 | 435.1 | 426.0 | 350.0 |

<sup>1</sup> Does not include seed for sweet corn or corn seed provided as food aid.

<sup>2</sup> Certified corn.

Source: Compiled by Mohinder Gill from USDA's Foreign Agricultural Service (FAS) data.

**Table 9—Regional and country shares of U.S. seed exports**

| Region and country                        | 1982  | 1983  | 1984  | 1985  | 1986  | 1987  | 1988  | 1989  | 1990  | 1991  | 1992  | 1993  | 1994  | 1995  | 1996  |
|-------------------------------------------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|
| <i>Percent of total value</i>             |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |
| North and                                 |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |
| Central America                           | 30.0  | 32.8  | 31.2  | 25.0  | 20.7  | 24.7  | 23.0  | 33.4  | 26.4  | 24.8  | 30.7  | 33.7  | 31.7  | 29.5  | 39.0  |
| Canada                                    | 9.5   | 8.8   | 8.9   | 7.4   | 6.3   | 9.4   | 8.3   | 6.2   | 10.2  | 10.0  | 11.3  | 11.8  | 11.9  | 13.2  | 12.2  |
| Mexico                                    | 18.0  | 21.9  | 19.6  | 15.1  | 12.3  | 13.0  | 12.6  | 25.4  | 14.4  | 13.2  | 17.8  | 20.1  | 18.0  | 14.7  | 25.5  |
| Other                                     | 2.5   | 2.1   | 2.7   | 2.5   | 2.0   | 2.3   | 2.1   | 1.8   | 1.8   | 1.6   | 1.6   | 1.8   | 1.8   | 1.6   | 1.3   |
| South America                             | 6.9   | 8.0   | 8.8   | 7.0   | 9.0   | 7.6   | 10.9  | 5.7   | 4.3   | 4.1   | 5.6   | 7.4   | 8.1   | 8.6   | 9.8   |
| Argentina                                 | 0.7   | 1.0   | 2.0   | 1.1   | 2.5   | 2.5   | 3.0   | 2.0   | 1.4   | 1.4   | 3.0   | 3.0   | 4.1   | 4.4   | 6.0   |
| Brazil                                    | 1.7   | 2.0   | 1.0   | 1.1   | 1.1   | 1.2   | 1.2   | 0.6   | 0.5   | 0.6   | 0.5   | 1.0   | 0.9   | 1.1   | 0.8   |
| Chile                                     | 0.3   | 0.6   | 1.1   | 0.3   | 0.4   | 0.5   | 0.8   | 0.6   | 0.6   | 0.6   | 0.6   | 1.0   | 1.1   | 1.0   | 1.0   |
| Colombia                                  | 1.0   | 1.2   | 1.4   | 0.8   | 1.0   | 0.9   | 1.1   | 0.6   | 0.6   | 0.6   | 0.6   | 0.7   | 0.6   | 0.7   | 0.6   |
| Venezuela                                 | 2.4   | 1.9   | 2.2   | 2.9   | 3.0   | 1.4   | 3.3   | 0.6   | 0.6   | 0.6   | 0.4   | 0.7   | 0.5   | 0.5   | 0.4   |
| Other                                     | 0.8   | 1.4   | 1.0   | 0.8   | 1.0   | 1.1   | 1.5   | 1.4   | 0.5   | 0.5   | 0.5   | 1.1   | 0.8   | 0.9   | 1.0   |
| Western Europe                            | 35.2  | 29.8  | 26.4  | 37.5  | 36.4  | 39.7  | 34.9  | 29.4  | 40.7  | 42.3  | 36.1  | 30.3  | 30.3  | 34.9  | 29.3  |
| France                                    | 5.5   | 4.9   | 4.2   | 9.6   | 6.2   | 4.5   | 4.5   | 3.7   | 7.4   | 7.2   | 6.3   | 6.0   | 4.9   | 5.1   | 4.2   |
| Germany                                   | 2.7   | 2.0   | 1.7   | 1.8   | 1.7   | 1.6   | 1.4   | 1.3   | 1.7   | 3.0   | 1.9   | 1.8   | 2.8   | 1.6   | 1.9   |
| Greece                                    | 2.3   | 1.7   | 1.4   | 1.9   | 2.3   | 1.3   | 1.8   | 1.0   | 1.4   | 2.0   | 1.3   | 1.8   | 2.8   | 1.9   | 3.4   |
| Italy                                     | 10.2  | 8.5   | 8.3   | 12.5  | 12.7  | 19.3  | 12.4  | 11.2  | 16.8  | 16.2  | 14.8  | 10.7  | 10.0  | 11.5  | 10.1  |
| Netherlands                               | 4.8   | 4.8   | 3.4   | 4.6   | 5.8   | 5.4   | 4.4   | 4.2   | 4.9   | 6.0   | 4.4   | 4.7   | 4.7   | 6.6   | 3.7   |
| Spain                                     | 1.5   | 1.0   | 1.2   | 1.4   | 1.6   | 2.1   | 4.4   | 2.9   | 3.4   | 2.5   | 2.4   | 2.0   | 2.3   | 3.7   | 2.5   |
| United Kingdom                            | 3.4   | 2.6   | 2.2   | 2.7   | 2.8   | 2.6   | 2.9   | 2.6   | 1.9   | 1.7   | 1.7   | 1.4   | 1.4   | 1.9   | 2.0   |
| Other                                     | 4.6   | 4.2   | 4.0   | 3.1   | 3.4   | 2.8   | 3.1   | 2.5   | 3.2   | 3.5   | 3.5   | 1.8   | 1.3   | 2.6   | 1.5   |
| Eastern Europe and<br>former Soviet Union | 0.9   | 1.1   | 0.5   | 3.3   | 4.8   | 0.2   | 2.0   | 1.0   | 2.0   | 3.7   | 1.6   | 7.2   | 5.4   | 1.3   | 0.8   |
| Romania                                   | 0.2   | 0.2   | 0.2   | 0.3   | 0.5   | 0.0   | 0.6   | 0.3   | 0.8   | 1.5   | 0.5   | 2.0   | 2.2   | 0.0   | 0.0   |
| Ukraine                                   | 0.4   | 0.1   | 0.0   | 0.3   | 0.7   | 0.0   | 0.0   | 0.0   | 0.0   | 0.0   | 0.0   | 4.7   | 0.5   | 0.7   | 0.1   |
| Other                                     | 0.3   | 0.8   | 0.5   | 2.7   | 3.6   | 0.2   | 1.3   | 0.7   | 1.2   | 2.2   | 1.1   | 0.6   | 2.7   | 0.5   | 0.7   |
| Middle East and Asia                      | 20.8  | 21.3  | 26.5  | 21.9  | 23.9  | 22.6  | 24.4  | 26.0  | 22.3  | 21.2  | 21.6  | 17.1  | 20.9  | 19.8  | 17.6  |
| Hong Kong                                 |       |       |       |       |       |       |       |       |       |       |       | 0.4   | 2.6   | 0.6   | 0.3   |
| Japan                                     | 11.9  | 11.2  | 11.5  | 10.7  | 9.5   | 12.3  | 11.8  | 8.9   | 7.8   | 7.1   | 8.1   | 8.2   | 9.0   | 8.8   | 9.8   |
| Saudi Arabia                              | 3.4   | 3.1   | 4.5   | 2.8   | 3.6   | 2.0   | 4.2   | 10.4  | 10.0  | 9.4   | 7.9   | 2.3   | 2.6   | 1.7   | 1.5   |
| South Korea                               | 0.5   | 0.7   | 1.5   | 0.8   | 0.9   | 1.0   | 1.0   | 0.7   | 0.6   | 0.7   | 0.9   | 1.2   | 1.7   | 1.4   | 1.3   |
| Other                                     | 5.0   | 6.3   | 9.0   | 7.6   | 9.9   | 7.4   | 7.5   | 6.0   | 3.9   | 4.0   | 4.7   | 4.9   | 5.0   | 7.2   | 4.7   |
| Africa                                    | 4.1   | 4.5   | 4.7   | 2.9   | 3.2   | 3.0   | 2.9   | 2.7   | 2.7   | 2.5   | 2.9   | 3.0   | 2.1   | 3.8   | 1.3   |
| Oceania                                   | 2.1   | 2.6   | 1.9   | 2.4   | 1.9   | 2.2   | 2.0   | 1.5   | 1.5   | 1.4   | 1.4   | 1.3   | 1.7   | 2.0   | 1.7   |
| Australia                                 | 1.7   | 2.2   | 1.5   | 2.0   | 1.6   | 1.8   | 1.7   | 1.2   | 1.2   | 1.2   | 1.2   | 1.0   | 1.3   | 1.6   | 1.4   |
| Other                                     | 0.4   | 0.4   | 0.4   | 0.4   | 0.3   | 0.4   | 0.3   | 0.3   | 0.3   | 0.2   | 0.2   | 0.3   | 0.3   | 0.4   | 0.3   |
| World <sup>1</sup>                        | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 |

<sup>1</sup> Totals may not add due to rounding

Source: Compiled by Mohinder Gill from USDA's Foreign Agricultural Service (FAS) data.

**Table 10—Regional and country shares of U.S. seed imports**

| Region and country                        | 1982  | 1983  | 1984  | 1985  | 1986  | 1987  | 1988  | 1989  | 1990  | 1991  | 1992  | 1993  | 1994  | 1995  | 1996  |
|-------------------------------------------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|
| <i>Percent of total value</i>             |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |
| North and                                 |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |
| Central America                           | 30.0  | 32.8  | 31.2  | 38.5  | 43.4  | 44.4  | 35.8  | 33.2  | 33.4  | 31.4  | 32.6  | 31.2  | 33.9  | 37.1  | 33.5  |
| Canada                                    | 9.5   | 8.8   | 8.9   | 26.7  | 35.1  | 37.7  | 30.4  | 27.0  | 26.1  | 24.9  | 25.4  | 22.8  | 27.2  | 29.2  | 27.5  |
| Mexico                                    | 18.0  | 21.9  | 19.6  | 4.0   | 2.9   | 2.0   | 2.1   | 3.2   | 3.4   | 3.8   | 3.2   | 4.5   | 3.1   | 3.8   | 3.5   |
| Other                                     | 2.5   | 2.1   | 2.7   | 7.7   | 5.4   | 4.7   | 3.2   | 3.2   | 4.0   | 2.7   | 3.9   | 3.9   | 3.6   | 4.1   | 2.5   |
| South America                             | 6.9   | 8.0   | 8.8   | 9.2   | 7.0   | 6.0   | 8.3   | 17.7  | 12.3  | 11.7  | 21.2  | 17.2  | 18.9  | 17.4  | 24.0  |
| Argentina                                 | 0.7   | 1.0   | 2.0   | 0.0   | 0.0   | 1.5   | 0.7   | 4.0   | 1.0   | 0.7   | 3.6   | 3.3   | 2.8   | 2.0   | 4.9   |
| Chile                                     | 0.3   | 0.6   | 1.1   | 8.2   | 6.2   | 4.0   | 6.8   | 13.3  | 11.2  | 10.7  | 17.2  | 13.5  | 15.7  | 14.8  | 18.1  |
| Other                                     | 5.9   | 7.0   | 5.6   | 1.0   | 0.8   | 0.5   | 0.8   | 0.4   | 0.1   | 0.3   | 0.4   | 0.5   | 0.4   | 0.6   | 1.0   |
| Western Europe                            | 35.2  | 29.8  | 26.4  | 21.0  | 18.7  | 19.2  | 16.8  | 16.3  | 15.7  | 18.0  | 16.2  | 21.7  | 18.7  | 18.1  | 15.9  |
| Denmark                                   | 1.1   | 0.9   | 0.7   | 1.6   | 1.2   | 2.1   | 1.9   | 1.5   | 1.4   | 1.2   | 1.7   | 2.6   | 1.3   | 1.5   | 1.8   |
| France                                    | 5.5   | 4.9   | 4.2   | 1.4   | 1.1   | 1.7   | 1.0   | 1.3   | 1.4   | 1.8   | 1.7   | 2.2   | 2.4   | 2.3   | 2.0   |
| Germany                                   | 2.7   | 2.0   | 1.7   | 1.4   | 2.2   | 2.5   | 2.2   | 1.8   | 1.6   | 2.2   | 2.0   | 2.5   | 2.4   | 1.9   | 2.0   |
| Italy                                     | 10.2  | 8.5   | 8.3   | 1.7   | 1.1   | 1.2   | 1.6   | 1.0   | 1.0   | 1.2   | 1.2   | 0.9   | 0.9   | 1.1   | 0.9   |
| Netherlands                               | 4.8   | 4.8   | 3.4   | 11.7  | 10.5  | 10.2  | 9.2   | 8.9   | 9.3   | 10.7  | 8.7   | 12.3  | 10.6  | 10.2  | 7.8   |
| Other                                     | 10.7  | 8.6   | 8.0   | 3.2   | 2.5   | 1.5   | 0.9   | 1.9   | 0.9   | 1.0   | 0.9   | 1.2   | 1.2   | 1.1   | 1.4   |
| Eastern Europe and<br>former Soviet Union | 0.9   | 1.1   | 0.5   | 1.8   | 0.4   | 0.5   | 1.3   | 3.3   | 0.7   | 0.1   | 0.5   | 1.7   | 1.9   | 0.5   | 0.4   |
| Asia                                      | 20.8  | 21.3  | 26.5  | 20.1  | 22.2  | 19.4  | 24.5  | 24.9  | 30.5  | 31.3  | 22.4  | 21.1  | 20.0  | 19.9  | 21.1  |
| China                                     |       |       |       | 0.0   | 0.0   | 0.0   | 2.4   | 3.9   | 6.8   | 9.0   | 5.5   | 4.8   | 6.0   | 7.0   | 7.3   |
| India                                     | 0.0   | 0.0   | 0.0   | 3.3   | 6.5   | 2.9   | 7.5   | 3.5   | 3.1   | 5.2   | 2.7   | 1.8   | 1.9   | 2.4   | 2.4   |
| Japan                                     | 11.9  | 11.2  | 11.5  | 6.1   | 6.1   | 6.0   | 6.4   | 6.9   | 7.6   | 7.8   | 6.2   | 9.0   | 7.7   | 6.3   | 5.3   |
| Taiwan                                    | 0.0   | 0.0   | 0.0   | 7.6   | 6.0   | 6.7   | 4.5   | 6.2   | 4.8   | 3.5   | 3.6   | 1.8   | 0.8   | 1.1   | 1.0   |
| Thailand                                  | 0.0   | 0.0   | 0.0   | 0.0   | 0.0   | 0.7   | 1.6   | 2.8   | 5.4   | 5.3   | 4.0   | 2.8   | 2.0   | 2.5   | 2.6   |
| Other                                     | 8.9   | 10.1  | 15.0  | 3.0   | 3.6   | 3.1   | 2.0   | 1.5   | 2.9   | 0.5   | 0.4   | 0.8   | 1.5   | 0.6   | 2.5   |
| Africa                                    | 4.1   | 4.5   | 4.7   | 6.4   | 4.0   | 3.9   | 3.8   | 0.7   | 0.9   | 1.3   | 1.1   | 1.4   | 1.0   | 1.6   | 1.0   |
| Oceania                                   | 2.1   | 2.6   | 1.9   | 3.0   | 4.3   | 6.5   | 7.4   | 4.0   | 6.4   | 5.5   | 4.5   | 4.6   | 3.1   | 3.3   | 3.5   |
| Australia                                 | 1.7   | 2.2   | 1.5   | 2.2   | 1.8   | 2.1   | 1.8   | 1.6   | 2.2   | 1.9   | 2.0   | 1.4   | 1.9   | 1.6   | 1.6   |
| New Zealand                               | 0.4   | 0.4   | 0.4   | 0.8   | 2.6   | 4.5   | 5.6   | 2.4   | 4.2   | 3.5   | 2.5   | 3.2   | 1.2   | 1.7   | 1.9   |
| Other                                     | 0.0   | 0.0   | 0.0   | 0.0   | 0.0   | 0.0   | 0.0   | 0.0   | 0.0   | 0.0   | 0.0   | 0.0   | 0.0   | 0.0   | 0.0   |
| World <sup>1</sup>                        | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 |

<sup>1</sup> Totals may not add due to rounding

Source: Compiled by Mohinder Gill from USDA's Foreign Agricultural Service (FAS) data.

**Table 11—U.S. exports of corn and soybean seed by country of destination and volume**

| Commodity/country    | 1986   | 1987   | 1988   | 1989    | 1990    | 1991   | 1992   | 1993   | 1994    | 1995   | 1996   |
|----------------------|--------|--------|--------|---------|---------|--------|--------|--------|---------|--------|--------|
| <i>Metric tons</i>   |        |        |        |         |         |        |        |        |         |        |        |
| <i>Corn seed:</i>    |        |        |        |         |         |        |        |        |         |        |        |
| Canada               | 1,621  | 2,505  | 2,582  | 1,548   | 4,076   | 7,561  | 8,192  | 8,678  | 15,421  | 16,890 | 13,217 |
| France               | 2,121  | 2,542  | 2,439  | 2,873   | 9,666   | 10,953 | 13,859 | 8,177  | 6,188   | 7,732  | 5,030  |
| Italy                | 7,939  | 12,229 | 8,741  | 12,168  | 20,889  | 21,773 | 23,955 | 14,178 | 11,782  | 15,042 | 10,383 |
| Mexico               | 3,703  | 3,143  | 3,151  | 10,205  | 10,329  | 7,963  | 12,472 | 15,750 | 16,453  | 15,175 | 15,088 |
| Netherlands          | 5,127  | 695    | 1,060  | 351     | 2,437   | 10,354 | 2,791  | 4,834  | 7,977   | 7,062  | 6,691  |
| Spain                | 1,245  | 2,049  | 4,134  | 1,836   | 4,132   | 2,076  | 2,853  | 2,492  | 4,004   | 4,796  | 3,546  |
| Subtotal             | 21,756 | 22,121 | 22,915 | 28,981  | 51,529  | 66,952 | 65,054 | 56,039 | 62,170  | 66,697 | 53,955 |
| All others           | 22,906 | 10,291 | 10,632 | 7,876   | 18,837  | 26,770 | 13,455 | 32,690 | 43,126  | 17,724 | 32,228 |
| Total, all countries | 44,662 | 32,412 | 33,547 | 36,857  | 70,366  | 93,722 | 78,509 | 88,729 | 105,296 | 84,421 | 86,183 |
| <i>Soybean seed:</i> |        |        |        |         |         |        |        |        |         |        |        |
| Italy                | NA     | 44,348 | 27,833 | 20,185  | 55,937  | 65,571 | 34,500 | 27,764 | 15,711  | 14,672 | 12,970 |
| Japan                | NA     | 4,151  | 5,277  | 1,608   | 2,325   | 6,947  | 7,341  | 7,439  | 9,654   | 19,741 | 27,751 |
| Mexico               | NA     | 12,630 | 8,922  | 100,380 | 36,731  | 4,827  | 32,674 | 19,472 | 8,891   | 23,116 | 23,160 |
| Subtotal             | NA     | 61,129 | 42,032 | 122,173 | 94,993  | 77,345 | 74,515 | 54,675 | 34,256  | 57,572 | 63,881 |
| All others           | NA     | 14,035 | 11,698 | 6,409   | 11,998  | 13,659 | 9,070  | 14,216 | 13,700  | 6,410  | 10,030 |
| Total, all countries | NA     | 75,164 | 53,730 | 128,582 | 106,991 | 91,004 | 83,585 | 68,891 | 47,964  | 63,982 | 73,911 |

NA = not available.

Source: Compiled by Mohinder Gill from USDA's Foreign Agricultural Service (FAS) data.