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U.S. Agricultural Trade Boosts Overall Economy

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Contents

Approved by USDA's World Agricultural Outlook Board

Abstract

U.S. agricultural trade generates employment, income, and purchasing power in both the farm and nonfarm sectors. Each farm export dollar earned stimulated another $1.65 in business activity in calendar year 2006. The $71.0 billion of agricultural exports in 2006 produced an additional $117.2 billion in economic activity for a total economic output of $188.2 billion. Agricultural exports also generated 841,000 full-time civilian jobs, which include 482,000 jobs in the nonfarm sector. Farmers' purchases of fuel, fertilizer, and other inputs to produce commodities for export spurred economic activity in the manufacturing, trade, and transportation sectors.

Keywords: agricultural trade, exports, imports, U.S. farm sector, multipliers, output, employment, income, food processing, bulk, nonbulk

Introduction

As the world becomes more integrated, global trade and the economic links between countries grow ever stronger. U.S. agricultural trade[1] is a significant contributor to the overall U.S. economy and to the rest of the world's economies. The United States continues to be a net exporter of agricultural products, the surplus helping to offset some of the U.S. nonfarm trade deficit. Trade agreements have expanded agricultural trade and, in turn, have opened the U.S. market to exporting opportunities for both developed and developing countries. Such trade benefits developing countries that in the past have had little market access. Agricultural exports by the United States are now enjoying a resurgence due to rising food demand in emerging markets, reduced competition in feed-grain markets, and a weakened dollar. At the same time the value of agricultural imports is rising, averaging 10-percent growth per year since 2001.

The U.S. farm and rural economies have always been affected by international and domestic macroeconomic trade influences. From early colonial days, when tobacco and cotton were the most important export commodities, to today's grain, oilseed, and processed foods, agricultural trade has been an important part of the U.S. economic engine. The North American Free Trade Agreement (NAFTA) and other bilateral and multilateral trade agreements lowered trade barriers and created additional consumer demand for U.S. agricultural commodities in foreign nations. In turn, that demand is satisfied with purchasing power acquired when their products are sold in the United States and elsewhere. The weakening U.S. dollar, which has now fallen to a 30-year low compared with the world's other major currencies, makes the price of U.S. goods increasingly competitive abroad. Canada and Mexico are the leading U.S. trading partners—together, those nations buy over 35 percent of U.S. exports. Meanwhile, U.S. imports of agricultural goods have not slowed despite the weakened buying power of the U.S. dollar. U.S. consumers continue to demand a large variety of imported goods and are willing to pay a premium for them.

Agricultural trade is most importantly a generator of output, employment, and income in the U.S. economy. For every dollar spent on exports in 2006, another $1.65 was created in the economy to support the exporting activity (see table 1, p. 15). ERS model results show that every $1 billion of agricultural exports in 2006 requires 11,800 American jobs (see box, "Data Sources," p. 6).

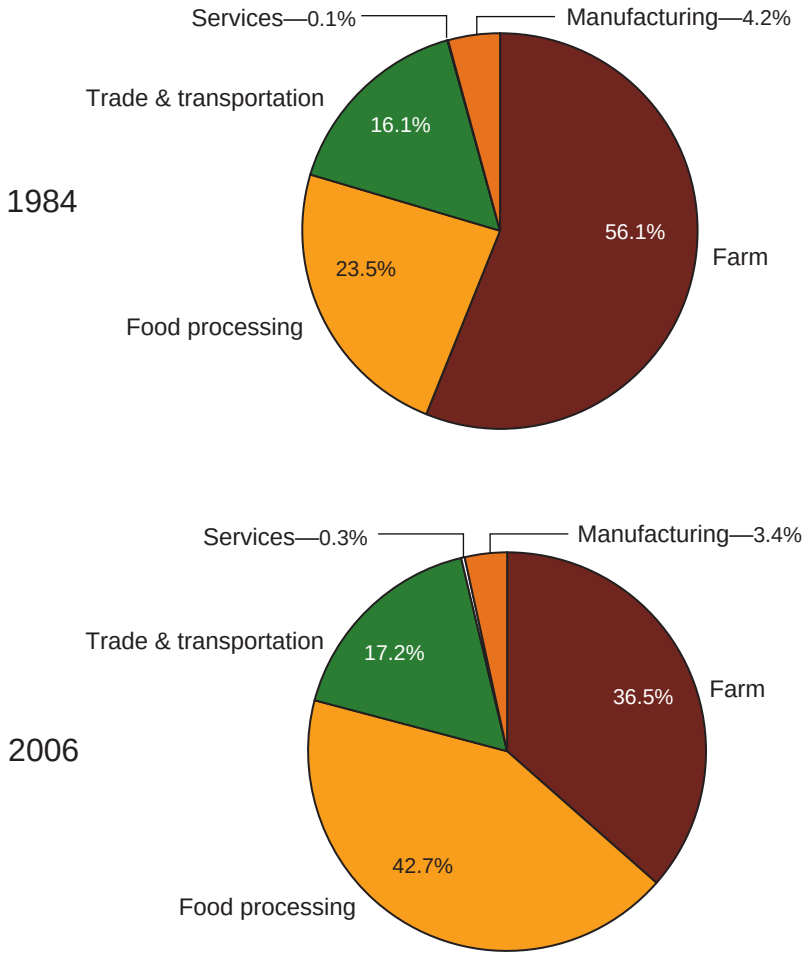
[1]ERS has data on agricultural trade flows in its U.S. Agricultural Trade briefing room. See http://www.ers.usda.gov/Briefing/AgTrade/.

Historical Impacts of Trade

The impacts of agricultural trade on the U.S. economy change from year to year. The changes have been dramatic since this analysis was first performed in the early 1980s. The changes have occurred because of overall changes to the structure of the U.S. economy and because of changes in the types of commodities exported in the intervening years. As can be seen from figure 1, the industrial sectors' shares of the value of agricultural exports have changed considerably since 1984. The farm sector's 56-percent share in 1984 had shrunk to 36.5 percent in 2006. The food-processing sector's exports increased from 23.5 percent in 1984 to 42.7 percent in 2006. While the shares and values of agricultural exports from sectors fluctuate from year to year, the long-term trend is away from bulk and raw farm exports and toward more processed-product exports.

Figure 1

Value share of commodity composition of agricultural exports



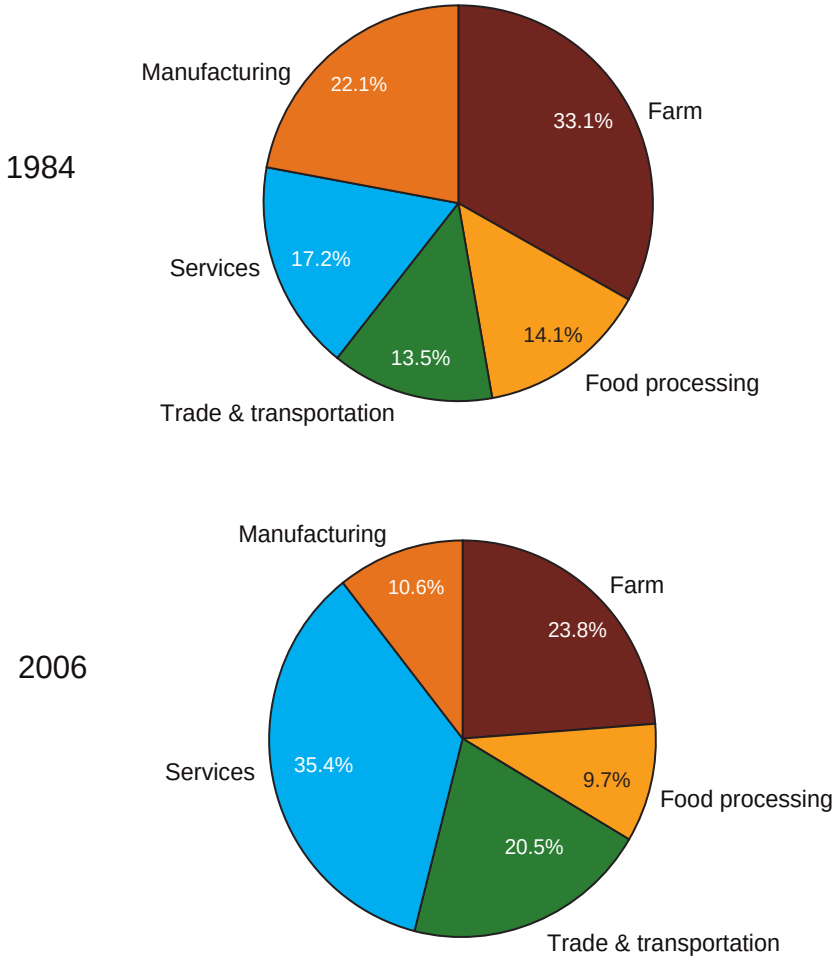
Source: Analysis by Economic Research Service, USDA, based on U.S. Census Bureau trade data, using Bureau of Economic Analysis input-output methodology.

Just as important as who contributes to the value of agricultural trade is who receives the income derived from those exports. Much depends on the year-to-year commodity composition of the "basket "of goods exported, but some overall trends can be discerned. U.S. farms' 33.1-percent share of export income shrank to 23.8 percent between 1984 and 2006 and the food-processing sector's 14.1 percent fell to 9.7 percent (see fig. 2). By contrast, the services sector's share of income more than doubled from 17.2 percent to 35.4 percent. Just as the service sector has become the largest producing sector of the total U.S. economy, it has become the largest earner of income related to agricultural exports. The sector includes data processing as well as financial, legal, managerial, administrative, and many other types of services needed to facilitate the movement of export commodities.

Employment generated by agricultural exports follows the same general trends as do the values of economic activity related to agricultural trade (fig. 3 and fig. 4) with peaks in the early 1990s and 2000s and valleys midway

Figure 2

Distribution of income returned for agricultural exports

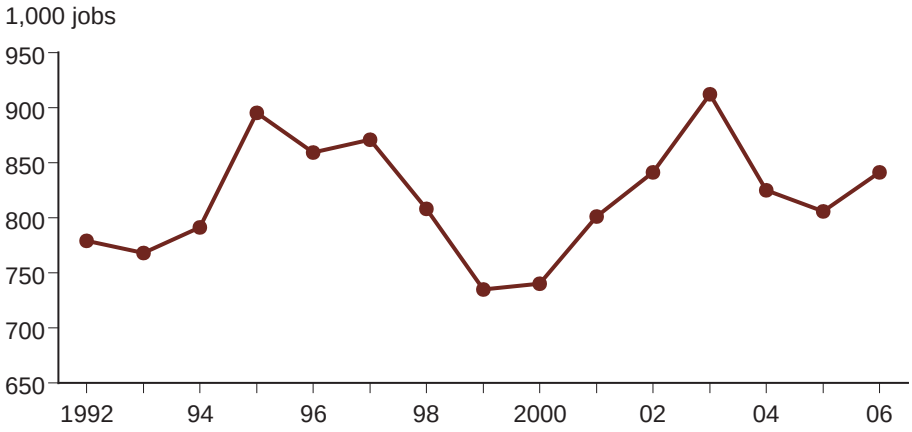


Source: Analysis by Economic Research Service, USDA, based on U.S. Census Bureau trade data, using Bureau of Economic Analysis input-output methodology.

between. But the jobs-required trend (the types of jobs needed to facilitate the export of agricultural commodities) is more volatile. This volatility occurs because job requirements change with the commodity composition of the exports. For example, most high-value and processed products require more total labor than do raw farm products. This means that in years when nonbulk commodities, composed of high-value products (HVPs) and other types of products that require special handling, are the major share of the "export basket," jobs generated by exports are higher. Some years the opposite holds true. When farm prices are especially low, customers are buying large amounts of bulk grains and oilseeds. Many jobs are created on the farm and in the supporting transportation and distribution industries, but job growth bypasses the processing and manufacturing sectors. In 2006, farm prices were low and the value of bulk exports was low. However, the volume of exports, which determines labor requirements, was high. Because of this,

Figure 3

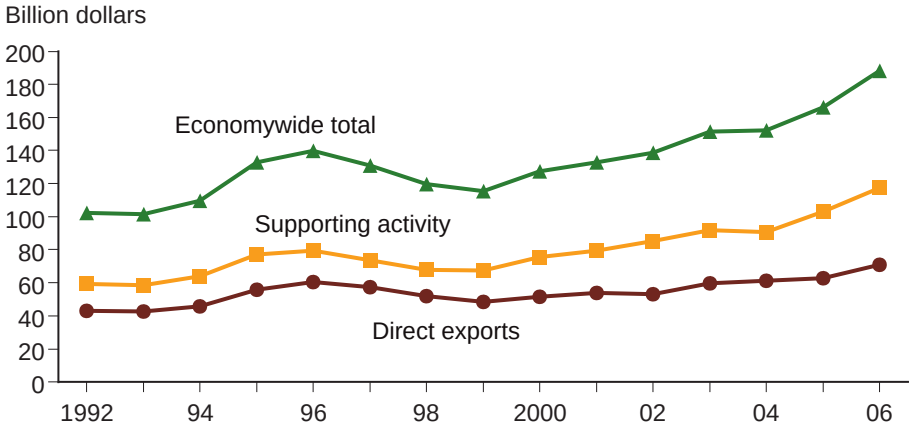
Number of civilian jobs generated by U.S. agricultural exports, 1992-2006



Source: Analysis by Economic Research Service, USDA, based on U.S. Census Bureau trade data, using Bureau of Economic Analysis input-output methodology.

Figure 4

Value of economic activity generated by U.S. agricultural exports, 1992-2006



Source: Analysis by Economic Research Service, USDA, based on U.S. Census Bureau trade data, using Bureau of Economic Analysis input-output methodology.

bulk products generated more jobs per dollar in 2006, but nonbulk products generated more of the total share of employment.

Figure 4 shows the historical trends of both direct exports and the indirect supporting activity, i.e., the additional economic activity that it takes to deliver these goods to their final consumer throughout the rest of the economy. Most of this activity falls outside of the farm sector. The largest gap between direct exports and supporting activity occurs in 2006, meaning that agricultural exports generated more additional domestic activity in 2006 than at any other point since 1992.

Data Sources

The Bureau of Economic Analysis (BEA), U.S. Department of Commerce, releases a Benchmark Input/Output (I/O) table every 5 years. The benchmark table is at the most highly disaggregated level of over 500 industry sectors. BEA also releases yearly updates to its benchmark table, aggregating those industries to the 79-sectors level. This analysis uses the benchmark table as its starting point because the annually updated tables are aggregated to contain only two agricultural sectors and one food-processing sector. Even though the data for beginning points are older, using the benchmark tables allows analysis of supporting agricultural activity and links to the rest of the economy. Then, the ERS model endogenously updates the information derived from the benchmark that is contained in its models, resulting in a view of the disaggregated agricultural economy that reflects current economic conditions.

The Impact of Agricultural Trade, 2006

In calendar year 2006, the $71.0 billion of agricultural exports produced an additional $117.2 billion in economic activity for a total of $188.2 billion of economic output. Supporting activity continued to climb after surpassing the $100 billion mark for the first time in 2005. Agricultural exports also generated 841,000 full-time civilian jobs, including 482,000 jobs in the nonfarm sector. Farmers' purchases of fuel, fertilizer, and other inputs to produce commodities for export spurred economic activity in the manufacturing, trade, and transportation sectors.

The production equivalent from almost one-fourth of U.S. cropland moved into export channels in 2006. Of raw crops, the United States exported 49 percent of food grain production, 16 percent of feed grains, and more than 38 percent of oilseeds. While the percentage of production of food-grain exports held steady and that of feed-grain exports decreased, oilseed exports increased significantly over 2005. Because exports increased more than imports, net agricultural exports in 2006 contributed $5.7 billion to the overall U.S. economy, $2.1 billion more than in 2005 ($3.6 billion).

It is not currently possible to measure the total economic activity associated with imports because there are no end-use data on imports available. After imports enter the United States and their value is recorded at that stage, imports are no longer tracked as imports. They then mix in the general domestic economy to be used in the same fashion as domestically produced goods. The end-use of a product is what determines its multiplier effects. Imports can be put into inventory (an almost negligible multiplier) and/or used in the most highly processed product (a very large multiplier). There is no feasible way to measure the indirect or supporting impacts of actual agricultural imports in terms of output, employment, value-added or in a multiplier analysis. Only the value of imports as measured upon entry into the U.S. can be discerned (direct effects). Imports can be assigned the generally held view of an economy-wide domestic business multiplier of 2.50, because activities associated with "absorbed" imports are the same as those associated with any other domestic commodity.

To illustrate the point, consider that almost all fishing products are imported. If statistics on consumers' demand and consumption of fish were analyzed, the supporting activity required to deliver that imported fish to the table could be measured. But this would not be the only contribution of fish imports as human food to the economy because the contributions of fish meal and feeds, processed products, and any other uses of fish have not been measured. These uses are completely intertwined with domestic production and to correctly measure these outputs, one would also have to separate the movement of imported fish products from the growing amount of products from domestic farm-raised fish.

The description of economic impacts of imports that follows is not the measurable economic activity associated with exports contrasted to the incalculable supporting activity of imports. Instead, the value of an imported product is estimated as if it were produced in the U.S., and assigned the value of that activity as a theoretical loss of economic activity to the United States.

Commodities come in various forms, including the raw commodity, and do provide employment and income to the economy once they reach our shores. However, once the product is here, it is processed and commingled with other product so that we cannot follow it past the shipping docks. The only actual "loss" to the U.S. economy that can be measured is the actual value of agricultural imports. After the imported product is absorbed into the U.S. economy, the supporting activity required to deliver the imported goods to final consumers is estimated using a general business multiplier "gain" of at least 2.50 (see box, "Multipliers).

Multipliers

An output multiplier is a summation of the effects of $1 of demand for a particular commodity from a particular industry. In this paper, demand is for agricultural exports. The employment multipliers are expressed in terms of jobs per billion dollars of agricultural exports. These multipliers measure the direct and indirect effects of an economic activity (exports) by weighing the impacts of sales and purchases between all goods and service sectors of the economy; sales to final demand (consumption, investment, government, and net exports); and purchases of land, labor, and capital services. Multipliers are best suited to describe activity that has already taken place in an economy and can be measured. It would be inappropriate to use these multipliers to forecast the economic impacts of future trade. Multipliers also describe, when dissected to their component parts, the interrelatedness of sectors in a base period.

The multiplier of 1.65 reported here represents the additional supporting activity generated by the original $1 purchase of agricultural exports. They are sometimes combined in popular parlance and expressed as a total, so that the agricultural exports multiplier becomes 2.65. There is a generally held view of an economywide business multiplier of 2.50. Therefore, agricultural exports generate more output in the economy than do most other domestic industries. The estimated employment multiplier for 2006 was close to 12,000 jobs per billion dollars of agricultural exports. Job requirements vary greatly across industries.

Exports Generate New Business, Add Jobs

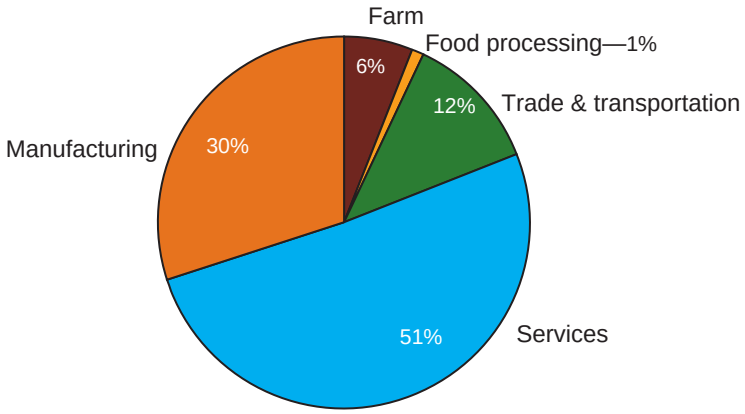
Of the $71 billion in direct U.S. agricultural exports in 2006, the value of exported raw products was $25.9 billion, compared with $30.3 billion of processed commodities, and $14.8 billion for transport and trade services. There was $117.2 billion of supporting or indirect activity generated by agricultural exports in 2006 that encompasses the value of activity required to facilitate the movement of exports to their final destination (e.g., computer and financial services, warehousing and distribution, packaging and additional processing). The service sector receives the lion's share of the additional activity, generating $46.9 billion of the $117.2 billion total. All nonfarm sectors of the economy received about 83 percent of this additional economic activity.

Employment required to produce, transport, and service agricultural exports in 2006 increased from 2005 levels. Export commodity mix, price changes, and the volume of goods exported contributed to the rise. Of the 841,000 full-time civilian jobs related to agricultural exports in 2006, more than 359,000 were U.S. farmworkers, an increase of 8,000 jobs in 2006 from 2005. Based on a Bureau of Labor Statistics estimate of 2,206,000 full-time-equivalent agricultural workers, this would mean that approximately 16 percent of the U.S. farm workforce is producing for export. Almost, 482,000 jobs in the nonfarm sector were involved in assembling, processing, distributing, and servicing agricultural products for export. About 65,000 of those were in food processing, 139,000 in trade and transportation, 56,000 in other manufacturing sectors, and 222,000 in other services.

Each dollar of bulk exports has a smaller proportional effect on the nonfarm economy than a dollar of processed, or high-value, exports. Bulk exports of $24.4 billion generated an additional $38.8 billion of business activity while nonbulk exports of $46.6 billion generated $78.4 billion (i.e., $1.59 additional output per dollar of bulk exports, $1.68 for nonbulk exports, and $1.65 for all agricultural exports). Over 50 percent of the additional business activity attributed to bulk exports took place in the service sector and 1 percent in food processing. By contrast, the additional business activity for nonbulk exports was 8 percent in food processing and 34 percent in services (see figs. 5, 6, and 7). Of the 841,000 jobs related to U.S. agricultural exports, 490,000 (57 percent) supported nonbulk exports.

Figure 5

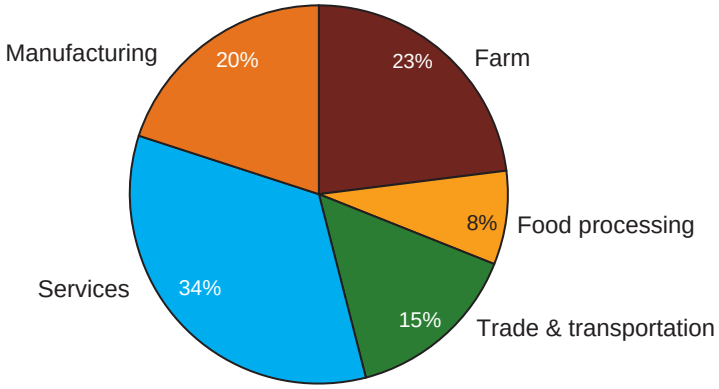
Bulk agricultural exports, 2006, distribution of supporting activity



Source: Analysis by Economic Research Service, USDA, based on U.S. Census Bureau trade data, using Bureau of Economic Analysis input-output methodology.

Figure 6

Nonbulk agricultural exports, 2006, distribution of supporting activity

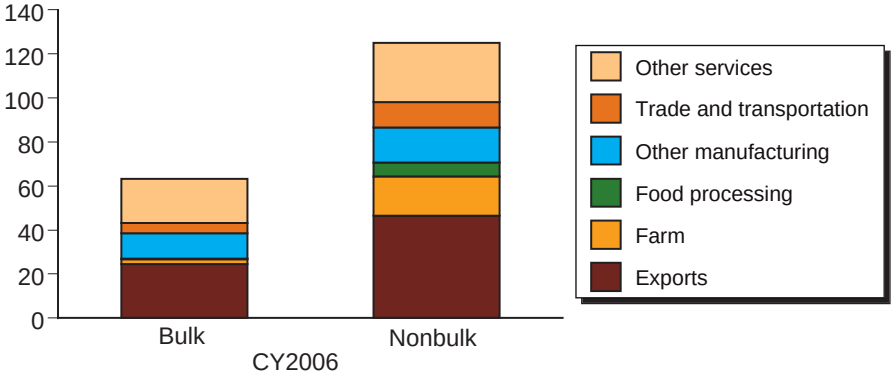


Source: Analysis by Economic Research Service, USDA, based on U.S. Census Bureau trade data, using Bureau of Economic Analysis input-output methodology.

Figure 7

Nonbulk agricultural exports generate more total business activity than bulk

Direct exports and supporting activity (billion dollars)



Source: Analysis by Economic Research Service, USDA, based on U.S. Census Bureau trade data, using Bureau of Economic Analysis input-output methodology.

Impacts of Agricultural Imports on U.S. Output

The domestic output effect of the $65.3 billion of agricultural imports into the U.S. in 2006 was $162.2 billion. Just as with exports, moving imported products to consumers generates jobs in the data processing, financial, legal, management, administrative, and marketing sectors. Each dollar spent on imports would have required another $1.48 in supporting goods and services if those imported items had been produced domestically, indicating an output multiplier of 2.48.

When valuing output associated with imports on the U.S. economy, we calculate a theoretical loss of economic activity from imports equal to the value of the product if it were to be produced here. Many imports such as coffee, bananas, and cocoa, have few if any counterparts in U.S. agricultural production. While the purchase of these imports does represent a loss in income to the U.S. economy equivalent to their value at the border, they do not a represent a loss in production or supporting activities.

U.S. agricultural trade has a positive effect on most sectors of the economy. The farm sector's $45.8 billion of output associated with agricultural exports more than offset the $30.5 billion of farm output implicitly lost because of agricultural imports. The nonfarm sectors, including food processing, gained $10.8 billion in total output, creating about 43,600 jobs and generating $4.7 billion in income. The U.S. economy gained a net $26 billion in output (after the theoretical loss to agricultural imports is considered). Outside of farming and food processing, the United States theoretically lost a net $2.6 billion from direct agricultural trade, that is, exports minus imports of agricultural goods that are neither farm nor processed goods, but gained $14.3 billion in total output because the direct plus indirect value of these exports was greater than that of the imports. Although there were imports of nonfarm, nonfood-processing of greater value than exports in 2006, the U.S. exports of this category generated more total output than imports did in the economy.

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Methodology Appendix

These estimates of the economic activities associated with exports are derived from the *1997 Benchmark Input-Output Accounts*, maintained by the U.S. Department of Commerce's Bureau of Economic Analysis. The economic methodology used to make specific estimates of the impacts of 2006 agricultural trade is given here.

Employment, output, and/or income related to exports of agricultural commodities can be estimated when an input/output (I/O) transaction table is available. Benchmark tables are available every 5 years, with a 5-year lag. Updates at the aggregate level are produced every year, with a 2-year lag. A 2002 benchmark table is being prepared for analysis.

Income Generation

Since income (or gross domestic product) measures, in an aggregated form, the sum of value added in various I/O sectors, then

(1)

$$\text{Output} = \sum_{j=1}^{n} X$$

$$\text{Income} = \sum_{j=1}^{n} Vj$$

where Vj is value added in sector j. Under an I/O structure, value added is a fixed proportion of output, so that income can be written in a matrix form as:

(2)

$$\text{Output} = X = (I-A)^{-1} F$$

$$\text{Income} = Y = vX = v\,(I-A)^{-1} F$$

Where X = an n x 1 vector of sector outputs

$(I-A)^{-1}$ = an n x n I/O total requirements matrix

F = an n x 1 vector of final demand for agricultural exports

Y = an n x 1 vector of income originating from each sector of the economy due to agricultural exports

v = an n x n diagonal matrix of value added per dollar of sector output coefficients

Employment Generation

Using the above notations, employment in each sector of I/O industries is derived as:

(3)

$E = L\ (I-A)^{-1}\ F$

Where $(I-A)^{-1}$ and F are as previously defined

L = an n x n diagonal matrix of civilian employment coefficients per dollar of sector output

E = an n x 1 vector of sector employment needs related to the level of agricultural exports defined in vector F

Nonbase Year Estimation

To estimate output, income, and employment multipliers related to exports for years beyond the published I/O tables, one must work with less information because current year $(I-A)^{-1}$, v, and L are unavailable. Yet, there are observable changes that can be incorporated into the analysis, such as changes in labor productivity and in the sectoral composition of final demand. Changes in the composition of final demand may also require changes in industry output requirements, which, in turn, change interindustry demand. Likewise, increases in labor productivity imply that the same output can be produced with a smaller workforce or that more output can be produced with the same size workforce.

Changes in the yearly commodity composition of agricultural exports are available from the Foreign Agricultural Trade of the United States (FATUS) summary tables. Available at: http://www.ers.usda.gov/Data/FATUS/MonthlySummary.htm.

Nonbase year income is estimated through a modification of equation 2.

(4)

$Y = qT$

Where $T = v(I-A)^{-1}\ F'$

q = an n x n diagonal matrix of output originating price deflators

F' = an n x 1 vector of current year exports

Nonbase year employment is estimated through a modification of equation 3.

Labor productivity changes in farming and in nonfarm sectors are available from USDA and the U.S. Department of Labor, respectively. Therefore, equation (3) is modified to incorporate the effect of productivity change in the generation of employment.

(5)

$E = pW$

Where p = an n x n diagonal matrix showing the ratio of base year labor productivity to current year productivity and

$W = L(I-A)^{-1}\ F'$

Table 1

U.S. economic activity triggered by agricultural trade, 2006

Item	2004 Total	2005 Total	2006 Total	2006 Bulk	2006 Nonbulk
			Billion dollars		
Economic activity generated by agricultural exports	152.2	166.1	188.2	63.2	125.0
Farm	39.8	39.6	45.8	21.3	24.5
Food processing	29.8	33.2	37.0	0.3	36.7
Other manufacturing	23.0	26.4	29.8	11.5	18.3
Trade and transportation	23.4	24.9	28.5	10.2	18.3
Other services	36.2	41.9	47.1	20.0	27.1
Exports	61.4	62.9	71.0	24.4	46.6
Agricultural imports	52.6	59.3	65.3	15.6	49.7
Agricultural trade balance	8.8	3.6	5.7	8.8	-3.1
Supporting activities	90.8	103.2	117.2	38.8	78.4
Farm	15.9	16.8	19.9	2.3	17.6
Food processing	5.5	6.0	6.7	0.3	6.4
Other manufacturing	20.8	24.2	27.4	11.5	15.9
Trade and transportation	12.7	14.3	16.3	4.8	11.5
Other services	36.1	41.7	46.9	20.0	26.9
			Percent		
Nonfarm share of supporting economic activity	83	84	83	94	77
Export multiplier (additional business activity generated by $1 of exports)	1.48	1.64	1.65	1.59	1.68
			1,000 jobs		
Employment generated by agricultural exports	825	806	841	351	490
Farm	388	351	359	180	179
Nonfarm	437	455	482	171	311
Food processing	58	62	65	0	65
Other manufacturing	54	54	56	19	37
Trade and transportation	129	130	139	50	89
Other services	196	209	222	101	121
Employment per billion dollars of agricultural exports	13.4	12.8	11.8	14.4	10.5
			Percent		
Share of farm workforce supported by agricultural exports	17	16	16	8	8

—Continued

Table 1

U.S. economic activity triggered by agricultural trade, 2006—Continued

Item	2004 Total	2005 Total	2006 Total	2006 Bulk	2006 Nonbulk
			Billion dollars		
Domestic equivalent of economic activity generated by agricultural imports	127.3	145.3	162.0	3.8	158.2
Farm	24.9	27.4	30.5	1.4	29.1
Food processing	33.5	37.1	40.6	0.0	40.6
Other manufacturing	19.9	23.6	26.6	0.7	25.9
Trade and transportation	19.7	22.5	25.0	0.6	24.4
Other services	29.2	34.5	39.3	1.1	38.2
Net domestic equivalent of total output gain or loss to agricultural imports	24.9	20.8	26.2	59.4	-33.2
Farm	14.9	12.2	15.3	19.9	-4.6
Food processing	-3.7	-3.9	-3.6	0.3	-3.9
Other manufacturing	3.1	2.8	3.2	10.8	-7.6
Trade and transportation	3.7	2.4	3.5	9.6	-6.1
Other services	7.0	7.4	7.8	18.9	-11.1
Nonfarm, nonfood processing sectors:					
Net direct benefit from exports	-0.8	-2.6	-2.6	5.1	-7.7
Net increased output from exports	14.6	15.1	16.9	34.2	-17.3
			Percent		
Farm share of total income from exports	26	23	24	33	18
Trade and transportation share of total income from exports	21	21	21	19	22

Source: USDA, Economic Research Service.