

Industry Used an Estimated \$110 Billion of Agricultural Materials In 1992

An estimated \$110 billion worth of agricultural and forestry products were used as raw materials in the manufacture of industrial (nonfood, nonfeed) products in 1992, according to the most recent census data available. Wood and paper products made up more than 85 percent of the value. Cotton, natural rubber, and vegetable oils were among the other raw materials used by industry.

Very little data are publicly available on industrial uses of agricultural materials. Moreover, when data are available, the information often reflects a particular raw material or use. There are no overall statistics on the volume or value of agricultural materials used by industry.

In an attempt to get a comprehensive estimate of industrial uses of agricultural materials, the Economic Research Service (ERS) focused on data sources for industrial production. Using data from the 1992 Census of Manufactures, ERS analysts have estimated the value of agricultural materials used by industry. The Census of Manufactures is part of the economic census of the Nation's economy taken every 5 years in the second and the seventh year of each decade. The Census of Manufactures contains statistics for individual industries or groups of related industries, including the number of establishments, employment, payroll, value added by manufacture, value of materials consumed, product shipments, and other industrial statistics.

The census reports the value of materials consumed or used in production by establishments in various industries based on six-digit material codes. With the help of chemists and chemical engineers, ERS analysts developed a list of material codes that are classified as agriculturally derived, partially agriculturally derived, or potentially derived from agriculture (see tables 8-11 for a list of codes that were used in the analysis).

The agriculturally derived category contains materials that are obtained from agricultural, forestry, or natural-plant sources. Agricultural materials used by the food and tobacco industries were not included in this analysis, since the objective was to isolate industrial (nonfood, nonfeed) uses of agricultural materials. The materials in the agriculturally derived category have received various amounts of processing, from goods with little processing, like raw cotton, to finished products used as intermediate goods, such as vegetable oils. The partially derived category contains:

- materials or chemicals that are partially derived from agricultural sources,
- agriculturally based materials or chemicals that are in an aggregated group containing agriculturally based and nonagriculturally based materials or chemicals, and

- materials or chemicals that can be derived from either agricultural or petroleum sources, but information on the derivation is not provided in the code description.

Finally, the potentially derived-from-agriculture group includes materials that may in the future be derived from agricultural or forestry products, but presently petroleum sources are used. The U.S. Department of Agriculture and other researchers are actively exploring new processes and procedures to expand industrial uses of agricultural materials, and these are examples of potential future products.

Using material codes as a basis for estimating the value of agricultural materials used by industry has some limitations. The codes are part of the Standard Industrial Classification, which is the classification used for all establishment-based Federal economic statistics on industries. The value of agricultural materials used as inputs by manufacturing industries may be underestimated because of how the data are collected and reported.

Underestimation can occur for several reasons. First, in addition to the total cost of materials, which every establishment was requested to report, information was collected from most manufacturing industries on the consumption of major materials used in manufacturing. The inquiries were restricted to those materials that were important parts of the cost of production in a particular industry and for which cost information was available from manufacturers' records. The value of materials used by the establishment but not listed separately on the census form are included as "not elsewhere classified." Also, the cost of materials for small establishments for which either administrative records or shorter census forms were used was imputed by the Census Bureau as "not specified by kind." Thus, because the use of agricultural materials in a manufacturing process may not be significant or well known makes their inclusion in the census unlikely. For example, information from small establishments that may use agricultural materials in production to satisfy niche markets would not be identified.

Second, if establishments consumed less than a specified amount, usually \$25,000, of a specific material, they were not requested to report consumption of the material separately. Since the value of some agricultural materials may be

low, particularly for specific establishments, it is likely that they may have been among those materials included in the "not elsewhere classified" category. Third, because the census is conducted on an establishment basis, some data are withheld from publication to avoid disclosing information for individual companies. Finally, some material codes include a large variety of materials. If the majority of the materials in these codes were deemed likely not to be agriculturally based, they were excluded from the partially agriculturally derived category.

Overestimating the value of agricultural products may occur through duplication in the cost of materials among industries. Within a census industry, inputs are additive. However, when combining material codes from different industries representing successive stages in the production of finished manufactured goods, the possibility of double counting occurs. For example, the value of cotton is counted twice when it is first an input into the manufacture of an intermediate good (yarn), and second, when the yarn is used as an input in the manufacture of fabric.

Industries Spent \$96 Billion on Wood And Paper Inputs in 1992

Given the limitations, it is estimated that more than \$110 billion of agricultural and forestry products were used as raw materials in the manufacture of industrial products in 1992, according to the most recent census data available. Wood and paper accounted for more than 87 percent or \$96 billion (figure 1, table 9). Other fibrous materials, animal products, natural rubber, and vegetable oils were among the other agricultural materials used in the manufacture of non-food items (table 8).

After wood and paper products, other fibrous materials were the next largest category of agricultural materials used by industry, with a total value of nearly \$7 billion. Raw cotton

use accounted for 45 percent of all nonwood fibers, estimated at \$3.1 billion. Other cotton products, including cotton yarns, fabrics, felt, linters, and waste, added another \$3.3 billion. Industries also used \$370 million worth of raw wool and wool materials in 1992, such as felt, yarn, noils, and waste.

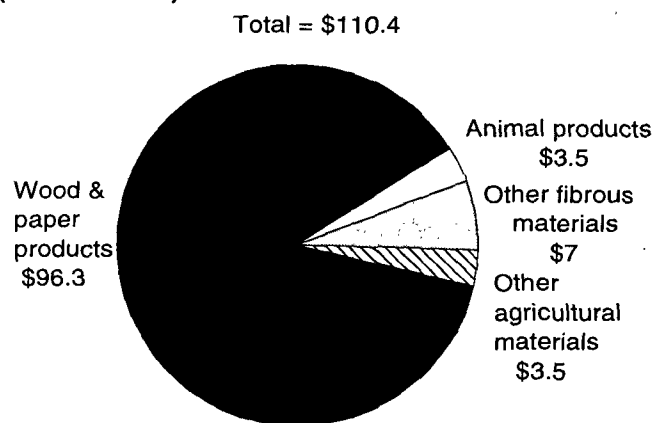
Animal products were the third largest category of agricultural materials used as industrial inputs in 1992, totaling nearly \$3.5 billion. Hides, skins, and pelts, valued at \$1.2 billion, were purchased by the leather and leather products industry. Another \$1.6 billion of finished leather was used in the manufacture of leather products and apparel. Nearly \$600 million worth of animal fats, oils, greases, and tallow were inputs into the production of perfumes, cosmetics, and chemical preparations. Establishments involved in the manufacture of medicinal chemicals and pharmaceutical preparations purchased \$51 million worth of pharmaceutical-grade gelatin. Finally, \$16 million of dressed hair, including horse hair, was used to make brooms and brushes.

An additional \$69 billion of raw materials that are partially derived from agricultural sources were used as manufacturing inputs in 1992 (table 10). However, \$69 billion may overestimate the value of agriculturally based materials because the category includes intermediate goods that are derived both from agricultural and petroleum sources. For example, the "knit fabrics" material code is considered partially agriculturally derived because it includes natural fabrics, like wool, along with synthetic fabrics, like polyester.

In 1992, industry used \$3.6 billion of raw materials that came from petroleum sources, but in the future may come from agricultural and forestry products (table 11). This estimate is meant to give researchers only a rough indication of potential market size. For each new use, agriculturally derived materials will have to compete with their more well-established, petroleum-based counterparts. For example, a new technology has been developed for turning cornstarch into propylene glycol, glycerine, and ethylene glycol but is not yet in commercial use. Also, researchers are studying the use of soybean and other vegetable oils in printing inks (see Fats and Oils section for more information).

Figure 1

Value and Type of Agricultural and Forestry Materials Used in Manufacturing in 1992 (Billion dollars)



Agricultural Materials Were Used by All Industry Major Groups

All Industry Major Groups used agriculturally derived materials in 1992 (table 1). The paper and allied products industry was the largest user, spending nearly \$39 billion on agricultural inputs and \$2.6 billion on intermediate goods partially derived from agricultural sources (figure 2). The lumber and wood products industry was next, using \$23 billion and \$0.6 billion of agriculturally derived and partially agriculturally derived materials, respectively. The chemicals and allied products industry was the third largest industry group, spending \$5.5 billion on agriculturally derived materials and \$16 billion on partially derived intermediate goods.

Table 1--Use of agricultural inputs in manufacturing in 1992, by Major Group, excluding food and tobacco usage

Major industry group	Agriculturally derived products	Share of total inputs	Partially agriculturally derived	Total 1/	Share of total inputs
	Million dollars	Percent	Million dollars		Percent
All Industries	110,360	4.9	69,458	179,818	7.9
Paper and allied products	38,944	30.2	2,553	41,497	32.2
Lumber and wood products	22,902	26.9	593	23,495	27.6
Chemicals and allied products	5,469	2.3	16,104	21,573	9.2
Printing and publishing	18,083	23.7	3,429	21,512	28.2
Apparel	1,209	2.3	15,617	16,826	31.4
Textile mill products	5,685	7.8	8,339	14,024	19.4
Transportation equipment	817	0.2	11,836	12,653	2.9
Furniture and fixtures	4,145	11.1	2,814	6,959	18.6
Rubber and miscellaneous plastics products	2,941	3.0	1,766	4,707	4.8
Leather and leather products	2,637	29.5	778	3,415	38.3
Measuring, analyzing, and controlling instruments	1,273	1.7	1,312	2,585	3.4
Fabricated metal products	952	0.7	1,336	2,288	1.6
Electronic and other electrical equipment and components, excluding computers	1,800	1.1	465	2,265	1.4
Industrial and commercial machinery and computer equipment	753	0.4	1,311	2,064	1.0
Stone, clay, glass, and concrete products	1,442	3.4	199	1,641	3.9
Miscellaneous manufacturing	1,130	3.9	415	1,545	5.3
Petroleum refining and related industries	160	0.1	590	750	0.3
Primary metal industries	19	2/	0	19	2/

1/ Sum of agriculturally derived and partially agriculturally derived materials. 2/ Less than 0.1 percent.

How important agricultural and forestry materials were as inputs varied among industries. Nonfood manufacturing industries spent nearly \$180 billion on agriculturally derived and partially agriculturally derived materials in 1992, which is nearly 8 percent of the \$2.3 trillion spent on raw material inputs used in production. The two categories were most important to the leather and leather products industry, accounting for 38 percent of all inputs (figure 3).

Agriculturally derived and partially agriculturally derived materials were also an important source of inputs to the paper and allied products and apparel industries, accounting for 32 and 31 percent of all inputs, respectively; although for the apparel industry, most of the inputs came from the partially derived category. [Jacqueline Salsgiver, ERS, (202) 501-7107, jsalsgiv@econ.ag.gov]

Figure 2

Industries That Used the Highest Value of Agricultural Materials in 1992

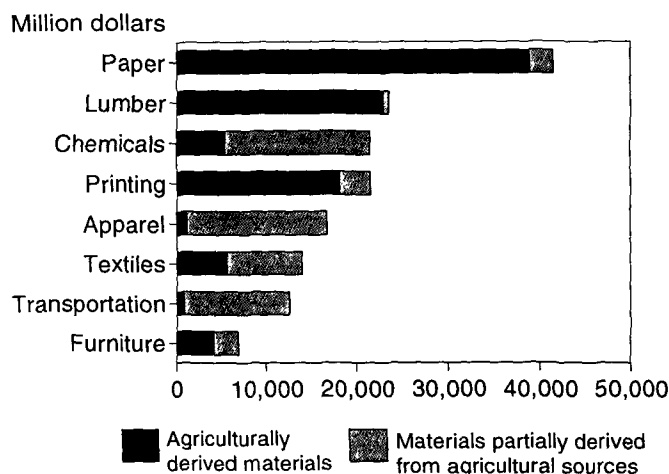


Figure 3

Industries That Used the Greatest Share of Agricultural Materials in 1992

