

VALUE OF TIMBER AND AGRICULTURAL PRODUCTS IN THE UNITED STATES, 1991

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ABSTRACT

In the United States, timber and agriculture are two important components of the Gross Domestic Product (GDP). The purpose of this study was to quantify the volume and value of timber in the U.S. economy in 1991 and compare the value of timber with that of agriculture. Combined, timber and agriculture accounted for 6.2 percent of total GDP in 1991, and 13.2 percent of the goods and structures portion of GDP. Primary timber products production totaled 17,889 million ft.³ in 1991 and was valued at \$19,370 million. Primary agricultural products were valued at \$156,094 million in 1991. Although timber was only 11 percent of combined timber and agricultural primary products production, it was the highest valued crop produced in two regions, the South and Pacific Coast, and fourth highest in two regions, the North and Rocky Mountain. Only the value of corn and soybeans produced in the North exceeded the value of timber produced in any region. Secondary timber-related products added \$40,128 million of value; secondary agriculture-related products added \$139,554 million. When primary and secondary products were combined, timber-related products accounted for 17 percent of all timber- and agriculture-related products in 1991.

Timber and agricultural activities provide not only the necessary goods and services to house, feed, clothe, and improve the quality of life for the people in the United States, but these activities make large, significant contributions to the U.S. economy. In 1991, the U.S. Gross Domestic Product (GDP) totaled \$5,722,900 million (1) (**Fig. 1**). The goods and structures portion of GDP (total GDP less value of services) in 1991 was \$2,690,200 million. The combined value of all timber and agriculture was estimated to be \$355,146 million, or 6.2 percent of GDP. In other words, more than 6 cents of every dollar from all GDP originated in timber or agricultural activities, and more than 13 cents of every dollar spent for goods and structures was attributable to timber or agriculture.

Although timber is not usually considered an agricultural crop, its production competes either directly or indirectly with agriculture for land, water, and other resources and for Federal, State,

and private research funding. Increasingly, agricultural production techniques are being adapted to timber as the volume of plantation-grown timber increases. The purpose of this study was to quantify the volume and value of timber in the U.S. economy in 1991 and compare the value of timber with that of agriculture. Both national and regional comparisons are made. Regions used in this report are Forest Service Resources Planning Act Assessment regions (**Fig. 2**). Primary timber and agricultural products in 1991 and 1986 are examined, as are secondary timber and agricultural products in 1991. Comparisons of timber with all agriculture and specific agricultural crops are also made.

PRIMARY PRODUCTS

Primary products are timber or agricultural crops removed or harvested from forest or cropland. Typically, additional processing is required before the primary product reaches its final end use. Examples include sawlogs, pulpwood, corn, soybeans, and fruits/nuts. In addition, livestock, poultry, and their products are also considered to be primary agricultural products. The following discussion examines the volumes of primary timber products and the values of timber and agricultural crops harvested. Values from livestock, poultry, and their products are also examined. Comparisons are made between timber and agricultural crops and between timber and all primary agriculture.

TIMBER PRODUCTS

Primary timber products are roundwood products such as "logs, bolts, and other round timber generated from harvesting trees for industrial or consumer use" (5). In 1991, 17,889 million ft.³ of roundwood timber products were harvested in the United States (**Table 1**) (5). Nearly half (48%) of this volume originated in one region, the South. Just under a fourth (23%) originated from each of two regions, the North and Pacific Coast. Overall, 63 percent of the volume harvested was softwood, 37 percent hardwood. Regionally, 90 percent or more of the timber harvested from the Rocky Mountain and Pacific Coast regions was softwood species. Nearly two-thirds

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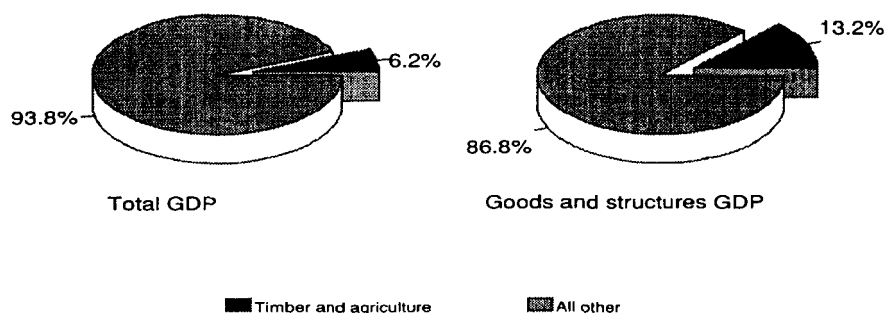


Figure 1. — Timber and agriculture as a percentage of Gross Domestic Product (GDP) in 1991.

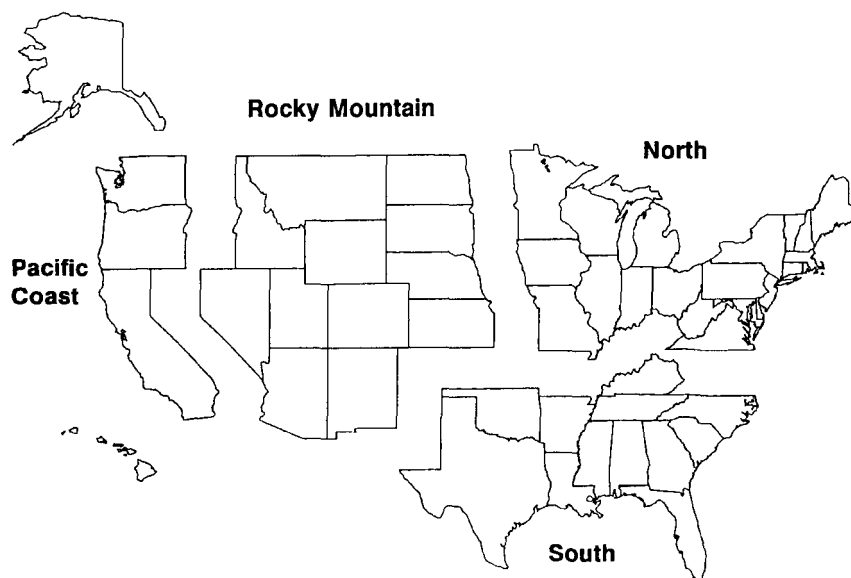


Figure 2. — Regions of the United States.

(64%) of the timber harvested in the South was softwood; in the North, less than a fourth (22%) was softwood.

Total roundwood harvested increased by less than 300 million ft.³ between 1986 and 1991 (**Table 1**). The North and Rocky Mountain regions maintained their shares of production at 23 and 5 percent, respectively. An approximate 2 percent shift in production from the Pacific Coast region to the South occurred between 1986 and 1991, primarily as a result of reductions in Federal lands available for harvesting. Hardwood roundwood production increased slightly (1%) during this period.

The value of all roundwood timber harvested in the United States in 1991 was estimated to be \$19,370 million (**Table 1**). The value of roundwood timber is defined here as its market value at local points of delivery, that is, delivered to a processing facility. To estimate roundwood timber value, unpublished volumes (measured in thousand board feet (MBF), log scale) and value of timber cut and sold from National Forests and costs of building roads needed to harvest the timber were obtained from the Forest Service's Timber Management staff (2). The volume and value of timber cut and sold are based on the "high bid" made by purchasers for specific tracts of timber. Although the high bid includes road-building costs, the Forest Service reimburses the purchaser these costs after the timber is harvested. The cut and sold data are the high bid values less road-building costs. Because roads increase the value of

TABLE 1. — Volume and value of roundwood timber products harvested in the United States, by region, 1986 and 1991.^a

Region	Volume				Value ^b				Value excluding road-building costs
	Total	Softwood		Hardwood	Total ^c	Softwood		Hardwood	
	($\times 10^6$ ft. ³)	----- (%) -----			($\times 10^6$ \$)	----- (%) -----			($\times 10^6$ \$)
1986									
North	4,079	23	22	78	1,627	13	23	77	--
South	8,079	46	66	34	5,110	40	77	23	--
Rocky Mountain	948	5	90	10	821	6	94	6	--
Pacific Coast	4,486	26	96	4	5,082	40	98	2	--
United States	17,593	100	64	36	12,640	100	79	21	--
1991									
North	4,140	23	22	78	2,746	14	20	80	2,592
South	8,613	48	64	36	7,976	41	71	29	7,592
Rocky Mountain	938	5	90	10	1,320	7	95	5	1,243
Pacific Coast	4,198	23	93	7	7,328	38	97	3	6,831
United States	17,889	100	63	37	19,370	100	76	24	18,258

^a Sources: (4,5,9).

^b Market values at local points of delivery.

^c Includes estimated road-building costs.

TABLE 2. — Value of primary agricultural products in the United States, by region, 1986 and 1991.^a

Region	Crops ^b		Livestock, poultry, and their products ^c		Total crops and livestock		Percent of total crops and livestock within each region	
	(×10 ⁶ \$)	(% of U.S.)	(×10 ⁶ \$)	(% of U.S.)	(×10 ⁶ \$)	(% of U.S.)	Crops	Livestock
----- (%) -----								
1986								
North	23,598	39	25,375	39	48,973	39	48	52
South	13,852	23	16,791	26	30,644	24	45	55
Rocky Mountain	12,197	20	18,260	28	30,458	24	40	60
Pacific Coast	11,008	18	4,839	7	15,847	13	69	31
United States	60,656	100	65,265	100	125,922	100	48	52
1991								
North	29,357	37	25,969	34	55,327	35	53	47
South	20,538	26	22,825	30	43,363	28	47	53
Rocky Mountain	15,744	20	22,408	29	38,152	24	41	59
Pacific Coast	13,950	18	5,302	7	19,252	12	72	28
United States	79,589	100	76,504	100	156,094	100	51	49

^a Sources: (6,8).^b Reported value of field and miscellaneous crops, fruits/nuts, and vegetables of commercial significance.^c Reported value of livestock, poultry, and their products less 20 percent average feed expense.

the timber by making it more accessible and increase the value of the land after harvesting, road-building costs were added back into the value of timber cut. These data were identified by type of roundwood cut, National Forest System region, and species group (softwood and hardwood). These values were then divided by the volumes cut, resulting in an average price per unit measured in \$/MBF. Estimated regional logging and transportation costs per MBF were added to the price, resulting in an estimated value per MBF of delivered stumpage. These values were then converted to a thousand cubic foot (MCF) basis, regionalized, and multiplied by the volumes of roundwood timber products harvested in the United States by region and product in 1991. The resulting estimated market values of roundwood timber products produced in the United States in 1991 are reported in **Table 1**. For comparison purposes, roundwood timber values are also reported in **Table 1** with road-building costs excluded. Overall, timber values decreased about 6 percent with the exclusion of road-building costs. Market values of roundwood timber in 1986 were obtained from McKeever and Jackson (4).

Three aspects of Forest Service timber sales may affect reported high bid prices for Forest Service timber, which may not be representative of timber cut from lands not owned by the Forest Service. Specific effects on bid prices are not known. First, the Knutsen-Vandenberg Act (K-V) provides that part of timber sales receipts may be put into a trust fund

to be used for timber stand improvement, reforestation, or other activities to protect and improve future productivity of renewable resources in timber sales areas. The effect of this legislation may be to increase bid prices above what they would have been without K-V funds, although this is not certain. Second, Forest Service logging roads are generally built to a higher standard than logging roads on private lands. The extra expense associated with the better quality Forest Service roads may be reflected in somewhat greater high bid prices. Finally, Forest Service timber harvested in the past has generally been of higher quality than timber from other lands, particularly in the Pacific Northwest. However, recent reductions in old-growth sales and increased numbers of salvage cuts may have equalized the quality of timber harvested from Forest Service and private lands.

The South was the region with the highest valued timber production in both 1986 and 1991 (**Table 1**). Total value of all roundwood harvested in the South in 1991 was estimated to be \$7,976 million. The Pacific Coast was a close second in both 1986 and 1991 at \$5,082 and \$7,328 million, respectively, even though production was only about half that of the South. This apparent discrepancy was due to the mix of roundwood produced and the costs of production. Timber products harvested in the Pacific Coast typically consist of larger diameter, higher valued sawlogs and veneer logs, and those in the South tend to be smaller diameter, lower valued sawlogs and

pulpwood. Differences in road-building, logging, and transportation costs also affect the disparity between the Pacific Coast and the South. Roundwood production in the North and Rocky Mountain regions lagged well behind the South and Pacific Coast, accounting for just 14 and 7 percent, respectively, of total roundwood value in 1991.

Softwood roundwood tended to be relatively higher valued than hardwood in all regions except the North in 1986 and 1991. Overall, softwood roundwood accounted for 63 percent of total production in 1991, but accounted for 76 percent of total value (**Table 1**).

Total value of roundwood production increased by \$6,730 million between 1986 and 1991, even though production increased by less than 300 million ft.³ (4) (**Table 1**). Much of this increase is directly attributable to rapidly increasing stumpage prices.

Agricultural Products

Primary agricultural products are agricultural crops, livestock, poultry, and their products. Agricultural crops include field and miscellaneous crops, fruits/nuts, and commercial vegetables harvested from U.S. croplands. Croplands are defined as "lands from which crops are harvested or hay is cut, and land in orchards, citrus groves, vineyards, nurseries, and greenhouses" (8). Livestock, poultry, and their products include cattle, hogs, sheep, and other livestock; chickens, turkeys, and other poultry; and their products such as milk and eggs.

TABLE 3. — Relative importance and percentage value of the top four agricultural crops in the United States, by region, 1986 and 1991.^a

Relative importance and percentage of regional total									
Region		First		Second		Third		Fourth	All other
		(%)		(%)		(%)		(%)	(%)
1986									
North	Corn	38	Soybeans	29	Hay	16	Fruit/nuts	3	14
South	Tobacco	12	Hay	12	Soybeans	11	Cotton	11	54
Rocky Mountain	Wheat	23	Hay	19	Corn	18	Soybeans	8	32
Pacific Coast	Fruit/nuts	42	Vegetables	21	Hay	9	Cotton	6	22
United States	Corn	21	Soybeans	15	Hay	14	Fruit/nuts	12	38
1991									
North	Corn	42	Soybeans	27	Hay	14	Fruit/nuts	3	13
South	Cotton	17	Tobacco	13	Fruit/nuts	11	Hay	10	48
Rocky Mountain	Corn	24	Wheat	23	Hay	17	Soybeans	7	29
Pacific Coast	Fruit/nuts	46	Vegetables	21	Hay	8	Cotton	6	19
United States	Corn	22	Soybeans	14	Hay	13	Fruit/nuts	12	39

^a Agricultural crops include field crops, fruits/nuts, and vegetables of commercial significance.

The value of all primary agricultural products produced in the United States in 1991 was estimated to be \$156,094 million (Table 2) (6,8). Nationally, the value of production was nearly equally divided between crops (51%) and livestock (49%). Livestock values reported here are estimated market values less 20 percent to account for the average cost of animal feed. This deduction was made to avoid double counting the value of crops used for feed. The proportion of livestock value to all primary agricultural products produced in 1991 was 3 percent less than in 1986, when livestock accounted for 52 percent of all primary agricultural products.

Crop values exceeded livestock values in the North and Pacific Coast regions, with crops accounting for 53 and 72 percent of all agriculture in those two regions, respectively, in 1991 (Table 2). In the South and Rocky Mountain regions, livestock values exceeded crop values. In 1986, livestock values exceeded crop values in all regions except the Pacific Coast. The relative distribution of crop and livestock values between regions remained fairly constant between 1986 and 1991.

Farms in the North accounted for the largest share of both crop and livestock values of all regions. Thirty-seven percent of the value of all crops and 34 percent of the value of all livestock were produced in the North in 1991 (Table 2). Overall, more than a third (35%) of all primary agricultural product values originated in the North. The South, Rocky Mountain, and Pacific Coast regions followed the North in descending

order. The relative importance of regions remained steady between 1986 and 1991.

In 1991, four crops accounted for nearly two-thirds (61%) of the value of all agricultural crops produced (Table 3). Corn was the highest valued crop, accounting for 22 percent of the total value of production. Soybeans, hay, and fruits/nuts followed at 14, 13, and 12 percent of total value, respectively. These percentages remained nearly constant between 1986 and 1991.

Regionally, the highest valued crops reflect to a large extent the differences in geographical characteristics of the region and the types of agricultural activities practiced. Corn and soybeans were the two highest valued crops in the North in 1991, reflecting the large production of the crops throughout the midwest for dairy and livestock feed. These two crops accounted for 69 percent of the total value of all crops produced in the North. Cotton and tobacco were the two highest valued crops in the South, at 30 percent of total value produced. The top two crops in the Rocky Mountain region were corn and wheat, at 47 percent of the value of all crops produced, and reflect the high levels of production of these crops in the plains states. Two-thirds of the value of all crops produced in the Pacific Coast region were from fruits/nuts and vegetables. Large areas of irrigated crop lands in southern California accounted, in part, for the importance of these two crops.

Small changes in the percentages of crops produced within regions occurred between 1986 and 1991 (Table 3). In the North, for example, the top four crops remained unchanged, but the relative importance of corn increased from 38 to 42

percent; soybeans and hay decreased; fruits/nuts remained steady. Similar changes occurred in other regions.

TIMBER COMPARED WITH AGRICULTURAL PRODUCTS

In 1991, \$19,370 million of roundwood timber products and \$156,094 million of primary agricultural products (crops plus livestock) were produced in the United States (Tables 1 and 2). Timber products were valued at 12 percent of the value of primary agricultural products. Thus, for every dollar of timber products produced, about \$8 of agricultural products were produced. Timber was valued at 24 percent of total crop value in 1991 and 25 percent of total livestock value. For each dollar of timber produced, about \$4 of crops and \$4 of livestock were produced.

In 1986, \$12,640 million of roundwood timber products and \$125,922 million of primary agricultural products were produced (Tables 1 and 2). At 10 percent of the value of primary agricultural products, every dollar of roundwood timber produced was accompanied by about \$10 worth of agricultural products. Timber was 21 percent of the value of all crops produced and 19 percent of the value of all livestock produced in 1986, slightly less than in 1991. These percentages translate into about \$4.75 of crops and \$5.25 of livestock being produced for each dollar of timber produced.

If viewed as an agricultural crop, timber was the highest valued crop in both 1991 and 1986. In 1991, primary timber products production was estimated to be worth \$19,370 million and accounted for 20 percent of total (timber plus agriculture) crop value (Table 4). Corn was the

sumer or require additional processing before reaching the final consumer. The wide diversity of products manufactured from primary timber and agricultural products makes it difficult to precisely define secondary products. For example, lumber is clearly a secondary product because it is manufactured from roundwood and typically requires further processing before reaching its final use. Wood furniture is considered a final product, not a secondary product, because it is made from lumber or other secondary timber products. In general, products made from secondary timber or agricultural products were not included in this analysis.

SECONDARY PRODUCTS

Secondary products are products manufactured from primary timber or agricultural products. Secondary products can be sold directly to the final con-

Information on the value added by manufacture from the 1991 Annual Survey of Manufactures (7) was used to esti-

Region	Relative importance and value of crop														
	First		Second		Third		Fourth		Fifth						
	($\times 10^6$ \$)	(%)	($\times 10^6$ \$)	(%)	($\times 10^6$ \$)	(%)	($\times 10^6$ \$)	(%)	($\times 10^6$ \$)	(%)	($\times 10^6$ \$)	(%)	($\times 10^6$ \$)	(%)	
1986															
North	Corn	9,048	36	Soybeans	6,750	27	Hay	3,722	15	Timber	1,627	6	Fruit/nuts	753	3
South	Timber	5,110	27	Tobacco	1,645	9	Hay	1,629	9	Soybeans	1,558	8	Cotton	1,500	8
Rocky Mountain	Wheat	2,793	21	Hay	2,258	17	Corn	2,256	17	Soybeans	955	7	Timber	821	6
Pacific Coast	Timber	5,082	32	Fruit/nuts	4,654	29	Vegetables	2,269	14	Hay	1,005	6	Cotton	637	4
United States	Timber	12,640	17	Corn	12,541	17	Soybeans	9,263	13	Hay	8,614	12	Fruit/nuts	7,048	10
1991															
North	Corn	12,383	39	Soybeans	8,064	25	Hay	4,060	13	Timber	2,746	9	Fruit/nuts	947	3
South	Timber	7,976	28	Cotton	3,534	12	Tobacco	2,739	10	Fruit/nuts	2,171	8	Hay	2,134	7
Rocky Mountain	Corn	3,840	23	Wheat	3,555	21	Hay	2,637	15	Timber	1,320	8	Soybeans	1,108	6
Pacific Coast	Timber	7,328	34	Fruit/nuts	6,357	30	Vegetables	2,863	13	Hay	1,179	6	Cotton	882	4
United States	Timber	19,370	20	Corn	17,864	18	Soybeans	11,092	11	Hay	10,010	10	Fruit/nuts	9,742	10

TABLE 5. — Value added by manufacture^a for timber- and agriculture-related two-digit SIC industries,^b by region, 1991.

Region	Timber-related industries ^c				Agriculture-related industries ^d				
	24: Lumber and wood products	26: Paper and allied products	28: Chemicals and allied products	Total	20: Food and kindred products	21: Tobacco products	22: Textile mill products	31: Leather and leather products	Total
					($\times 10^6$ \$)				
North	4,067	11,385	97	15,549	52,670	4,279	1,256	453	58,658
South	5,376	10,846	128	16,350	26,975	20,182	5,854	142	53,153
Rocky Mountain	908	169	7	1,083	8,488	12	69	40	8,609
Pacific Coast	4,386	2,753	7	7,145	18,845	12	203	75	19,134
United States	14,737	25,153	238	40,128	106,978	24,484	7,382	710	139,554

31: 3111.

TABLE 6. — Value of primary and secondary timber and agricultural products and Gross Domestic Product (GDP) in the United States, 1991.

Product and GDP	Value		GDP	
	(×10 ⁶ \$)	(% of total)	(% of goods)	(% of total)
Timber				
Primary	19,370	11.0	0.7	0.3
Secondary	40,128	22.3	1.5	0.7
Total	59,498	16.8	2.2	1.0
Agricultural				
Primary	156,094	89.0	5.8	2.7
Secondary	139,554	77.7	5.2	2.4
Total	295,648	83.2	11.0	5.2
Total				
Primary	175,464	100.0	6.5	3.1
Secondary	179,682	100.0	6.7	3.1
Total	355,146	100.0	13.2	6.2
GDP				
Goods ^a	2,690,200	47.0	--	--
Services	3,032,700	53.0	--	--
Total	5,722,900	100.0	--	--

^a Includes structures.

mate the value of timber- and agriculture-related secondary products. To do this, each four-digit Standard Industrial Classification System (SIC) industry was examined. If the types of products produced were deemed to be principally secondary products, then the industry was considered to be a secondary products manufacturing industry. Value added by state for all timber- and agriculture-related secondary products industries was then regionalized and summarized by two-digit SIC groupings. More information can be obtained from the Standard Industrial Classification Manual (3).

In 1991, timber-related secondary products manufacturing industries added an estimated \$40,128 million of value to primary timber products, and agriculture-related secondary products manufacturing industries added \$139,554 million (Table 5). Most of the timber-related value added (63%) originated in the paper and allied products industry. The lumber and wood products industry added nearly 37 percent of total timber-related value added. Less than 1 percent was from chemicals and allied products. The food and kindred products industry was the largest agriculture-related secondary products manufacturing industry, accounting for 77 percent of agriculture-related value added. An additional 18 percent was added by the tobacco products industry; 5 percent by the textile mill

products industry; less than 1 percent by the leather and leather products industry. Overall, the value added by timber-related industries was about 30 percent of that added by agriculture-related industries.

The South and North were the two largest timber-related secondary products manufacturing regions, adding \$16,350 million (41%) and \$15,549 million (39%) of value, respectively, in 1991 (Table 5). The Rocky Mountain and Pacific Coast regions combined added the remaining 20 percent. The North was the largest agriculture-related secondary products manufacturing region, adding \$58,658 million, followed closely by the South at \$53,153 million. These two regions accounted for 80 percent of all agriculture-related value.

CONCLUSIONS

Timber and agricultural production in the United States is an important contributor to Gross Domestic Product (GDP). In 1991, timber-related activities in the United States generated approximately \$59,498 million; agriculture-related activities \$295,648 million (Table 6). Combined, these activities accounted for 6.2 percent of all GDP (more than 6 cents of every dollar spent), and 13.2 percent of the goods and structures portion of GDP (more than 13 cents of every dollar spent). Primary timber and agricultural products production totaled

\$175,464 million, of which timber was \$19,370 or 11 percent. When compared with specific crops in specific regions, the relative importance of timber becomes more evident. In 1991, timber was the highest valued crop in the South and Pacific Coast regions, and fourth highest in the North and Rocky Mountain regions. Corn and soybeans in the North were the only two regional crops that exceeded timber in value in 1991.

The manufacture of secondary timber- and agriculture-related products added \$179,682 million of value in 1991. Timber-related products accounted for nearly a fourth of this value. Secondary agriculture-related products exceeded secondary timber-related products value in all regions in 1991.

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