AGRICULTURAL PRODUCTION AND PRICES.

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MAGNITUDE AND DEVELOPMENT.

Foremost among countries in agricultural resources, equipment, and production, the United States affords an interesting and important subject for statistical examination with respect to agriculture. Here is a country covering the breadth of the North American continent and extending almost to antarctic regions on the north and fully to semitropical regions on the south, with an area of 2,939,000 square miles[1] of land surface, of which 623,218,619 acres were in farms in 1890 and 357,616,755 acres were under cultivation, and within this great area the variations in soil, altitude, heat, moisture, rainfall, and other agricultural conditions are so numerous and so considerable in degree, that the products of agriculture are of many kinds and bountiful, so that the world market is largely affected by many of them.

GROWTH OF FARMS.

Great and rapid development has characterized the agriculture of this country. The number of farms increased 215 per cent from 1850 to 1890, or from 1,449,073 to 4,564,641; their total acreage increased 112.3 per cent, or from 293,560,614 acres to 623,218,619; their improved acreage, 216.2 per cent, or from 113,032,614 to 357,616,755 acres, and their unimproved acreage, 47.1 per cent, or from 180,528,000 acres to 265,601,864. The largest percentage of increase of improved land within a decade since 1850 was 50.7—from 1870 to 1880; next to this was an increase of 44.3 per cent—from 1850 to 1860; third in order was the decade 1880 to 1890, with an increase of 25.6 per cent, while the lowest percentage of increase was in the decade in which the civil war occurred, and was 15.8.

Upon examining the figures for the different geographical divisions,[2] the rate of growth of improved land is found to be much greater in the regions where there were public and railroad lands that could be

[1] Not including Alaska and Indian Territory.

[2] The geographical divisions of the Eleventh Census are adopted, as follows: North Atlantic—Maine, New Hampshire, Vermont, Massachusetts, Rhode Island, Connecticut, New York, New Jersey, Pennsylvania. South Atlantic—Delaware, Maryland, District of Columbia, Virginia, West Virginia, North Carolina, South Carolina, Georgia, Florida. North Central—Ohio, Indiana, Illinois, Michigan, Wisconsin, Minnesota, Iowa, Missouri, North Dakota, South Dakota, Nebraska, Kansas. South Central—Kentucky, Tennessee, Alabama, Mississippi, Louisiana, Texas, Oklahoma, Arkansas. Western—Montana, Wyoming, Colorado, New Mexico, Arizona, Utah, Nevada, Idaho, Washington, Oregon, California.

acquired for agriculture than in the older States. In the North Atlantic division the acreage of improved land increased 24.7 per cent from 1850 to 1890; in the South Atlantic division, 38.9 per cent; in the North Central division, 590.7 per cent; in the South Central division, 200.8 per cent, and largest of all, 6,518 per cent in the Western division.

The following table exhibits a more detailed statement of increases, not only of improved land but also of unimproved land and of farms, and shows that they have been rapid outside of the Atlantic States. The table also shows a marked slackening in the increase during the last decade, when public land suitable for agriculture had approached more nearly the point of exhaustion of supply.

Percentage of increase (+) or decrease (—) of number and acreage of farms, by geographical divisions and by census decades.

Geographical division and decade.	Number of farms.	Acreage.		
		Total.	Improved.	Unimproved.
North Atlantic:				
1850 to 1860	+ 15.4	+ 10.7	+ 14.8	+ 4.2
1860 to 1870	+ 6.5	+ 2.7	+ 5.5	— 2.1
1870 to 1880	+ 15.7	+ 8.4	+ 12.8	— 0.1
1880 to 1890	— 5.4	— 7.7	— 8.7	— 5.5
1850 to 1890	+ 34.5	+ 13.7	+ 24.7	— 3.8
South Atlantic:				
1850 to 1860	+ 21.6	+ 14.0	+ 16.3	+ 13.0
1860 to 1870	+ 23.9	— 15.3	+ 13.5	— 16.2
1870 to 1880	+ 72.3	+ 12.4	+ 19.8	+ 8.7
1880 to 1890	+ 16.3	— 1.2	+ 15.2	— 10.4
1850 to 1890	+ 202.0	+ 7.2	+ 38.9	— 7.7
North Central:				
1850 to 1860	+ 76.5	+ 72.1	+ 96.1	+ 54.4
1860 to 1870	+ 45.7	+ 29.0	+ 49.9	+ 9.4
1870 to 1880	+ 50.9	+ 48.7	+ 74.5	+ 15.4
1880 to 1890	+ 13.3	+ 24.0	+ 34.7	+ 3.1
1850 to 1890	+ 339.6	+309.3	+ 590.7	+100.8
South Central:				
1850 to 1860	+ 38.8	+ 53.2	+ 50.8	+ 54.2
1860 to 1870	+ 38.0	— 16.5	— 6.4	— 20.4
1870 to 1880	+ 73.5	+ 34.4	+ 60.2	+ 22.6
1880 to 1890	+ 22.6	+ 17.2	+ 33.1	+ 7.7
1850 to 1890	+ 307.3	+101.5	+ 200.8	+ 62.1
Western:				
1850 to 1860	+ 416.4	+172.7	+ 959.9	+ 10.9
1860 to 1870	+ 39.1	+ 27.5	+ 119.8	— 10.1
1870 to 1880	+ 73.7	+ 61.5	+ 92.1	+ 31.0
1880 to 1890	+ 74.2	+ 80.5	+ 47.9	+128.3
1850 to 1890	+2,073.4	+913.7	+6,518.0	+462.1
The United States:				
1850 to 1860	+ 41.1	+ 38.7	+ 44.3	+ 35.2
1860 to 1870	+ 30.1	+ 0.1	+ 15.8	— 10.4
1870 to 1880	+ 50.7	+ 31.5	+ 50.7	+ 14.8
1880 to 1890	+ 13.9	+ 16.2	+ 25.6	+ 5.7
1850 to 1890	+ 215.0	+112.3	+ 216.4	+ 47.1

CHEAP PUBLIC LAND.

Conspicuous among the causes of the rapid and enormous development of agriculture in the United States is the large area of public land that has been available to immigrants as well as to natives at small prices and waiting for the exploitation of fertility to begin. Previous to July 1, 1897, final homestead entries to the number of 529,051 had been made for 70,396,856 acres belonging to the National Government and disposed of under the homestead act of May 20, 1862, while the number of entries made, both final and pending, cover 102,280,228 acres.

During the twenty-two years preceding July 1, 1897, the public and Indian lands disposed of for cash and under the homestead laws, under the timber-culture laws, located with agricultural college and other kinds of scrip, located with military bounty land warrants, and selected by States and railroads embraced 299,961,357 acres.

In addition to this, some of the States and many railroad companies have been selling land, mostly for farms, amounting in the aggregate to a vast area. The number of sales on credit of tracts of land large enough to be measured by acres has been ascertained for the ten years 1880 to 1889, and these are: By States, 60,431 sales for $30,533,142; by railroads, 140,190 sales for $81,591,299.

EXTENSION OF RAILROADS.

Railroad companies have facilitated the acquisition of public land by farmers by constructing their lines through that portion of our domain extensively enough to enable them to carry away the crops that have been raised, and in many instances railroad projection has antedated settlement, so as to make settlement possible. The increase and magnitude of the railroad mileage in the various geographical divisions should be noted in connection with this.

From 1870 to 1896 this mileage was increased from 14,203 to 27,538 miles in the North Atlantic division, or 93.9 per cent; in the South Atlantic division, from 7,349 to 21,924 miles, or 198.3 per cent; in the North Central division, from 22,747 to 80,820 miles, or 255.3 per cent; in the South Central division, from 6,073 to 28,297 miles, or 366 per cent, and in the Western division, from 2,550 to 24,198 miles, or 848.9 per cent; while in the United States the increase during the twenty-six years was from 52,922 to 182,777 miles, or 245.4 per cent. Thus, it appears that the growth of railroad lines corresponds geographically with the multiplication of farms and farm acreage.

FARM CAPITAL AND PRODUCTS.

In magnitude of value farm capital and products reach stupendous figures, as the table following shows. A prominent feature of

the table is the fact that about one-half of the capital and products is found in the North Central States, the great wheat and corn producing region. The farm capital of the United States, as reported by the census of 1890, was valued at $15,982,267,689 as the aggregate of these items: Land, fences, and buildings, $13,279,252,649; implements and machines, $494,247,467; live stock on hand, $2,208,767,573. The product of farms in the year previous to June, 1890, was valued at $2,460,107,454.

Value of farm property and products in 1890, by geographical divisions.

Geographical division.	Total farm capital.	Land, fences, and buildings.	Implements and machines.	Live stock on hand.	Farm products.
North Atlantic	$2,969,971,293	$2,539,200,537	$116,868,252	$313,902,504	$418,309,066
South Atlantic	1,333,395,489	1,135,319,670	36,444,018	161,631,801	292,847,809
North Central	8,517,238,731	7,069,767,154	252,225,315	1,195,246,262	1,112,949,820
South Central	1,849,395,198	1,440,022,598	58,343,772	351,028,828	480,337,764
Western	1,312,266,978	1,094,942,690	30,366,110	186,958,178	155,662,99
The United States	15,982,267,689	13,279,252,649	494,247,467	2,208,767,573	2,460,107,454

INCREASE OF CAPITAL AND PRODUCTS.

The table following has been computed to discover the percentage of increase or decrease of the value of farm capital and products every ten years from 1850 to 1890, and for the whole period of forty years. During the full period the value of land, fences, and buildings increased 305.9 per cent; implements and machines, 226 per cent; live stock, 305.9 per cent; the aggregate of these three classes of capital, 302.8 per cent, and the value of the annual products, 1870 to 1890, 15.5 per cent.

The decade exhibiting the highest degree of increase of capital is from 1850 to 1860, for which the percentage is 101.2; next is the decade 1880 to 1890, the percentage being 28.8; the intermediate decades have nearly the same percentage, the smaller one being 21.2 for 1870 to 1880.

From 1870 to 1880 the value of farm products increased 3.9 per cent; from 1880 to 1890, 11.2 per cent. It is a conspicuous fact that the value of capital increased in a much greater degree than the value of products.

Percentage of increase (+) or decrease (—) of the value of farm property and products, by geographical divisions and by census decades.

[Values for 1870 are in gold.]

Geographical division and decade.	Total farm capital.	Land, fences, and buildings.	Implements and machines.	Live stock on hand.	Farm products.[1]
North Atlantic:					
1850 to 1860	+ 45.7	+ 45.8	+ 36.3	+ 47.1	.....
1860 to 1870	+ 30.7	+ 29.6	+ 32.2	+ 39.2	.....
1870 to 1880	— 3.2	+ 2.0	+ 9.8	— 20.5	— 20.2
1880 to 1890	— 6.8	— 9.4	+ 9.1	+ 9.7	— 5.1
1850 to 1890	+ 76.3	+ 74.5	+ 115.7	+ [2] 78.7	— 24.2
South Atlantic:					
1850 to 1860	+ 71.0	+ 74.9	+ 38.1	+ 56.9	.....
1860 to 1870	— 33.2	— 34.2	— 36.0	— 27.1	.....
1870 to 1880	+ 22.9	+ 34.3	+ 41.4	+ 7.4	— 0.0
1880 to 1890	+ 23.2	+ 27.3	+ 18.3	+ 25.3	+ 9.2
1850 to 1890	+ 88.8	+ 96.9	+ 47.8	+ [2] 54.0	+ 9.2
North Central:					
1850 to 1860	+ 175.9	+ 183.4	+ 104.8	+ 151.7	.....
1860 to 1870	+ 77.1	+ 76.3	+ 84.6	+ 81.0	.....
1870 to 1880	+ 33.6	+ 36.6	+ 53.4	+ 31.4	+ 18.6
1880 to 1890	+ 35.5	+ 37.8	+ 22.3	+ 56.7	+ 10.1
1850 to 1890	+ 831.2	+ 840.5	+ 609.2	+ [2] 838.3	+ 30.6
South Central:					
1850 to 1860	+ 159.1	+ 174.0	+ 66.8	+ 130.2	.....
1860 to 1870	— 41.0	— 43.8	— 47.0	— 27.1	.....
1870 to 1880	+ 20.0	+ 33.0	+ 43.5	+ 8.4	+ 0.3
1880 to 1890	+ 40.3	+ 46.7	+ 25.2	+ 49.7	+ 20.6
1850 to 1890	+ 186.6	+ 200.3	+ 58.8	+ [2] 172.2	+ 20.9
Western:					
1850 to 1860	+ 652.5	+ 711.2	+ 823.5	+ 571.7	.....
1860 to 1870	+ 72.7	+ 120.3	+ 67.2	+ 4.6	.....
1870 to 1880	+ 115.3	+ 151.8	+ 127.8	+ 72.6	+ 56.5
1880 to 1890	+ 148.9	+ 180.1	+ 92.2	+ 112.1	+ 64.2
1850 to 1890	+7,898.2	+12,501.6	+ 6,660.7	+22,472.0	+ 157.0
The United States:					
1850 to 1860	+ 101.2	+ 103.1	+ 62.4	+ 100.2	.....
1860 to 1870	+ 21.3	+ 21.3	+ 19.1	+ 21.9	.....
1870 to 1880	+ 21.2	+ 26.5	+ 38.6	+ 13.0	+ 3.9
1880 to 1890	+ 28.8	+ 30.2	+ 21.6	+ 47.2	+ 11.2
1850 to 1890	+ 302.8	+ 305.9	+ 226.0	+ [2] 305.9	+ 15.5

[1] Includes betterments and additions to stock in 1870.
[2] 1870 to 1890.

CROP INCREASE AND DECREASE.

The magnitude and growth of farm area and property having been shown, the tendency of the principal crops may now be noted. The following table discloses the percentage of increase or decrease of area devoted to each crop from 1880 to 1890, as shown by the census. Corn acreage increased 15.6 per cent; rye, 17.9 per cent; oats, 75.4 per cent; barley, 61.2 per cent; cotton, 39.3 per cent; sugar cane, 20.7 per cent; hay, 72.9 per cent, and tobacco, 8.8 per cent; while wheat acreage decreased 5.2 per cent; buckwheat, 1.3 per cent, and rice, 7.4 per cent.

Percentage of increase (+) or decrease (—) of acreage of farm crops, 1880 to 1890, by geographical divisions.

Geographical division.	Corn.	Wheat.	Rye.	Oats.	Barley.	Buckwheat.	Cotton.	Hay.	Tobacco.
North Atlantic	—20.7	—20.5	—16.1	+ 8.1	— 2.0	—13.1	.....	+ 9.8	— 1.7
South Atlantic	— .9	—17.7	— 5.3	— 1.2	+ 8.6	—54.2	+30.6	+ 70.7	— 2.7
North Central	+25.7	— 5.6	+74.6	+124.6	+112.6	+75.5	+80.6	+108.0	+11.2
South Central	+ 7.8	—28.7	—39.0	+ 40.2	— 56.5	—58.9	+44.0	+202.1	+20.1
Western	+60.1	+57.6	+85.6	+ 65.4	+ 39.1	—21.5	.....	+172.5	—51.0
The United States	+15.6	— 5.2	+17.9	+ 75.4	+ 61.2	— 1.3	+39.3	+ 72.9	+ 8.8

A census of agricultural production was first taken in 1840, and the increase or decrease to 1890 is contained in the table following for principal crops. The product of corn increased 462.2 per cent during the fifty years, or to 2,122,327,547 bushels; wheat, 452.2 per cent, or to 468,373,968 bushels; rye, 52.4 per cent, or to 28,421,398 bushels; oats, 557.6 per cent, or to 809,250,666 bushels; barley, 1,782.3 per cent, or to 78,332,976 bushels; buckwheat, 66.1 per cent, or to 12,110,349 bushels; cotton, 372.7 per cent, or to 7,472,511 bales (9,476,435 in 1894–95); hay, 552.1 per cent, or to 66,831,480 tons; rice, 59.1 per cent, or to 128,590,934 pounds; tobacco, 122.8 per cent, or to 488,256,646 pounds, and Irish potatoes, from 1850 to 1890, 230.6 per cent, or to 217,546,362 bushels.

The decade 1870 to 1880 is a prominent one during the fifty years with respect to the rate of increase of corn, wheat, cotton, sugar cane, and tobacco; and the decade 1880 to 1890 for rye, oats, and hay. In each of the two decades since 1870 the production of most of the crops increased faster than the population.

Percentage of increase (+) or decrease (—) of production of farm crops, by geographical divisions and by time periods.

Geographical division and period of time.	Corn.	Wheat.	Rye.	Oats.	Barley.
North Atlantic:					
1840 to 1890	+ 97.4	+ 13.2	— 39.0	+ 67.3	+ 170.8
South Atlantic:					
1840 to 1890	+ 24.8	+ 48.2	— 50.5	+ 2.0	— 27.9
North Central:					
1840 to 1890	+1,410.4	+ 1,067.7	+ 1,473.8	+ 2,026.7	+ 9,910.2
South Central:					
1840 to 1890	+ 142.6	+ 133.3	— 59.5	+ 128.6	+ 771.9
Western:					
1850 to 1890	+1,208.5	+11,729.0	+135,634.8	+21,580.5	+183,306.6
The United States:					
1840 to 1850	+ 56.8	+ 18.5	— 23.9	+ 19.1	+ 24.2
1850 to 1860	+ 41.7	+ 72.3	+ 48.7	+ 17.8	+ 206.3
1860 to 1870	— 9.3	+ 66.2	— 19.8	+ 63.4	+ 88.0
1870 to 1880	+ 130.6	+ 59.7	+ 17.2	+ 44.6	+ 47.8
1880 to 1890	+ 21.0	+ 1.9	+ 43.3	+ 98.4	+ 78.0
1840 to 1890	+ 462.2	+ 452.2	+ 52.4	+ 557.6	+ 1,782.3

Geographical division and period of time.	Buckwheat.	Cotton.	Hay.	Tobacco.	Potatoes (Irish).
North Atlantic:					
1840 to 1890	+ 45.0	.....	+ 106.6	+5,693.5	[1] + 24.8
South Atlantic:					
1840 to 1890	— 19.4	+ 299.6	+ 229.2	— 14.0	[1] + 154.8
North Central:					
1840 to 1890	+ 243.5	+2,393.1	+ 2,473.2	+ 345.9	[1] + 810.6
South Central:					
1840 to 1890	— 12.7	+ 414.3	+ 1,293.3	+ 210.5	[1] + 201.6
Western:					
1850 to 1890	+3,904.6	.....	+73,145.7	+ 151.8	+6,826.4
The United States:					
1840 to 1850	+ 22.8	+ 56.2	+ 35.0	— 8.9	.....
1850 to 1860	+ 96.2	+ 118.2	+ 37.9	+ 117.4	+ 68.9
1860 to 1870	— 44.1	— 44.1	+ 43.1	— 39.5	+ 29.0
1870 to 1880	+ 20.3	+ 91.1	+ 28.7	+ 79.9	+ 18.2
1880 to 1890	+ 2.5	+ 29.8	+ 90.1	+ 3.3	+ 28.4
1840 to 1890	+ 66.1	+ 372.7	+ 552.1	+ 122.8	[1] + 230.6

[1] From 1850 to 1890.

Farm animals are commensurate in number with the magnitude of farming operations. At the census of 1890 there were 14,969,467 horses on farms, 2,295,532 mules and asses, 1,117,494 working oxen, 16,511,950 milch cows, 33,734,128 other cattle, 57,409,583 swine, and 35,935,364 sheep, not including spring lambs, and in the census year the wool clip amounted to 165,449,239 pounds, not including pulled wool and wool clipped on ranges, which were sufficient, according to the estimates of the Department, to make the entire wool clip for the census year 276,000,000 pounds.

In forty years, from the census of 1850 to that of 1890, the number of horses on farms increased 245.2 per cent; mules and asses, 310.4 per cent; milch cows, 158.6 per cent; other cattle, 248 per cent; swine, 89.1 per cent; sheep, not including spring lambs, 65.4 per cent, and the farm wool clip increased 215 per cent; but working oxen decreased 34.3 per cent. The following table shows further details:

Percentage of increase (+) or decrease (—) of farm animals in the United States, by census decades.

Decade.	Horses.	Mules and asses.	Neat cattle.			Swine.	Sheep, not including spring lambs.	Wool.[1]
			Working oxen.	Milch cows.	Other cattle.			
1840 to 1850	.....	.....	.....	.....	.....	+15.5	+12.5	+ 46.7
1850 to 1860	+ 44.1	+105.8	+32.6	+ 34.5	+ 52.5	+10.4	+ 3.4	+ 14.8
1860 to 1870	+ 14.3	— 2.2	—41.5	+ 4.1	— 8.2	—25.0	+26.7	+ 66.1
1870 to 1880	+ 45.0	+ 61.1	—24.7	+ 39.3	+ 65.8	+89.7	+23.6	+ 55.5
1880 to 1890	+ 44.5	+ 26.6	+12.4	+ 32.7	+ 50.0	+20.4	+ 2.1	+ 6.3
1850 to 1890	+245.2	+310.4	—34.3	+158.6	+248.0	+89.1	+65.4	+215.0

[1] Not including pulled wool nor wool clipped on ranges.

The increase of population compares with the preceding increases of farm property and products as follows: Increase, 1840 to 1850, 35.9 per cent; 1850 to 1860, 35.6 per cent; 1860 to 1870, 22.6 per cent; 1870 to 1880, 30.1 per cent; 1880 to 1890, 24.9 per cent; 1840 to 1890, 266.9 per cent; 1850 to 1890, 170 per cent.

ECONOMIC CONDITIONS.

AGRICULTURAL OCCUPATIONS.

By far the largest portion of the people are engaged in agriculture in comparison with the other great groups of occupations, known as mining, fishing, manufacturing, domestic and personal service, professional service, and trade and transportation. The number of persons reported in 1890 to be engaged in agriculture for gain was 8,395,634, of whom 678,142 were women, and the entire number is 36.9 per cent of all persons having gainful occupations. This percentage may be regarded as substantially representing the agricultural portion

of the population if the farm family is of about the same size as that of the rest of the population. The table following exhibits the number of persons in agricultural pursuits:

Number of persons in the United States ten years of age and over engaged in agriculture, by specified occupations, 1890.

Occupation.	Males.	Females.	Total.
Agricultural laborers [1]	2,556,957	447,104	3,004,061
Apiarists	1,728	45	1,773
Dairymen and dairywomen	16,161	1,734	17,895
Farmers, planters, and overseers	5,055,130	226,427	5,281,557
Gardeners, florists, nurserymen, and vine growers	70,186	2,415	72,601
Other agricultural pursuits	17,330	417	17,747
Total	7,717,492	678,142	8,395,634

[1] In agricultural districts "agricultural laborers" are often reported by census enumerators simply as "laborers."

FARM TENANCY.

What effect upon agricultural production the drift toward farm tenancy has it is impossible to establish, but the common supposition is that in this country farm tenancy is detrimental to production, because the tenant's interest in maintaining the productivity of the farm is not as great as that of the owner.

The following table shows that from 1880 to 1890 farm tenancy increased from 25.6 to 28.4 per cent, the increase being 2.8 farms in 100, and being about the same in all the geographical divisions, except the Western, where tenancy decreased:

Percentage of farms cultivated by owners and tenants, 1880 and 1890, by geographical divisions.

Geographical division.	Percentage cultivated by—			
	Owners.		Tenants.	
	1880.	1890.	1880.	1890.
North Atlantic	84.0	81.6	16.0	18.4
South Atlantic	63.9	61.5	36.1	38.5
North Central	79.5	76.6	20.5	23.4
South Central	63.8	61.6	36.2	38.4
Western	86.0	87.9	14.0	12.1
The United States	74.4	71.6	25.6	28.4

On account of the increase of farm tenancy and because of the diminishing demand for labor relative to quantity of products, due to the increasing use of machinery, the number of agricultural laborers who work for hire, who were 48.9 per cent of all agricultural workers in 1870, became 43.6 per cent in 1880, and fell to 35.8 per cent in 1890.

WAGES OF FARM LABOR.

The productivity of farm labor as measured in wages is represented by a low figure, as is the case with unskilled labor in general. Wage rates for this labor have been ascertained by the Department for a long series of years, beginning with 1866, when the monthly pay of an agricultural laborer without board was $19.07. It rose to $19.49 in 1869 and fell to $16.42 in 1879. In 1882 the rate was $18.94, and in 1885, $17.97, after which there was a rise to $19.10 in 1893, followed by a fall to $17.69 in 1895, during the financial depression. Details for geographical divisions will be found in the table following. The divisions are unlike those mentioned elsewhere throughout this paper, and are the ones established long ago for the tabulation of farm-wage statistics in the Department, and are sufficiently indicated by their names:

Wages of farm labor per month without board, by geographical divisions and by years.

[In gold for all years.]

Geographical division.	1895.	1894.	1893.	1892.	1890.	1888.	1885.	1882.	1879.	1875.	1869.	1866.
Eastern States	$29.00	$27.02	$29.07	$26.46	$26.64	$26.03	$25.30	$26.55	$21.36	$25.24	$24.08	$23.64
Middle States	23.80	23.64	24.82	23.83	23.62	23.11	23.19	23.21	20.24	23.49	21.95	21.17
Southern States	12.71	13.04	14.07	14.86	14.77	14.54	14.27	14.67	12.65	13.30	12.40	11.80
Western States	21.82	21.50	23.12	22.61	22.01	22.23	22.27	23.26	19.81	20.23	19.84	19.76
Mountain States	30.04	29.95	33.97	32.16	31.94	33.37	30.24	36.50	.....	.....	.....	19.33
Pacific States	31.68	34.15	36.95	36.15	34.87	36.73	37.78	37.22	40.11	43.50	46.38	44.60
The United States	17.69	17.74	19.10	18.60	18.33	18.24	17.97	18.94	16.42	17.29	19.49	19.07

SIZE OF FARMS.

In this age of agricultural machines the area of a farm has some relationship to agricultural production. A farm may be so small that its owner can not afford to own expensive machines, and, although this difficulty is obviated in many parts of the country in the cases of some crops, as in the ginning of cotton and in the thrashing of wheat by men who do this work for a neighborhood of farmers at a rate per pound or bushel, yet, generally speaking, a farmer with a small farm does feel his limitations in the purchase and use of machines.

While it might be too much to claim that the average area of farms is economically the best one, it may be more reasonable to suggest that it is adjusted to the financial ability of the owners. At any rate, whatever may be the cause or causes of changes in average farm areas, the fact is that they uninterruptedly diminished from 1850 to 1880, and, outside of comparatively small regions where new land has been taken in large farms for wheat raising, mostly between the Missouri River and the arid region and on the Pacific Coast, there was

a diminished average farm area from 1880 to 1890. This may be verified by reference to the "Abstract of the Eleventh Census," from which the table following has been computed.

It is better, however, to take the average farm areas of improved land as more truly responding to economic conditions, if there is such a response. In 1850 the average farm had 78 acres of improved land; in 1860, 80 acres; in 1870 and 1880, 71 acres, and in 1890, 78 acres, or the same number as at the beginning of the forty-year period under consideration. So it appears that the number of acres under cultivation on each farm on the average has remained substantially the same in the days of the use of machines and improved tools and of convenient railroads as it was in the days of hand labor, the ox team, and restricted markets.

Average acreage of farms, by geographical divisions and by census years.

Geographical division and year.	Average number of acres.		Geographical division and year.	Average number of acres.	
	Improved.	Entire farm.		Improved.	Entire farm.
North Atlantic:			South Central:		
1850	69	113	1850	83	291
1860	69	108	1860	90	321
1870	68	104	1870	61	194
1880	67	98	1880	56	151
1890	64	95	1890	61	144
South Atlantic:			Western:		
1850	121	376	1850	52	695
1860	116	353	1860	106	367
1870	81	241	1870	168	336
1880	56	157	1880	186	313
1890	56	134	1890	158	324
North Central:			The United States:		
1850	61	143	1850	78	203
1860	68	140	1860	80	199
1870	70	124	1870	71	153
1880	81	122	1880	71	134
1890	96	133	1890	78	137

As having further bearing on this subject, it may be said that 29.3 per cent of the farms of 1880 and 28.9 per cent of those of 1890 had less than 50 acres each; the farms of 50 and less than 100 acres were 25.8 per cent of the total in 1880 and 24.6 per cent in 1890; the farms of 100 and less than 500 acres were 42.3 per cent in 1880 and 44 per cent in 1890; those of 500 and less than 1,000 were 1.9 per cent in 1880 and 1.8 per cent in 1890; while those of 1,000 acres and over were 0.71 of 1 per cent in 1880 and 0.69 of 1 per cent in 1890.

PROPORTIONS OF CLASSES OF CAPITAL.

As a contribution to information regarding the economic conditions attending agriculture the table on page 588 has been computed. In

this it appears that the value of farm real estate in 1890 was 83.1 per cent of the value of the farm capital reported by the census and the portion was very nearly the same in 1880 and 1870.

The value of implements and machines was 3.1 per cent of the value of capital in 1890, 3.4 per cent in 1880, and 3 per cent in 1870, so that they can hardly be said to have gained in relative importance in value as an element of capital during the twenty years; and the same remark applies to the value of live stock on hand, which was 13.8 per cent of the value of capital in 1890, 12.4 per cent in 1880, and 13.7 per cent in 1870.

RATIO OF PRODUCT TO CAPITAL.

While the three specified elements of the capital of the farm have maintained about the same relationship to one another during the twenty years, a decided change in the ratio of the value of product to that of capital has taken place. This ratio is expressed by 22 per cent for 1870, by 18.3 per cent for 1880, and by 15.4 per cent for 1890, and, since there has been no decrease in crop production per acre, the inference is that a fall in crop prices is responsible for the diminishing ratio.

Percentage that the value of farm property and products is of the total farm capital, by geographical divisions and by census years.

Geographical division and year.	Land, fences, and buildings.	Implements and machines.	Live stock on hand.	Farm products.[1]	Geographical division and year.	Land, fences, and buildings.	Implements and machines.	Live stock on hand.	Farm products.[1]
North Atlantic:					South Central:				
1870	85.7	3.1	11.2	17.2	1870	74.8	3.3	21.9	40.3
880	87.7	3.4	8.9	13.8	1880	77.7	3.7	18.6	31.6
1890	85.5	3.9	10.6	14.1	1890	77.9	3.1	19.0	26.0
South Atlantic:					Western:				
1870	82.4	2.7	14.9	33.3	1870	72.8	3.2	24.0	28.4
1880	84.8	2.9	12.3	25.5	1880	79.0	3.2	17.8	19.2
1890	85.2	2.7	12.1	22.0	1890	83.4	2.3	14.3	11.9
North Central:					The United States:				
1870	84.0	3.0	13.0	19.1	1870	83.3	3.0	13.7	22.0
1880	84.1	3.4	12.5	16.6	1880	84.2	3.4	12.4	18.3
1890	83.0	3.0	14.0	13.1	1890	83.1	3.1	13.8	15.4

[1] Includes betterments and additions to stock in 1870.

CAPITAL AND PRODUCT AVERAGES.

Quite similar results are shown in another way by means of averages in the table following. The average value of land, buildings, and fences per farm in 1870 was $3,030, in 1890, $2,909; of implements and machines in 1870, $111, in 1890, $108; of live stock on hand in 1870, $499,

in 1890, $484; of farm products in 1870, $801, in 1890, $539. During this time the increase in the number of acres of improved land per farm was 7, or from 71 to 78; but notwithstanding this the average amount of each of the three classes of farm capital slightly decreased, while the average value of products very considerably decreased.

Average value of capital and products per farm, by geographical divisions and by census years.

[Values for 1870 are in gold.]

Geographical division and year.	Land, fences, and buildings.	Implements and machines.	Live stock on hand.	Farm products.	Geographical division and year.	Land, fences, and buildings.	Implements and machines.	Live stock on hand.	Farm products.
North Atlantic:					South Central:				
1870	$4,570	$162	$598	$917	1870	$1,444	$64	$423	$777
1880	4,027	154	411	633	1880	1,107	53	265	449
1890	3,856	177	477	635	1890	1,325	54	323	442
South Atlantic:					Western:				
1870	1,775	58	321	716	1870	3,220	144	1,059	1,257
1880	1,384	48	200	416	1880	4,669	189	1,053	1,133
1890	1,515	49	216	391	1890	7,506	208	1,282	1,067
North Central:					The United States:				
1870	3,338	119	516	757	1870	3,030	111	499	801
1880	3,021	121	449	595	1880	2,544	101	374	552
1890	3,675	131	621	579	1890	2,909	108	484	539

Upon turning to the geographical divisions it will be noticed that the average value of farm real estate increased during the twenty years in the North Central and Western divisions; that the average value of implements and machines increased in the North Atlantic, North Central, and Western divisions; that the average value of live stock increased in the North Central and Western divisions, all of these being exceptions to the general tendency for the United States, but there are no exceptions among the geographical divisions to the conclusion that for the United States the average value of products per farm has materially diminished during the period under consideration.

RELATION OF IMPLEMENTS TO PRODUCTS.

The value of farm implements and machines increased from 1870 to 1890 relative to the value of farm products, being 13.8 per cent of the products in 1870, 18.4 per cent in 1880, and 20.1 per cent in 1890. Every geographical division shows an increasing percentage. The highest percentage for 1890 for any geographical division is 27.9 for the North Atlantic; next, 22.7 per cent for the North Central; third, 19.5 per cent for the Western; fourth, 12.4 per cent for the South Atlantic; and, fifth, 12.2 per cent for the South Central.

RELATION OF IMPLEMENTS TO CAPITAL.

The ratio of the value of farm implements and machines to farm real estate was higher in 1850 than in any subsequent census year, but has not materially changed since 1860. The ratio was 4.6 per cent in 1850, 3.7 per cent in 1860, 3.6 per cent in 1870, 4 per cent in 1880, and 3.7 per cent in 1890. Since 1860, therefore, changes in the value of farm real estate have been commensurate with the changes in the value of equipment of machines and implements.

In the present consideration of values it should be borne in mind that farm machines and tools are more varied, better, and cheaper than in the earlier year of comparison, and that the cost of producing most, if not all, of the farm crops may be less than before.

EARNINGS OF FARM LABORERS IN 1890.

It is possible to compute the wages paid to farm laborers (those working for hire) in 1890, the wage rates for the States and Territories, the number of laborers, and the time employed being known. The result of this computation is that the agricultural laborers of the United States were paid $645,460,352 in 1890, or 26.2 per cent of the value of the farm product. Board is not included, nor is there included any compensation to farmers (working on farms owned or hired by them), nor to their wives, children, and others working without wages or merely for board and keeping.

PRODUCTS MEASURED BY RAILROAD TRAINS.

So large in quantities are the crops produced in the United States that numbers of pounds, tons, and bushels fail to convey anything more than a vague conception of their amounts. To put the matter in form for better intellectual grasp, computations have been made to ascertain the number of railroad freight cars, each of 15 tons capacity, required to haul the crops of 1897, and what their length would be.

To haul the hay crop 4,017,933 cars would be needed, and the length of the train would be 25,112 miles, or more than long enough to encircle the earth at the equator; for the corn crop there must be 3,540,257 cars, making a train 22,127 miles long; the wheat crop would take 1,060,000 cars, with a total length of 6,625 miles, or farther than from New York to Cape Horn; a train of 772,098 cars, extending 4,826 miles, or from New York to the Congo River, would be required for the oat crop; a train of 327,354 cars, and 2,046 miles long, to move the potato crop, and this train would extend from New York to Utah; a train to haul the cotton crop would be as long as from New York to Chicago, and one to haul the barley crop would reach from Washington, D. C., to Atlanta, Ga.

EXPORTS.

Raising, as this country does, a larger amount of agricultural products than its people can consume, the exports constitute a considerable

portion of some of the crops, as the table following shows. The average portion of the corn crop exported annually from 1894 to 1896 was 5.4 per cent; of wheat, 16 per cent; of rye, 12.2 per cent; of oats, 2.2 per cent; of barley, 13 per cent; of tobacco, 67.4 per cent; of cotton, 73.6 per cent.

Percentage of crops exported.

Crop.	Annual average.			
	1868-1872.	1878-1882.	1888-1892.	1894-1896.
Corn	1.84	4.82	3.49	5.39
Wheat	12.83	27.84	17.68	15.96
Rye	1.78	10.30	.....	12.21
Oats	.13	.37	.80	2.22
Barley	.93	1.55	.....	12.96
Potatoes	.....	.37	.....	.30
Tobacco	71.12	55.84	.....	67.42
Cotton	72.81	72.80	66.79	73.60
Hay	.....	.03	.....	.10

It is to be remembered that large portions of some of the crops are exported in the form of animals and animal products. In 1895 the exports of beef products were 344,598,139 pounds; of hog products, 1,092,024,847 pounds; of mutton, 591,449 pounds, and of oleomargarine 88,199,775 pounds.

SURPLUS ACREAGE.

In recent years predictions have been made of the near approach of the time when our domestic consumption will overtake domestic production of various crops, especially of wheat, but the predictions seem hardly nearer realization as time passes, and the potential expansion of acreage, as demand and price become strong and high, promises a surplus for export for many years to come.

For domestic requirements 28.6 bushels of corn are needed per capita, 5.5 bushels of wheat, and 10.7 bushels of oats, the computations being made in the usual way upon the figures of exports, imports, production, and population, and the annual average for 1888–1892 being adopted.

Therefore, it follows that 1.15 acres in corn are required per capita for domestic consumption, 0.43 of 1 acre in wheat, and 0.43 of 1 acre in oats. This gave us a surplus area in corn in 1890 of 2,648,404 acres above domestic requirements, of 11,264,478 acres in wheat, and 238,162 acres in oats.

VALUES AND PRICES.

AVERAGE VALUE OF PRODUCTS PER ACRE.

There is space for only a brief reference to crop production and value per acre and to prices, and the tables presented need little comment. The first table following shows that the average value of farm

products per improved acre decreased from $11.28 in 1870 to $7.77 in 1880, and then to $6.88 in 1890. The geographical divisions show the same tendency, with the exception that the average value increased from 1880 to 1890 in the North Atlantic division and in the Western.

Average value of farm products per improved acre, by geographical divisions and by census years.

Geographical division.	1870.[1]	1880.	1890.
North Atlantic	$13.42	$9.50	$9.88
South Atlantic	8.88	7.41	7.03
North Central	10.87	7.38	6.04
South Central	12.78	8.00	7.25
Western	7.48	6.09	6.75
The United States	11.28	7.77	6.88

[1] Farm products include betterments and additions to stock; values are in gold.

Average value and yield of cereal crops in the United States, by geographical divisions and by periods of years.

[Values are in gold.]

Geographical division and period.	Corn.			Wheat.			Oats.		
	Average farm price per bushel.	Average yield per acre.	Average value per acre.	Average farm price per bushel.	Average yield per acre.	Average value per acre.	Average farm price per bushel.	Average yield per acre.	Average value per acre.
North Atlantic:		*Bush.*			*Bush.*			*Bush.*	
1870 to 1879	$0.66	34.8	$23.09	$1.33	14.2	$18.94	$0.43	31.6	$13.56
1880 to 1889	.59	30.7	18.11	1.02	13.3	13.61	.39	28.4	11.06
1890 to 1896	.53	32.0	16.81	.81	14.9	11.99	.35	27.3	9.68
South Atlantic:									
1870 to 1879	.66	15.0	9.89	1.31	9.0	11.81	.51	15.6	7.90
1880 to 1889	.57	13.7	7.80	1.02	8.3	8.49	.48	11.3	5.46
1890 to 1896	.50	14.4	7.29	.80	9.4	7.47	.44	13.1	5.71
North Central:									
1870 to 1879	.33	32.3	10.56	.96	13.0	12.50	.28	30.8	8.67
1880 to 1889	.32	28.9	9.41	.79	12.6	9.94	.26	31.0	8.14
1890 to 1896	.30	28.4	8.46	.62	13.3	8.28	.25	27.2	6.87
South Central:									
1870 to 1879	.58	21.2	12.21	1.11	9.0	9.98	.48	20.5	9.82
1880 to 1889	.50	18.5	9.19	.91	8.1	7.34	.44	15.8	6.91
1890 to 1896	.44	18.8	8.37	.73	9.8	7.15	.39	17.7	6.93
Western:									
1870 to 1879	.88	31.0	27.26	1.10	13.9	15.18	.62	32.5	20.01
1880 to 1889	.72	26.3	18.84	.80	14.1	11.31	.46	29.5	13.54
1890 to 1896	.57	23.4	13.30	.68	14.7	9.95	.39	30.7	11.96
The United States:									
1870 to 1879	.426	27.1	11.54	1.049	12.4	13.00	.353	28.4	10.03
1880 to 1889	.393	24.1	9.48	.827	12.1	9.98	.309	26.6	8.22
1890 to 1896	.355	24.1	8.55	.658	13.0	8.54	.286	25.2	7.21

Average value and yield of cereal crops in the United States, by geographical divisions and by periods of years—Continued.

[Values are in gold.]

Geographical division and period.	Barley.			Rye.			Buckwheat.		
	Average farm price per bushel.	Average yield per acre.	Average value per acre.	Average farm price per bushel.	Average yield per acre.	Average value per acre.	Average farm price per bushel.	Average yield per acre.	Average value per acre.
North Atlantic:		*Bush.*			*Bush.*			*Bush.*	
1870 to 1879	$0.86	21.8	$18.76	$0.83	13.8	$11.47	$0.72	18.4	$13.16
1880 to 1889	.75	22.5	16.79	.72	11.3	8.09	.63	13.5	8.50
1890 to 1896	.58	21.8	12.68	.53	15.2	8.10	.48	18.5	8.89
South Atlantic:									
1870 to 1879	.89	15.0	13.38	.81	9.9	8.03	.71	16.5	11.77
1880 to 1889	.86	15.5	13.35	.79	6.9	5.43	.66	10.7	7.05
1890 to 1896	.....	.....	.....	.62	9.3	5.70	.56	16.9	9.40
North Central:									
1870 to 1879	.62	23.5	14.50	.55	16.4	9.10	.70	15.7	11.04
1880 to 1889	.51	21.9	11.13	.52	14.0	7.34	.69	11.2	7.74
1890 to 1896	.31	23.7	7.44	.39	13.5	5.22	.52	13.8	7.12
South Central:									
1870 to 1879	.89	22.7	20.26	.79	11.3	8.92	.81	12.9	10.51
1880 to 1889	.68	18.7	12.71	.75	8.1	6.08	.67	8.6	5.82
1890 to 1896	.49	19.0	9.39	.60	10.7	6.46	.58	14.8	8.55
Western:									
1870 to 1879	.80	20.9	16.68	.98	17.5	17.14	1.25	24.9	31.13
1880 to 1889	.63	21.1	13.31	.77	11.5	8.89	.74	17.9	13.28
1890 to 1896	.44	21.4	9.31	.58	14.6	8.51	.64	20.0	12.75
The United States:									
1870 to 1879	.738	22.1	16.34	.701	14.1	9.92	.715	17.7	12.65
1880 to 1889	.589	21.7	12.79	.622	11.9	7.39	.642	12.8	8.24
1890 to 1896	.374	22.8	8.52	.467	13.6	6.35	.490	17.4	8.51

FARM PRICES OF CROPS.

As exhibited in the above table, corn had the average farm price of 42.6 cents per bushel in the ten years 1870 to 1879, 39.3 cents in 1880 to 1889, and 35.5 cents in 1890 to 1896. The farm price of wheat declined in a more marked degree, the prices for the three periods being 104.9, 82.7, and 65.8 cents, respectively. The farm prices of the other cereals also declined during the twenty-seven years.

In farm value of product per acre, corn averaged $11.54 in 1870 to 1879, $9.48 in 1880 to 1889, and $8.55 in 1890 to 1896; while wheat averaged $13 in 1870 to 1879, $9.98 in 1880 to 1889, and $8.54 in 1890 to 1896. A decline will be noted for the other cereals.

PRODUCTION PER ACRE.

Nothing conclusive with regard to increasing or decreasing fertility of soil is revealed in crop statistics of acreage and production. The extension or contraction of crop area may have the effect of raising or lowering the average yield per acre in the whole country. The average bushels of corn produced per acre were 27.1 in 1870 to 1879

and 24.1 in each of the periods 1880 to 1889 and 1890 to 1896; of wheat, 12.4 in 1870 to 1879, 12.1 in 1880 to 1889, and 13 in 1890 to 1896. Oats declined from 28.4 to 25.2 bushels from the first to the last period, while barley, rye, and buckwheat did not change materially from first to last, except that the production of rye and buckwheat per acre was small in the middle period.

PRICES OF COTTON AND WHEAT.

The tables following exhibit the average prices of cotton and wheat for a long series of years. Fluctuations appear in the prices, due to scarcity, to plenty, to wars, and to other causes, but the general fact of decreasing price during the present century is conspicuous. A brief reference to wool may be added. The average price of medium washed clothing Ohio fleece wool in the Eastern markets was 43 cents per pound from 1852 to 1859,[1] 43 cents from 1860 to 1869,[1] 45 cents from 1870 to 1879, 40 cents from 1880 to 1889, and 28 cents from 1890 to 1896. In 1890 the price was 37 cents per pound, and the decline was unbroken to 20 cents in 1896.

Average prices of cotton per pound in New York and Liverpool, 1791 to 1896, by periods of years.

[In gold for all years.]

Period of years.	In New York.	In Liverpool.	Year.	In New York.	In Liverpool.
	Cents.	*Cents.*		*Cents.*	*Cents.*
1791 to 1799	34.4	48.9	1890	11.5	12.2
1800 to 1809	23.2	36.0	1891	9.0	9.9
1810 to 1819	20.4	38.5	1892	7.6	8.5
1820 to 1829	13.2	15.4	1893	8.2	9.3
1830 to 1839	12.4	14.5	1894	7.7	8.5
1840 to 1849	8.1	9.7	1895	6.3	6.7
1850 to 1859	11.4	12.5	1896	8.0	8.3
1860 to 1869	29.4	30.5			
1870 to 1879	14.4	16.3			
1880 to 1889	10.8	12.1			
1890 to 1896	8.3	9.1			

Average prices of wheat in England, 1041 to 1896, by periods of years.

Period of years.	Number of years represented.	Price per bushel.	Period of years.	Number of years represented.	Price per bushel.
1041 to 1100	7	$0.351	1800 to 1809	10	$2.493
1114 to 1197	10	.511	1810 to 1819	10	2.693
1202 to 1294	27	1.828	1820 to 1829	10	1.764
1301 to 1391	29	1.032	1830 to 1839	10	1.651
1401 to 1500	39	.494	1840 to 1849	10	1.649
1504 to 1600	41	.737	1850 to 1859	10	1.575
1601 to 1700	96	1.108	1860 to 1869	10	1.518
1701 to 1800	85	1.096	1870 to 1879	10	1.514
1801 to 1896	96	1.690	1880 to 1889	10	1.091
			1890 to 1896	7	.833

[1] In gold.

Farm prices of wheat and freight rates from Chicago to New York, by years.

[Prices and rates in gold.]

Year.	Farm prices per bushel.	Average freight rate per bushel.	Number of bushels which could be carried for farm price of 1 bushel.	Year.	Farm prices per bushel.	Average freight rate per bushel.	Number of bushels which could be carried for farm price of 1 bushel.
		Cents.				*Cents.*	
1867	$1.436	32.38	4.44	1892	$0.624	13.80	4.52
1872	1.104	31.13	3.55	1893	.538	14.63	3.68
1877	1.034	19.56	5.29	1894	.491	13.20	3.72
1882	.882	14.47	6.10	1895	.509	11.89	4.28
1887	.681	15.75	4.32	1896	.726	12.00	6.05

PRICES BECOMING MORE STEADY.

The prices of agricultural products, especially those that have a world market, have tended toward a narrower range of fluctuations in a marked degree. Cotton prices may be cited as an illustration. The range in the prices of middling upland cotton per pound in New York has been ascertained for each year from 1821 to 1895, and the ranges have been averaged for groups of years. For the ten years 1821 to 1830 the average range of prices was 7.35 cents; 1831 to 1840, 7.60 cents; 1841 to 1850, 4.12 cents; 1851 to 1860, 3.46 cents; 1861 to 1870, 43.95 cents; 1871 to 1880, 4.16 cents; 1881 to 1890, 1.77 cents; 1891 to 1895, 2.21 cents. Here may be seen the steadying of prices due to the telegraph, the publication of trade and market news, to crop reporting and estimating, and to the anticipation of higher or lower prices in the future by raising or lowering present prices.

INFLUENCES THAT DEPRESS PRICES.

TRANSPORTATION.

That the wholesale market price of wheat and many other farm products should be less now than in earlier years is partly accounted for by the diminished cost of transportation. The tables following disclose this. The freight rate on 100 pounds of wheat from Chicago to New York in 1870 was 42 cents; in 1896 it was 20 cents. The rate per mile per ton of freight on thirteen large railroads was 1.37 cents in 1870; it was .71 of 1 cent in 1896. On all of the railroads of the United States this rate declined from 1.29 cents in 1880 to .81 of 1 cent in 1896. So greatly have the freight rates declined that the farm value of 1 bushel of wheat in 1896 paid for the transportation of 6.05 bushels from Chicago to New York, as against 4.44 bushels in 1867.

Freight rates, by years.

Year.	Rates in cents per 100 pounds.				Coal, per ton.	Rates in cents per mile.			
	Wheat.		Flour.	Packed meats.		Freight, per ton.	Freight, per ton.	Per passenger.	Anthracite coal, per ton.
	Chicago to New York.	St. Louis to New York.	St. Louis to New York.	Cincinnati to New York.	Clearfield region to Jersey City.	Thirteen railways.	All railways of United States.	All railways of United States.	Lehigh Valley Railroad.
1870[1]	42	----------	----------	38	----------	1.37	----------	----------	----------
1875[1]	30	----------	----------	23	$3.20	1.03	----------	----------	1.61
1880	33 1/6	42	42	33 3/8	4.17	1.01	1.29	2.51	1.43
1885	23 1/3	22 1/7	22 1/7	21 1/10	2.72	.83	1.04	2.20	1.22
1890	23 5/8	27 5/8	27 5/8	23 9/10	2.25	.77	.94	2.17	.84
1894	21 1/3	24 3/4	24 3/4	26	2.10	.76	.87	1.98	.74
1895	20 1/3	[2] 23 1/2	[2] 23 1/2	26	2.10	.72	.84	2.04	.65
1896	20	23	23	26	1.95	.71	.81	2.02	.68

[1] The rates are in gold.

[2] Actual rates probably lower.

COST OF MARKETING COTTON.

For the purpose of discovering in detail how much the cost of marketing cotton has declined since 1840, one of the special agents of the Department, living in Mobile, Ala., was requested to duplicate for 1897 the itemized statement of cost for 1840, published in Hunt's Merchant's Magazine[1] fifty-seven years ago. It cost $18.15 to market a bale of upland middling cotton weighing 420 pounds in 1840, or 4.32 cents a pound, and the cost fell to $7.89 in 1897, on account of the elimination of some charges and the reduction of others. This makes the present cost of marketing 1.58 cents per pound, a saving of 2.74 cents per pound from the beginning to the end of the fifty-seven years.

Charges for marketing a bale of cotton, 1840 and 1897.

[The charges exhibited in this table were incurred at Mobile, Ala., exclusive of insurance, calculated on a bale of 420 pounds of middling upland cotton at 10 cents in 1840, with ocean freight at ¾*d.*; and on a bale of 500 pounds of middling upland cotton at 5¼ cents in 1897, ocean freight at 15/64*d.*]

Charge.	In 1840.	In 1897.	Charge.	In 1840.	In 1897.
Wharfage (if by river)	$0.10	[1] $0.08	Commission on purchase	$0.80	[3] $0.00
Weighing	.12½	.10	Freight and primage	6.64½	2.46¼
Draying to press	.12½	.10	Chargeable to purchaser	8.00	3.75¼
Storage	.20	.25	Compressing	.80	[4] .00
Factor's commissions	.80	.05	Lighterage to lower bay	.25	.00
Add for freight to city (by river)	1.50	.75	Stowing	.25	.35
Chargeable to planter	2.85	1.93	Chargeable to vessel	1.30	.35
Brokerage	.25	.50	Total charges on a bale	12.15	6.03
Storage until compressed	.12½	[2] .00	Add port charges at Liverpool	6.00	1.86
Drayage to vessel or lighter	.08	.00	Total, on both sides, per bale	18.15	7.89
Wharfage	.10	.04			
Compressing	.00	.75			

[1] If by railroad, no wharfage charge.

[2] No charge if shipped in ten days.

[3] Included in charges for brokerage.

[4] Purchaser pays charge for compressing.

[1] Vol. II, p. 267 (March, 1840).

EFFECT OF INVENTIONS.

Perhaps it has not occurred to the reader that the chief causes of our nearly ten-million-bale cotton crop were ideas that were in the minds of inventors many years ago. This great crop is absolutely dependent upon the invention of the machines of the cotton mills and upon the cotton gin, which have made the cost of production of cotton fabrics very cheap, and thus made markets for enormous quantities of them. This is brought out forcibly in the table following, which mentions various inventions and the consequent extraordinary increase in the imports of cotton into Great Britain.

The extraordinary importance of some of these machines may be understood from the statement that before Whitney's invention of the cotton gin one person could pick the seed from only about 1½ pounds of cotton lint in ten hours, while at the present time one machine will gin from 1,500 to 7,500 pounds of lint in the same time, the quantity varying according to the size and power of the gin.

Inventions and cotton production.[1]

Invention.	Year of advent of invention.	Cotton imported to Great Britain.	Year of importation.
		Pounds.	
Hargreave's spinning jenny (patented 1770) for weft only	1764	3,870,392	1764
Calico printing introduced into Lancashire	1764	----------	--------
Arkwright perfects Wyatt's spinning frame (patented 1769), liberating cotton from dependence on linen warp	1768	----------	--------
Arkwright's mill built at Crawford	1771	4,764,589	1771 to 1775
Arkwright takes patents for carding, drawing, roving, spinning	1775	----------	--------
Crompton's mule completed (combining jenny and water frame, producing finer and more even yarn)	1779	5,198,775	1781
Cartwright's power loom; Watt and Boulton's first engine for cotton mills	1785	18,400,384	1785
Whitney's saw gin	1792	34,907,497	1792
Horrock's dressing machine	1813	51,000,000	1813
The "Throstle" (almost exclusively used in England for spinning warp)	1830	261,200,000	1830
Roberts's self-acting mule perfected	1832	287,800,000	1832
Bullough's improved power loom; ring spinning (largely used in United States of America, recently introduced into Lancashire)	1841	489,900,000	1841

[1] The Evolution of Modern Capitalism (Hobson), p. 60.

RESULTS OF USE OF FERTILIZERS.

Intensive agriculture, as affecting the economics of farming, has supplied few statistics beyond those collected by the Department for 1896 in North Carolina, South Carolina, Georgia, Florida, and Alabama with regard to the use of commercial fertilizers in cotton raising. It is a practical question to the farmer whether by the use of fertilizers his profit per bale is more or less than it has been without fertilizers;

and if the fact is established that it is profitable to use them, it is important to know when the point of diminishing returns is reached.

From returns made by 1,495 cotton planters in the States named, the table on page 599 has been prepared. The crop planted in 1896 is the one represented, and the crop brought a profit to 1,268 planters and a loss to 227. All of them used commercial fertilizers, and they are classified according to the value of the fertilizers used; those making a profit being in one group, and those suffering a loss in another.

It appears that twenty-one planters spent 74 cents apiece, on the average, for fertilizers for 1 acre, and that they each derived a profit of $4.62, on the average, above all costs of raising the crop. The planters who spent from $1 to $1.99 for fertilizers, made a profit of $5.09; from $2 to $2.99, a profit of $5.34; from $3 to $3.99, a profit of $5.91; from $4 to $4.99, a profit of $7.96; from $5 to $5.99, a profit of $8.76; and those whose fertilizers cost them $6 and more, made a profit of $12.51.

So it is evident that, so far as the table shows, the point of diminishing returns was not reached, when the crop was profitable, at any degree of fertilization. The returns from the planters who suffered a loss, while at first seeming to indicate a conclusion contrary to the above, in reality do not, because their crops were subject to abnormal conditions and were partial failures, the cause generally having been a drought, in which the fertilizer is likely to "burn" the plants. It will be observed that in the cases of the planters who lost on their crops the loss is greater as the cost of fertilizers is greater, and had climatic conditions been favorable the loss would have been a profit.

The word "profit" as here used should mean the excess of returns over expenses, including the theoretical one of rent, and for the most part has such a significance; some small charges against the crop may have been omitted from the schedules, such as the acre's share of the general farm expenses of insurance, repairs, and renewals.

Percentages of increase of profit and loss by each class over the preceding class have been computed to discover whether there is much, if any, uniformity in the increase, as there is in the classification of cost of fertilizers, but the uniformity does not appear.

Relationship between the average cost of fertilizers and the profit in raising 1 acre of cotton in 1896 in North Carolina, South Carolina, Georgia, Florida, and Alabama.

Classification of cost of fertilizers per acre.	For plantations having a—							
	Profit.				Loss.			
	Number of farms reporting.	Average cost of fertilizers.	Average profit.	Percentage of increase of profit over preceding class.	Number of farms reporting.	Average cost of fertilizers.	Average loss.	Percentage of increase of loss over preceding class.
Under $1	21	$0.74	$4.62	.....	3	$0.74	$1.48	.....
$1 and under $2	291	1.40	5.09	10.2	60	1.40	1.50	1.4
$2 and under $3	656	2.20	5.34	4.9	126	2.20	1.89	26.0
$3 and under $4	118	3.13	5.91	10.7	16	3.13	2.75	45.5
$4 and under $5	82	4.11	7.96	34.7	9	4.11	3.69	34.2
$5 and under $6	49	5.14	8.76	10.1	7	5.14	3.89	5.4
$6 and over	51	9.11	12.51	42.8	6	9.11	3.95	1.5
Total	1,268	2.52	5.71	.....	227	2.52	1.91	.....

Statistics of agriculture are mainly concerned with quantities, areas, values, and prices, and comparatively little statistical work with an economic bearing has been done. It was not the design of this paper to bring together the old matter of this sort, but rather to use the new matter at hand and to present some of the old in a new light.[1]

HAND AND MACHINE LABOR.

A very remarkable economic investigation into the old and new processes employed in manufacture, agriculture, and transportation was recently made by the United States Department of Labor, the results of which will be shown in a forthcoming report of that Department. The endeavor was to ascertain the time and labor cost by the latest processes of production and to compare them with the processes that obtained twenty to fifty years ago.

Certain facts relating to agriculture have been taken from thirty-three pairs of schedules, and these are presented in the table following.

Each pair of schedules has one relating to hand labor and one relating to machine labor, and the two are to be compared with each other, since they represent the same area of ground—an acre in the case of every schedule included in the table—and the same quantity of product. Each pair of schedules also covers the same extent of operations, although by different means. The information was obtained by special agents, and has been very carefully scrutinized by them and by other experts. It seems desirable to give this assurance, since the table is such an extraordinary one.

[1] For valuable discussions of economic conditions with respect to agriculture, see Wells's Recent Economic Changes.

Hand and machine labor in

[The words "hand" and "machine" within

No.	Crop and predominating labor.	Units of production on 1 acre.	Year of operation.	Time worked. By employees. Hrs.	Time worked. By employees. Min.	Time worked. By animals. Hrs.	Time worked. By animals. Min.	Cost of labor. For employees.	Cost of labor. For animals.	Cost of labor. Total.
1	Corn—hand ... bushels ..	40	1858	34	38.5	34	23.5	$3.2642	$1.2898	$4.5540
2	machine ... do	40	1894	16	30.3	38	41.2	1.6505	1.9344	3.5849
3	Corn—hand ..... do	40	1855	38	45.0	37	30.0	3.6250	1.4064	5.0314
4	machine ... do	40	1894	15	7.8	35	56.2	1.5130	1.7969	3.3099
5	Corn—hand ..... do	40	1855	182	40.8	54	9.0	14.3082	2.0308	16.3390
6	machine ... do	40	1894	27	30.3	47	46.8	4.2269	2.3891	6.6160
7	Corn—hand ..... do	40	1858	169	27.0	49	2.5	16.9451	1.8392	18.7843
8	machine ... do	40	1894	27	17.0	47	30.2	4.1502	2.3753	6.5255
9	Wheat—hand ..... do	20	1830	64	15.0	23	0.0	3.7125	.2875	4.0000
10	machine . do	20	1896	2	58.2	8	3.6	.7180	.4030	1.1210
11	Wheat—hand ..... do	20	1830	61	5.0	22	20.0	3.5542	.2792	3.8334
12	machine . do	20	1896	3	19.2	27	18.6	.6605	1.3655	2.0260
13	Oats—hand ..... do	40	1830	60	25.0	9	0.0	3.4375	.1125	3.5500
14	machine ... do	40	1893	7	10.8	10	51.2	1.0836	.5427	1.6263
15	Oats—hand ..... do	40	1830	66	15.0	9	40.0	3.7292	.1208	3.8500
16	machine ... do	40	1893	7	5.8	10	31.2	1.0732	.5260	1.5992
17	Rye—hand ..... do	25	1848	62	58.9	36	40.0	[1] 4.1061	1.1459	5.2520
18	machine ... do	25	1895	25	10.0	25	50.0	[1] 2.6542	1.6459	4.3001
19	Rye—hand ..... do	25	1848	66	3.8	38	0.0	[1] 3.3031	1.4250	4.7281
20	machine ... do	25	1895	25	10.0	26	20.0	[1] 2.6542	1.3167	3.9709
21	Barley—hand ..... do	30	1830	63	35.0	23	0.0	3.5958	.2875	3.8833
22	machine . do	30	1896	2	42.8	9	12.6	.6020	.4605	1.0625
23	Barley—hand ..... do	30	1830	58	5.0	22	20.0	3.3208	.2792	3.6000
24	machine . do	30	1896	3	24.4	26	18.0	.7136	1.3150	2.0286
25	Potatoes (Irish)—hand, bushels.	220	1866	108	55.0	45	50.0	10.8916	2.2916	13.1832
26	Potatoes (Irish)—machine, bushels.	220	1895	38	0.0	43	28.0	3.8000	2.1733	5.9733
27	Potatoes (Irish)—hand, bushels.	220	1870	108	55.0	45	50.0	10.8916	2.2916	13.1832
28	Potatoes (Irish)—machine, bushels.	220	1895	38	21.0	44	10.0	3.8350	2.2083	6.0433
29	Potatoes (sweet)—hand, bushels.	105	1868	317	20.0	97	4.0	28.2334	6.0666	34.3000
30	Potatoes (sweet)—machine, bushels.	105	1895	122	7.0	55	14.0	7.5292	2.7618	10.2910
31	Potatoes (sweet)—hand, bushels.	105	1868	317	20.0	97	4.0	28.2334	6.0666	34.3000
32	Potatoes (sweet)—machine, bushels.	105	1895	122	7.0	55	14.0	7.5292	2.7618	10.2910
33	Tobacco—hand, pounds.	1,500	1853	311	23.0	66	40.0	[1] 23.3538	2.5002	25.8540
34	Tobacco—machine, pounds.	1,500	1895	252	54.6	57	30.6	[1] 25.1160	2.8755	27.9915
35	Cotton (seed)—hand, pounds.	1,000	1866	115	58.0	25	18.0	8.7921	1.9461	10.7382
36	Cotton (seed)—machine, pounds.	1,000	1895	111	58.0	23	18.0	6.6133	1.3441	7.9574
37	Sugar cane—hand, tons.	20	1855	351	21.0	184	18.0	37.9409	2.3773	40.3182
38	Sugar cane—machine, tons.	20	1895	191	33.0	111	6.0	11.3189	5.0500	16.3689

[1] With board.

agriculture in the United States.

each brace cover the same extent of operations.]

Average total labor per bushel, etc.	Average human labor per bushel, etc.	Human labor required per bushel, etc.	Extent of operation and means employed.	No.
		Minutes.		
$0.1138	$0.0816	52.0	Stalks not cut from ground and corn not shelled; shovel plow, hoe, husking peg.	1
.0896	.0413	24.8	Gang plow, disk and four-section harrows, corn planter, and cultivator.	2
.1258	.0906	58.1	Stalks not cut from ground and corn not shelled; shovel plow, hoe, husking peg.	3
.0827	.0378	22.7	Gang plow, disk and four-section harrows, corn planter, and cultivator.	4
.4085	.3577	274.0	Stalks cut from ground and made into fodder and corn shelled; corn knife, horses.	5
.1654	.1057	41.3	Machine for cutting and binding stalks, and for husking and cutting into fodder; gang plow, corn planter, steam corn-sheller.	6
.4696	.4236	254.2	Stalks not cut from ground and corn not shelled; shovel plow, hoe, husking peg.	7
.1631	.1038	40.9	Gang plow, disk and four-section harrows, corn planter, and cultivator.	8
.2000	.1856	192.8	Oxen, brush harrow, sickle, flail and hand winnowing	9
.0560	.0359	8.9	Steam gang plow, seeder and harrow, steam reaper and thrasher.	10
.1917	.1777	183.2	Oxen, brush harrow, sickle, flail and hand winnowing	11
.1013	.0330	10.0	No steam power, disk plow, seeder and harrow, reaper and thrasher.	12
.0888	.0859	90.6	Oxen, brush harrow, sickle, flail and hand winnowing	13
.0407	.0271	10.8	Self-binding reaper, steam thrasher, spading harrow	14
.0962	.0932	99.4	Oxen, brush harrow, sickle, flail and hand winnowing	15
.0400	.0268	10.6	Self-binding reaper, steam thrasher, spading harrow	16
.2101	.1642	151.2	Oxen, sickle, flail, hand winnowing	17
.1720	.1062	60.4	Self-binding reaper, steam thrasher	18
.1891	.1321	158.6	Oxen, sickle, flail, hand winnowing	19
.1588	.1062	60.4	Self-binding reaper, steam thrasher	20
.1294	.1199	127.2	Oxen, brush harrow, sickle, flail and hand winnowing	21
.0354	.0201	5.4	Steam gang plow, seeder and harrow, steam reaper and thrasher.	22
.1200	.1107	116.2	Oxen, brush harrow, sickle, flail and hand winnowing	23
.0676	.0238	6.8	No steam power, disk plow	24
.0599	.0495	29.7	Shovel plow, hoe; potatoes cut by hand	25
.0272	.0173	10.4	Potato cutter, planter, digger	26
.0599	.0495	29.7	Shovel plow, hoe; potatoes cut by hand	27
.0275	.0174	10.5	Potato cutter, planter, digger	28
.3267	.2689	181.3	Plants set out by hand; hoe, spade for digging	29
.0980	.0717	69.8	Ridger, transplanter, digger	30
.3267	.2689	181.3	Plants set out by hand; hoe, spade for digging	31
.0980	.0717	69.8	Ridger, transplanter, digger	32
.0172	.0156	12.5	Plants set out by hand	33
.0187	.0167	10.1	Transplanter	34
.0107	.0088	7.0	Fertilizer distributed and seed planted by hand	35
.0080	.0066	6.7	Fertilizer distributor, planter	36
2.0159	1.8970	1,054.0	Hoe; hand planting	37
.8184	.5659	574.6	Cane planter, disk cultivator to cover cane, cultivator	38

Hand and machine labor in agriculture

[The words "hand" and "machine" within

No.	Crop and predominating labor.	Units of production on 1 acre.	Year of operation.	Time worked. By employees. Hrs.	Time worked. By employees. Min.	Time worked. By animals. Hrs.	Time worked. By animals. Min.	Cost of labor. For employees.	Cost of labor. For animals.	Cost of labor. Total.
39	Carrots—hand, tons.	30	1855	418	30.0	68	30.0	$27.1875	$3.4250	$30.6125
40	Carrots—machine, tons.	30	1895	257	20.0	60	40.0	26.1667	3.7917	29.9584
41	Carrots—hand tons.	30	1850	480	30.0	81	30.0	34.6375	4.0750	38.7125
42	Carrots—machine, tons.	30	1895	238	3.0	73	3.0	23.5550	3.6525	27.2075
43	Turnips—hand, bushels.	350	1850	456	0.0	39	30.0	31.1375	1.9750	33.1125
44	Turnips—machine, bushels.	350	1895	217	18.5	34	48.5	19.5433	1.7404	21.2837
45	Turnips—hand, bushels.	350	1855	399	0.0	35	30.0	23.8525	1.7750	25.6275
46	Turnips—machine, bushels.	350	1895	240	50.0	30	40.0	21.4292	1.9167	23.3459
47	Tomatoes—hand, bushels.	150	1870	324	20.0	128	40.0	30.1833	6.4333	36.6166
48	Tomatoes—machine, bushels.	150	1895	134	52.5	69	45.0	12.3894	3.4875	15.8769
49	Tomatoes—hand, bushels.	150	1870	322	20.0	124	40.0	29.9833	6.2333	36.2166
50	Tomatoes—machine, bushels.	150	1895	134	12.5	68	25.0	12.3327	3.4208	15.7535
51	Beets—hand...bushels..	300	1850	441	0.0	37	0.0	30.4500	1.8500	32.3000
52	machine...do....	300	1895	202	35.0	32	35.0	18.3833	1.6292	20.0125
53	Beets—hand .....do....	300	1855	383	20.0	33	20.0	23.1500	1.6667	24.8167
54	machine...do....	300	1895	225	20.0	28	40.0	20.1667	1.7917	21.9584
55	Strawberries—hand, quarts.	4,000	1872	1,728	20.0	84	40.0	226.2084	4.2333	230.4417
56	Strawberries—machine, quarts.	4,000	1895	676	40.0	93	40.0	93.5667	4.6833	98.2500
57	Strawberries—hand, quarts.	4,000	1872	1,732	20.0	92	40.0	226.6417	4.6333	231.2750
58	Strawberries—machine, quarts.	4,000	1895	675	21.2	89	43.6	93.4353	4.4863	97.9216
59	Peas—hand....bushels..	20	1856	77	0.0	49	20.0	[1] 4.8126	1.8500	6.6626
60	machine ...do....	20	1895	45	38.0	40	13.0	[1] 4.7534	2.0109	6.7643
61	Peas—hand. .....do....	20	1855	82	0.0	49	20.0	5.1251	2.4668	7.5919
62	machine ...do....	20	1895	45	38.0	40	13.0	4.7534	2.5136	7.2670
63	Onions—hand.....do....	250	1850	433	55.0	35	20.0	30.7938	1.7667	32.5605
64	machine .do....	250	1895	223	22.6	31	11.6	22.3277	1.5597	23.8874
65	Onions—hand .....do....	250	1855	501	30.0	32	0.0	28.5125	1.6000	30.1125
66	machine .do....	250	1895	343	44.0	27	28.0	29.9667	1.7167	31.6834

[1] With board.

in the United States—Continued.

each brace cover the same extent of operations.]

Average total labor per bushel, etc.	Average human labor per bushel, etc.	Human labor required per bushel, etc.	Extent of operation and means employed.	No.
		Minutes.		
$1.0204	$0.9062	837.0	Hoe; seed planted by hand	39
.9986	.8722	514.7	Drill, cultivator	40
1.2904	1.1546	961.0	Hoe; seed planted by hand	41
.9069	.7852	476.1	Drill, cultivator, weeding hoe	42
.0946	.0890	78.2	Hoe; bottle with hole in cork to drill seed	43
.0608	.0558	37.3	Drill, cultivator, weeding hoe	44
.0732	.0682	68.4	Hoe; bottle with hole in cork to drill seed	45
.0667	.0612	41.3	Drill, cultivator, weeding hoe	46
.2441	.2012	129.7	Plants set out by hand; hoe	47
.1058	.0826	54.0	Transplanter, cultivator, fertilizer drill	48
.2414	.1999	128.9	Plants set out by hand; hoe	49
.1050	.0822	53.7	Transplanter, cultivator, fertilizer drill	50
.1077	.1015	88.2	Hoe; seed planted by hand	51
.0667	.0613	40.5	Drill, cultivator, weeding hoe	52
.0827	.0772	76.7	Hoe; seed planted by hand	53
.0732	.0672	45.1	Drill, cultivator, weeding hoe	54
.0576	.0566	25.9	Plant set out by hand; hoe	55
.0246	.0234	10.2	Transplanter, cultivator, weeder	56
.0578	.0567	26.0	Plant set out by hand; hoe	57
.0245	.0234	10.1	Transplanter, cultivator, weeder	58
.3331	.2406	231.0	Seed sown by hand, covered by harrow; scythe, flail	59
.3332	.2377	136.9	Drill, mower, thrasher	60
.3796	.2563	246.0	Seed sown by hand, covered by harrow; scythe, flail	61
.3634	.2377	136.9	Drill, mower, thrasher	62
.1302	.1232	104.1	Hoe; seed planted by hand	63
.0955	.0893	53.6	Drill, cultivator, weeding hoe	64
.1205	.1140	120.4	Hoe; seed planted by hand	65
.1267	.1198	82.5	Drill, cultivator, weeding hoe	66

REMARKABLE EFFECTS OF MACHINES.

Examination of a pair of schedules will show how the table on pages 600–603 is to be understood. Schedule 5 represents the raising of corn on 1 average acre in 1855, with the implements and in the manner of that day, the shovel plow being used for marking the rows and for cultivating, the hoe for planting, and a peg in husking by hand. The stalks were cut with knives, and cut for fodder with an old-fashioned cutter turned by hand, and the corn was shelled by hand.

From the plowing of the ground to the depositing of the corn in the granary the human labor required per acre was equal to that of one man for 182 hours and 40.8 minutes, and labor of horses was required equal to that of one horse for 54 hours and 9 minutes. The cost of the human labor was $14.3082; animal, $2.0308; total labor per acre, $16.3390, or 40.85 cents per bushel. The human labor per bushel was 274 minutes, and cost 35.770 cents.

On the other hand, schedule 6 is for the raising of the same quantity of corn (40 bushels) on the same area (1 acre) in 1894 with the use of the best implements, machines, and methods. The plowing was done with a gang plow and corn planter; machine for cutting and binding stalks, a combined husking and fodder-cutting machine, and a steam cornsheller were used.

The human labor required was equal to that of one man for 27 hours and 30.3 minutes; the animal labor, 47 hours and 46.8 minutes. The cost of the human labor was $4.2269; animal, $2.3891; total, $6.6160.

The increased effectiveness of labor when aided by machines is clearly brought out in the table under consideration. Machines and improved implements in raising corn reduced the human labor cost per bushel from 35.770 to 10.57 cents, or 25.20 cents, or 70.5 per cent, and reduced the time of human labor from 274 to 41.3 minutes, or 84.9 per cent. A very remarkable reduction in human labor not appearing in the table is in the shelling of the corn, which is from 100 minutes per bushel when the work was done by hand to 1 minute when the steam sheller is used, or 99 per cent.

REDUCTION OF COST OF LABOR.

A comparison of schedules discovers the following reductions in the cost of human and animal labor per bushel caused by the use of machines and implements: Corn, from 12.58 to 8.27 cents; wheat, 19.17 to 10.13 cents; wheat (another pair of schedules), 20 to 5.60 cents; oats, 8.88 to 4.07 cents; rye, 21.01 to 17.20 cents; barley, 12.94 to 3.54 cents; Irish potatoes, 5.99 to 2.72 cents.

The reduction of human labor per bushel is as follows for selected pairs of schedules: Corn, from 58.1 to 22.7 minutes; wheat, 183.2 to 10 minutes; oats, 90.6 to 10.8 minutes; rye, 151.2 to 60.4 minutes; barley, 116.2 to 6.8 minutes; Irish potatoes, 29.7 to 10.4 minutes.

SAVING OF TIME.

Every pair of schedules in the table shows a saving of human labor in time, and all but six pairs show a saving in animal labor in time. This should be remembered in any consideration of the number of farm horses, mules, and oxen, with comparison of dates, and also in similarly considering the number of persons engaged in agriculture.

The cost of the human labor required to produce the unit of product is shown to have been reduced with the substitution of machine for hand labor by all but two pairs of schedules, and the exceptions are due to higher wage rates at the later or machine time. With respect to the cost of animal labor, the reverse is more generally true, although thirteen out of the thirty-three pairs of schedules show a decreased cost. The increase is due to the greater rate of cost of animal labor in the later years.

CONCLUSION.

It is not the purpose of this paper to predict the future of agriculture in this country. For some years past magazine and newspaper writers have been prophesying that upon complete or nearly complete disposal of the better public land the production of corn and wheat, at least, would be arrested, and, while domestic consumption is absolutely increasing, the exported fraction of these crops would be diminished; but the prophets have not taken into account the possible redistribution of cultivated land among the various crops, nor the conversion of unimproved into cultivated land, nor have they recognized the expanding consumption of commercial fertilizers, especially in the cotton States, and the dissemination of information with regard to technical and scientific agriculture through the efforts of the Department, the boards of agriculture of the various States, and the many experiment stations, all of which agencies are in more or less close touch with millions of the farmers of the country, and whose services can be made available to everyone at the cost of a letter.

The changes that agricultural production, especially the preparation of agricultural products for the market, have undergone within the last half century, and still more within the last quarter century, are remarkable and important. There is a great difference in results between the time when, as ascertained by the United States Department of Labor, 20 minutes of human labor were required to husk a bushel of corn by hand, with the use of a husking peg, and 102 minutes to haul the stalks required to produce a bushel of corn to a barn and cut them into fodder, and the time, as at present, when 17½ minutes are sufficient to haul the same stalks to a husker and, by the use of a machine operated by steam, to husk the corn and at the same time cut the stalks into fodder; and there was a transition from one agricultural age to another when a man ceased to expend 100 minutes of labor in shelling corn by hand, and employed a steam sheller by

which a bushel of corn is shelled in a minute and a half. When farmers reaped their wheat with sickles and bound the straw by hand, hauled the sheaves to the barn and thrashed the grain with flails, these operations, applied to 1 bushel of wheat, required the labor of one man for 160 minutes, whereas this work is now done, by the use of a combined reaper and thrasher operated by steam, with 4 minutes of human labor.

Present conditions indicate that a subject of growing importance in agriculture will be the use of fertilizers, both homemade and commercial. There was a time when it was the practice of the cotton planters to crop the soil until it became so unfertile that it was abandoned, whereupon new land was cleared of its forest and the exploitation of soil fertility repeated. But such a practice as this, in the case of nearly all agricultural land, must end in the poorest sort of agriculture, if not in the abandonment of agriculture, and so farmers have resorted, and now are still more resorting, to the use of fertilizers. The use of these, as discovered in a recent investigation by the Division of Statistics, in the cultivation of cotton, presents economic advantages to farmers, and teaches them rather to cultivate well the land that they cultivate at all than to cultivate poorly a larger area.

The foregoing consideration has been sufficient to account on economic grounds for some of the reduction in prices of farm products—production increasing faster than population, necessitating the meeting of cheaper foreign agricultural labor in the world market; cheaper transportation; cheaper cost of production due to machines and improved implements; reduced expenses of marketing; the dissemination of information and the multiplying of the means and facilities of transportation, preventing scarcity with respect both to time and place, and thus steadying prices.