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Physical Capital per Farm and per Person Engaged in Farming

The farm is the unit of operation in agriculture. Value of capital per farm, therefore, measures the resources that are utilized in the average "plant" engaged in the production of farm products. As a rule it is also a measure of the average resources under the management of the individual farm operator.¹ When reported in current dollars, the value of capital per farm suggests the magnitude of the financial problem that from time to time faced those who wished to become owner-operators. When expressed in constant dollars, the value of capital per farm indicates trends in the amount of resources per operational unit, i.e. in the scale of farming. Variations in the scale of farming, either regional or secular, have probably contributed a great deal to differences in the efficiency with

¹ The foregoing generalizations do not quite fit those parts of the South in which the share cropper is common. The census recognizes the "cropper" as a farm operator, and his holding, rather than the larger one of which it is a part, is considered as a farm, provided that it qualifies in respect to acreage or to income produced. The management of these farms operated by share croppers is ordinarily largely in the hands of the owner, who provides not only the land but also the power and machinery with which some of the major operations are performed. The share cropper supplies mainly his labor, but in many cases he supplies a part of the implements too. In 1940, for example, census reported that 60 per cent of croppers owned implements, and that the average per cropper farm was 56 per cent of the value of implements on southern cash tenant farms.

In the regions in which this system is common, the value of capital per census farm may give a somewhat distorted view of the scale on which farm operations are conducted. At least some of the operations, such as plowing, are often performed on a larger scale than these data suggest. However, the impression received from a comparison of regional figures, that farming is on a decidedly smaller scale in the cotton- and tobacco-growing states, is correct. That the scale declined from 1870 to 1930 to the extent indicated is partly, but not wholly, a consequence of the development of the cropper arrangement.

which agricultural resources were utilized and to differences in farm income.

Regional Differences in Scale of Farming

Regional differences in the value of physical assets per farm are striking. This value in current dollars was consistently lowest in the Delta States and the Southeast, and highest, at one time or another, in the Pacific, the Great Plains, or the Mountain regions.² In 1910 the Pacific and Great Plains regions had the highest investment per farm: more than seven times as large as in the Southeast and Delta States, and nearly five times as large as in the Appalachian region. In 1950 the highest investment per farm, \$42,800, was in the Mountain region; this was roughly five times the figure for the Delta and Southeast regions.

In the Delta States and the Southeast the relatively low value of resources per farm and the marked tendency until recently for the constant-price values to decline (Table 9) result basically from an increasingly dense rural population with relatively limited opportunities for more remunerative nonfarm employment. The sharp decline in the earlier decades reflects also the development of the share-cropper system, which multiplied the number of farms without altering greatly the resources involved in farming, or even, in many instances, the resources that were essentially under a single management. It reflects likewise the breakup of some of the larger plantations into owner-operated farms of smaller size. Similar forces were at work in some states of the Appalachian region.

In contrast, in the Great Plains and Mountain regions, where the investment per farm grew rapidly and in 1950 exceeded that of every other region, the population was sparse. Enlargement of farm acreage was therefore relatively easy, and in the agriculture which developed—small grain and livestock production—the economies of large-scale operation were marked.

² The current-dollar values are to be preferred for interregional comparisons of aggregate values at any point in time. Constant-price values were calculated in order to measure changes in physical volume through time. For this purpose it matters little which particular weight base is used (see Table 1 and discussion on page 21). But if interest is focused on interregional comparisons at a given point in time, the weight base used in calculating the constant-price aggregates may make a substantial difference in the results. In such instances there is less ambiguity if values in current dollars are compared.

Changes in Scale of Farming

How has the scale of farming, as reflected in the constant-price value of physical capital per farm, changed through the years? For the United States as a whole it was slightly smaller in 1900 than in 1870 (Table 9). After 1900 it expanded slowly to 1940, and very rapidly during the 1940's.

Pronounced upward trends in the constant-price value of capital per farm throughout the eighty-year span are clearly present in the Lake States, the Corn Belt, and the Great Plains regions (Table 9). In contrast, the trend was downward at least to 1935 or 1940 in the Appalachian, Delta, Southeast, and Pacific regions. In Texas-Oklahoma and, after 1890, in the Mountain region the trend was toward lower values of capital per farm until 1910 and thereafter toward higher values. In the Northeast no long-term trends are discernible.

TABLE 9

VALUE OF PHYSICAL ASSETS PER FARM IN CONSTANT PRICES (1910-1914 AVERAGE),
BY REGIONS, CENSUS YEARS, 1870-1950
(hundreds of dollars)

<i>Region</i>	<i>1870</i>	<i>1880</i>	<i>1890</i>	<i>1900</i>	<i>1910</i>	<i>1920</i>	<i>1930</i>	<i>1940</i>	<i>1950</i>
United States	74	69	74	70	71	77	78	80	100
Northeast	64	62	63	61	63	66	71	65	80
Appalachian	49	39	39	33	33	34	32	32	39
Southeast	45	29	27	22	22	24	22	26	35
Lake States	61	65	69	72	83	90	95	92	112
Corn Belt	106	107	115	112	120	130	131	129	150
Delta States	36	30	28	22	21	22	20	21	29
Great Plains	73	78	106	132	149	175	183	181	230
Texas-Oklahoma	80	60	67	66	58	63	63	71	97
Mountain	60	126	149	129	101	118	135	142	214
Pacific	267	265	223	190	166	163	153	152	187

Source: Based on Tables 5 and 8.

Changes in the value of capital per farm were often accompanied by somewhat similar changes in the average number of acres per farm (Table 10). In the South and in the Pacific region the long decline in the value of physical assets per farm went hand in hand with a decline in average acreage. In the South this trend to smaller farms was a consequence of the growing density of farm

TABLE 10
AVERAGE NUMBER OF ACRES PER FARM, BY REGIONS, CENSUS YEARS, 1870-1950

Region	1870	1880	1890	1900	1910	1920	1925	1930	1935	1940	1945	1950
United States	153	134	136	146	138	148	145	157	155	174	195	215
Northeast	104	98	95	96	96	99	92	102	93	97	98	111
Appalachian	189	140	127	102	91	84	77	80	76	80	80	85
Southeast	266	157	130	102	85	78	77	75	83	96	102	124
Lake States	114	112	115	121	125	127	122	130	125	129	139	146
Corn Belt	125	118	120	116	119	123	122	129	122	129	136	142
Delta States	190	148	124	89	76	71	66	60	65	72	80	91
Great Plains	154	160	198	270	297	359	339	365	359	408	461	492
Texas-Oklahoma	301	208	224	323	232	232	212	227	242	289	323	383
Mountain	127	159	299	458	324	481	564	652	641	822	1,151	1,284
Pacific	420	379	337	335	270	240	204	231	209	231	254	279

Source: Based on Table 5.

population and of the share-cropper arrangement. In the Pacific region it resulted from the development of types of farming, including the production of fruit, vegetables, dairy and poultry products, which were suitable to smaller farms, and which tended to lessen the importance of ranches that produced range livestock and wheat. In other regions, notably the Great Plains, in which topography, type of farming, and relatively sparse settlement invited expansion that would make possible more efficient operation, the average acreage increased about as fast as the value of total physical assets. In some regions, however, the constant-price value of all farm capital outran the increase in acreage to an extent that altered the capital per acre considerably. For example, in the Corn Belt the average farm in 1940 contained about the same number of acres as in 1870, yet the investment at constant prices was one-fifth greater. For some classes of capital the difference was much greater. In the Corn Belt, where the average acreage per farm changed little, the value of machinery per farm in 1940, at constant prices, was more than four times that of 1870, and the value of stored crops was more than two and one-half times as great.

Relation of Physical Farm Assets to Persons Engaged in Farming

The amount of physical farm assets per person engaged in farming increased steadily throughout the eighty-year span encompassed by this study. By 1950 the value of these assets per farm worker, in 1910–1914 average prices, was 170 per cent higher than in 1870 (Table 11).

From 1870 to 1940 the increase in physical farm assets per worker ranged from 5 to 13 per cent per decade. Thereafter the rate accelerated sharply. In 1950 the amount of physical farm assets per worker was 47 per cent greater than in 1940 (Table 12).

During the early decades when the settlement of many regions was still in progress, the number of persons working on farms increased rapidly, but the physical resources used in farming increased at an even faster rate (Table 12). Land was abundant in these regions and was available to settlers for conversion into farms at low cost. Between 1910 and 1920 the number of persons engaged in farming began to decline, probably as a result of World War I,

TABLE 11

VALUE OF PHYSICAL FARM ASSETS PER PERSON ENGAGED IN FARMING, IN CONSTANT PRICES (1910-1914 AVERAGE), BY REGIONS, CENSUS YEARS, 1870-1950
(hundreds of dollars)

Region	1870	1880	1890	1900	1910	1920	1930	1940	1950
United States	29	32	34	37	39	44	47	53	78
Northeast	35	37	34	36	41	43	43	48	65
Appalachian	16	18	17	17	18	20	20	23	34
Southeast	8	9	9	9	9	10	11	14	25
Lake States	32	39	38	43	53	58	61	63	84
Corn Belt	53	57	60	65	78	86	88	97	127
Delta States	8	9	9	10	9	11	11	13	23
Great Plains	34	47	61	79	100	117	120	128	167
Texas-Oklahoma	27	26	30	38	29	33	38	45	76
Mountain	17	47	51	64	56	68	76	90	132
Pacific	137	116	91	98	87	86	77	88	113

Source: Based on Tables 4 and 8.

but as farming had seldom been so profitable and so promising as during this period, the volume of farm assets rose to the end of the decade. During the 1920's, which in general were difficult years for farmers, the number of persons engaged in agriculture declined 8 per cent, although the physical assets with which they worked fell only 1 per cent. During the 1930's, when farm operation became even less profitable, the farm labor force shrank faster than during the previous decade, but assets shrank only slightly.

By far the greatest increase of physical capital per farm worker

TABLE 12

PERCENTAGE CHANGE IN PERSONS ENGAGED IN FARMING, VALUE OF PHYSICAL FARM ASSETS, AND VALUE OF PHYSICAL ASSETS PER PERSON ENGAGED, UNITED STATES, CENSUS YEARS, 1870-1950

Period	Persons	Assets ^a	Assets per Person ^a
1870-1880	25.3	40.8	10.3
1880-1890	15.8	21.2	6.2
1890-1900	9.8	19.6	8.8
1900-1910	6.2	12.6	5.4
1910-1920	-1.2	9.9	12.8
1920-1930	-8.5	-1.4	6.8
1930-1940	-12.5	-1.2	12.8
1940-1950	-24.6	10.5	47.2

^a Based on constant-price values.

Source: Based on Tables 4, 8, and 11.

occurred in implements and machinery. In the eighty years following 1870 the value per worker of this class of assets rose from \$36 to \$638 in 1910–1914 prices, or 1,672 per cent. After 1920 this gain reflected increasingly the substitution of mechanical power for work animals and a general increase in the size of machinery. If horses and mules are included with implements and machinery, to make a total for mechanical devices and power to propel them, the increase per person was from \$189 to \$765, or 305 per cent. No other class of farm capital rose so much in relation to farm labor. The smallest increase occurred in livestock, 64 per cent. This reflects, of course, a sharp decline in horses and mules. Exclusive of work animals, livestock increased 123 per cent, still the smallest gain among the major classes.

Wide regional differences in the amount of physical farm assets per worker were found in 1870, and although in time the range became less wide, large differences persisted during the entire period. In 1870 farm property per farm worker, at current prices, amounted to \$325 in the Southeast and \$484 in the Delta States. At the same time, in the Pacific States and the Northeast—regions far removed from each other and with very different types of farming—the highest investments per person obtained. A comparison of the extremes shows that agricultural workers in the Pacific region, on the average, worked with twelve times the capital available to those in the Southeast. Over the years this range was considerably reduced. In 1950 the regions that ranked highest in the amount of capital per farm worker had only about four times as much as those at the bottom of the scale.

The extremely low value of capital per worker in the Southeast and in the Delta States in 1870 was partly due to the type of farming and to farm practices that had developed before the Civil War. The production of cotton under a slave economy had made very large use of hand labor. Even before the Civil War destroyed much agricultural capital, the amount of real estate, machinery, and livestock per worker in the South was relatively low, and the losses of the war accentuated this situation.³ As farm income in the South

³ For example, it was widely held that one Negro worker was required for every 3 acres of cotton. See Emory Q. Hawk, *Economic History of the South* (Prentice-Hall, 1934), p. 236.

during the reconstruction period was especially meager, provision of more capital per worker through savings from income was a slow and painful process. Hardly less so was the improvement of land or the increase of other physical assets directly through the farmers' own efforts. Indeed, relatively low farm income continued to characterize the South to 1950. Under these circumstances savings were meager, and ability to borrow was low. Moreover, facilities for granting credit were often inadequate. Thus with painfully slow accretions to capital on the one hand, and a rapid growth of rural population seeking employment on farms on the other, the amount of physical assets per farm worker remained well below that of other regions. These influences operated to some extent also in the Appalachian and Texas-Oklahoma regions, which lie partly in the Cotton Belt. Consequently physical assets per farm worker in these border regions have also been consistently low.

The Pacific region is unique in that physical capital per worker, the highest in the United States in 1870, declined with great consistency until 1930. The high value of capital per worker in the Pacific region in the early decades reflects the sparse settlement and the types of agriculture that predominated at that time. In the 1870's and after, particularly in California, much wheat was produced on large ranches with equipment that dwarfed that of most other regions. In the production of small grains, therefore, as well as in range livestock, operations in the early decades were organized in a way that made the investment in farm property per worker larger than in any other region.

Thicker settlement of the Pacific region was accompanied by a steady decline in the average size of farms (Table 10) and by a shift in the relative importance of different types of agriculture. On the smaller farms fruit, nuts, vegetables, dairy and poultry products could be produced advantageously with a smaller investment per person engaged in farming. The increasing prominence of these branches accounts for the decline in both the investment per farm and investment per person engaged in farming.

Although increases in the amount of physical capital per worker occurred in all regions except the Pacific, the degree of increase varied considerably. The smallest gains, 87 and 112 per cent, occurred respectively in the Northeast and Appalachian regions. The

gains in these regions were also less consistent than elsewhere. In contrast, in the Great Plains and Mountain regions the amounts of physical capital per worker in 1950 were respectively about five and eight times as much as in 1870.

Four factors appear chiefly to have influenced the direction and rate of growth of physical capital per worker, and to account for many of the regional differences in that growth. The first is the extent to which a region was settled or developed in 1870. As has already been observed, the smallest gains in capital per worker were in the Northeast and Appalachian regions, which were far removed from the frontier of 1870, and which were well settled at that time. The largest gains were in the Great Plains and Mountain regions. Doubtless the greater growth in the western regions stems in part from the presence of abundant land together with sparse population. These characteristics encouraged the development of types of agriculture in which the amounts of capital per worker can profitably be large, and they discouraged agricultural operations which cannot easily be mechanized or which for other reasons require relatively large amounts of labor per unit of capital.

Thus a second factor that influenced the growth of capital per worker was the type of agriculture. In some types, such as the production of range livestock, small grains, hay, and more recently corn, large amounts of capital per worker proved profitable. Other crops, such as fruit, nuts, and vegetables, are not so well adapted to machine processes at certain stages of production. Cotton is a staple product that resisted mechanization partly because of technical difficulties, but also partly because an abundant labor supply reduced the incentive that spurred changes elsewhere in agriculture.

A third factor, therefore, that had great influence on the amount of capital per worker was the supply of workers. Agriculture competes more or less keenly with other sectors for its part of the total labor force. When, and where, nonfarm employment has been relatively attractive and plentiful it has drawn workers from farms in large numbers. It has thus created a special incentive to increase labor-saving equipment so that farm operations may continue on the same scale despite the loss of workers. Hence the migration of farm labor to other sectors has simultaneously tended to increase

the amount of machinery and to lower the number of farm workers. This undoubtedly was a factor of considerable importance in regions such as the Northeast, the Corn Belt, and the Lake States, where large industrial centers had developed. It probably was important in most regions during the 1940's, when, because of the demand for labor in industrial plants and other war-expanded activities, many workers left the farms. Contrariwise, as already indicated, the relatively meager opportunities for nonfarm employment in many parts of the South help to account for the slow growth of capital per worker in that region.

A fourth factor is the ability of farmers to finance increases of capital. This is closely related to the size of net farm income, which is the source of farmers' savings and an important factor determining their credit. In the less prosperous farming regions low incomes often prevented the acquisition, either by cash or by credit, of capital that might have raised the productivity and the income of farm workers. Even in the best regions, in times of agricultural depression, low income has been a barrier to acquisition of capital. The extremely rapid growth of capital per worker during the 1940's was possible because of the unusual ability of farmers to pay for additional physical capital, whether out of their own savings or with credit which had been considerably improved by the prosperity of those years.