

## HARVESTING OF CORN, SMALL GRAINS, AND RELATED CROPS: DATA ON PRACTICES

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## SUMMARY

Harvesting of corn, small grains, soybeans, and sorghums by combines continues to increase. Combining of small grains in the United States increased from about 84 percent of the total production in 1950 to 97 percent in 1960 . During the same period, combining from windrow increased from 22 to 27 percent of the total; but the largest gain was in harvesting by combine from standing stalk, from about 62 percent of the small grains harvested in 1950 to 70 percent in 1960 (table 1).
Harvesting small grains with combines from windrow is most important in the northern section of the United States. It increased considerably from 1950 to 1960 in the Northern Plains and the Lake States. In most other States, however, combining from: windrow has dropped or is a very small part of the total harvesting operation.
Compicking attachments on grain combines are being used increasingly in the major corn-producing areas. In 1956, only 3 percent of the corn harvested was field shelled, but this increased to about 15 percent by 1960. Field shelling was highest on farms with a large acreage of corn. A similar relationship was found for harvesting by mechanical picker, except that the importance of mechanical picking dropped slightly in all areas on farms with over 300 acres of corn harvested.
Field shelling of corn will continue to increase. Domestic shipments of cornpicking attachments for combines, and cornpicker shellers numbered under 5, 000 units in 1956, but shipments have risen and averaged between 9,000 and 10,000 units annually since 1956 . Shipments of field-shelling units probably will continue at about this rate in the next few years, leading to an increase of corn harvesting by combines and other field-shelling machines before replacements are needed in any quantity.

# HARVESTING OF CORN, SMALL GRAINS, AND RELATED CROPS: DATA ON PRACTICES 

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## BACKGROUND

This report is based on information from voluntary crop reporters of the U.S. Department of Agriculture. Over 30, 400 usable reports were obtained from a mailed questionnaire sent out in February 1961, covering the year 1960.

For small grains and related crops, respondents reported separately for selfpropelled and pull-type combines the total acres combined from standing crop and from windrow. Threshing of small grains has become such a small percentage of the total that it and grain that was cut ripe and fed unthreshed were left as a residual. This residual was tabulated as "threshed and all other." Custom work also was reported for small grains.

Acreage of corn harvested for grain was reported showing the number of acres harvested by mechanical pickers, field picker-shellers, and by hand. Acreage of field-shelled corn harvested by custom operator was also reported.

These data were expanded to State and national estimates based on size-of-farm groupings by States using the 1959 Census of Agriculture's number of farms.

Results of earlier studies of harvesting corn and small grains were reviewed and compared. These were Department of Agriculture bulletins ARS 43-91, "Harvesting the 1956 Corn Crop;" and FM-91, "Harvesting Small Grains and Soybeans and Methods of Saving Straw;" also "Harvesting Selected Field Crops, 1959 and Comparisons (working data Oct. 1961). The sample survey conducted by the Bureau of the Census, U.S. Department of Commerce, 1960, provided additional information on custom work.

Data for manhours of labor used per acre and per unit of production were obtained from Statistical Bulletin No. 144, "Labor Used for Field Crops," June 1954, and estimates compiled by the Labor Unit of the Farm Production Economics Division of the Economic Research Service.

In this report, "United States" is used to mean the 48 contiguous States.

## HARVESTING CORN

Acreage of corn harvested for grain has declined gradually since 1930 with a general increase in production per acre. For example, the acreage of corn harvested for grain was slightly less in 1960 than in 1950, but total production in 1960 was over 40 percent higher.

The production of corn has tended to concentrate in certain areas of the United States. In 1938, about 50 percent of the U.S. corn acreage was in the Corn Belt, Lake States, and Northern Plains. In 1960, the percentage in these areas increased to nearly 80 percent of the U.S. total. Acreage of corn grown for grain remained relatively stable in the Northeast during this period and declined for the rest of the Nation except the Pacific area (table 2).

A larger percentage of the corn crop was harvested by field picker-shellers in 1960 than in 1956 (table 3). Corn harvested by mechanical picker dropped slightly in 1960, and the percentage of corn harvested by hand dropped to half of the 1956 level.

Field shelling increased from 3 percent of the corn crop in 1956 to 15 percent in 1960 (table 3). Grain combines equipped with cornpicker attachments accounted for most of this increase.

Custom shelling accounted for about one-third of the field shelling of corn in 1960. Most of this was done on small corn acreages. On farms with large corn acreages, the percentage field shelled by custom operator was down (table 4). On farms with under 10 acres of corn, 80 percent of the field shelling was done by custom operators (table 5). Slightly over 20 percent of the crop on farms with 100 or more acres of corn was shelled by custom operators.

As expected, areas having the largest number of farms with small corn acreage had more of the field shelling done by custom operators than others. Nearly 50 percent of the field shelling in the Appalachian area was done by custom operators compared with only about 25 percent in the Northern Plains region.

## HARVESTING WHEAT

Next to corn, wheat is the largest grain crop in terms of acres in the United States. Production in 1960 was over 1.3 billion bushels, compared with slightly over 1 billion bushels harvested in 1950 on 16 percent greater acreage. Higher yielding, smut- and lodge-resistant varieties, as well as better cropping practices, have helped increase production.

Slightly more wheat was combined from standing crop (allowed to mature on the stalk) in 1960 than in 1950 (table 6). The proportion of grain combined from windrow was the same in both periods, and increased slightly in the Lake States and Northern Plains from 1950 to 1960 , while declining in the rest of the Nation. Nearly one-fourth of the wheat acreage in 1960 was harvested by custom operators (table 7). For many grain farmers, custom work accounts for about half of the total time spent harvesting wheat and other small grains.

Combining from standing crop with self-propelled combine is more important on the larger farms. Self-propelled combines harvested 87 percent of the acreage on farms with 300 or more acres of wheat in 1960 compared with 21 percent of the acreage on farms with under 10 acres of wheatland (table 8).

Combining from windrow increased with size of farm on those with under 200 acres of wheatland, then dropped on farms growing 300 acres of wheat or more (table 8). Approximately 29 percent of the wheat in the Northern Plains was combined from windrow, and 36 percent in the Lake States.

Windrowing is considered necessary by some farmers in the northern States because of the short growing season and the increased possibility of inclement weather if the farmer waits to harvest the grain from standing crop. Another reason advanced in these areas in favor of windrowing is the fact that the grain is left to "sweat" or "condition" in the row for about a week, supposedly to produce a better quality grain than when harvested from standing crop.

The general decrease in wheat acreage from 1950 to 1960 did not apply to the Southern States. Acreage harvested in the South was 18 percent higher in 1960 than in 1950, and over 95 percent of the wheat was combined from standing crop in 1960.

## HARVESTING OATS

Oats are produced in practically every State in the Union, with the total U.S. harvested acreage in recent years varying from 20 to 40 million acres. Over 80 percent of the production is concentrated in the Corn Belt, Lake States, and Northern Plains (table 9). Spring oats are grown mainly in this area where they often serve as a nurse crop for grasses and legumes. Red oats, or fall oats are produced principally in the Southeast.

The acreage of oats harvested has been erratic over the years--principally because in some areas it is a supplemental crop. If wheat or com allotments are restricted or a crop failure is imminent, oats are one of the crops that can be harvested to salvage some production.

More than 90 percent of the oats harvested in 1960 were combined as standing crop or from windrow. In 1938, 90 percent of the crop was harvested by other methods. In 1945, about two-thirds of the oat crop was threshed from shock or stack or cut ripe and fed unthreshed, and in 1950 about one-third of the crop was thus harvested. By 1960 , only 6 percent of the U.S. acreage was threshed. Threshing was as high as 14 percent in the Appalachian area with a low of 2 percent in the Delta States (table 10).

## HARVESTING BARLEY

Barley is grown mainly in the Northern and Southern Plains, Minnesota, Montana, Idaho, Colorado, and the Pacific area. Over 87 percent of the U.S. barley acreage was produced in about a dozen States in 1960 compared with less than 82 percent of the total in 1950 (table 12). Because of a short growing season, barley can be grown as a nurse or companion crop to alfalfa and clover. Barley matures in a relatively short time and it is adaptable for northern latitudes where frost-free seasons are relatively short (60-70 days), but does better when seasons are over 90 days.

Combining of barley was well on its way by 1950 when approximately 86 percent of the crop was harvested in this manner; 52 percent of this was from standing crop and 34 percent from windrow (table 12). The rest was threshed or cut ripe and fed unthreshed. By 1960, 98 percent of the crop was combined, while combining from windrow increased only slightly. Practically all of the increase in combining was in harvesting grain from standing crop and nearly two-thirds of the total U.S. barley acreage in 1960 was harvested by this method. Over two-thirds of the barley acreage was harvested (either as standing crop or from windrow) by self-propelled combines.

Most of the barley in areas of northern United States where the growing season is short (about 75 percent in the Northern Plains and over 80 percent in the Lake States) was combined from windrow in 1960. Two of the top 12 producing States, Minnesota and North Dakota, had more than 90 percent of the barley harvested in this fashion.

Combining barley from standing crop was higher than windrowing in all of the acreage groups. However, over 40 percent of the barley was combined from windrow on farms of 50 acres and over (table 14).

## HARVESTING RYE

Rye is among the least important of the small-grain crops. Acreage harvested has varied between 1.4 and 2 million acres since World War II. It is a supplemental crop in many areas and is generally grown on the poorer, less productive soils.

Acreage of rye harvested in the United States declined from about 1.7 million acres in 1950 to 1.5 million in 1960, a decrease of over 10 percent. Most of this decrease was in the Lake States, some was in the Northern and Southern Plains (tables 15 and 16). Acreage increased in the Corn Belt and in the rest of the ryegrowing areas of the country.

In 1960, as in 1950, over half the rye acreage harvested was in the Northern Plains. Nearly two-thirds of the U.S. rye in 1960 was combined as standing crop. On farms with under 20 acres of rye, more than 80 percent was harvested in this manner (table 17). Combining from windrow increased with size of crop acreage; 4 percent of the crop on farms with less than 5 acres being harvested in this fashion and about 40 percent on farms with 50 or more acres of rye.

## HARVESTING GRAIN SORGHUMS

From 1950 to 1960, the U.S. grain-sorghum acreage increased 50 percent (table 18). Due to improved varieties producing higher yields, grain production increased even faster during this period than did acreage, or from 233.5 million bushels in 1950 to 620 million bushels of grain sorghum in 1960 .

All regions growing sorghum for grain increased production from 1950 to 1960 (table 18). Over 4 million, or 80 percent, of the $5-$ million increase in harvested acreage in this period was in the Northern Plains area. In 1960, over 6 million acres of sorghum for grain were harvested in the Northern Plains, nearly three times the 1950 acreage harvested. The Southern Plains area is still the country's leading grain-sorghum producer, with over 7.5 million acres harvested in 1960. This, however, was only 5 percent above the 1950 acreage.

The U.S. grain-sorghum crop was nearly all harvested by combine in 1960 as well as in 1950, threshing being 2 percent of the total in both periods (tables 18, 19, and 20). More than three-fourths of the crop was harvested by self-propelled combine as standing crop in 1960 (table 18). Some acreage was combined from windrow in the Plains States; it was insignificant in the rest of the United States. Slightly over 2 percent of the total crop was combined from windrow and nearly all of this by selfpropelled combine.

About two-thirds of the grain sorghum on farms producing 5 acres or less, was harvested as standing crop by pull-type combines (table 19). As sorghum acreage increased, the proportion harvested as standing crop by self-propelled combines also increased; and nearly nine-tenths of the crop on farms producing 100 or more acres of grain sorghums was harvested in this manner.

## HARVESTING SOYBEANS

Soybean acreage and production have increased almost steadily since 1924 when the first acreages were officially recorded. From 1924 to 1930, soybean acreage more than doubled, from 450 thousand to over 1 million acres, and production nearly tripled from 5 million to 14 million bushels. Acreage tripled from 1930 to 1940, nearly doubled from 1940 to 1950 , and was 70 percent higher in 1960 than in 1950, with nearly 23 million acres harvested for soybeans in 1960 (table 21). Beginning in 1961, soybean acreage has surpassed oat acreage. Only wheat and corn are grown more extensively.

Soybeans expanded into a mechanized agriculture using the methods already at hand for combine harvesting. Varietal adaption was the biggest problem and as new varieties were introduced and appeared to fit the local area, planted acreage was expanded. Acreage increases would not have been so rapid without the establishment of oil-crushingplants nearby. (A similar limitation exists with castorbean production today.) Acreage restrictions on corn production have also given an impetus to increased soybean planting.

Since 1950, nearly all the soybean acreage in the United States has been harvested by combine. Threshing amounted to 1 percent of the total acreage in 1950 and less than 0.5 percent in 1960. The proportion of the crop harvested standing and from windrow has remained about the same for both periods (table 21). Combining is about equally split between self-propelled and pull-type units, 51 percent of the harvesting done by pull-type and 49 percent with trailing-type combines.

Combining from windrow was most important in the Lake States with about onequarter of the soybean crop harvested by this method in 1960 and in 1950 (table 21).

Harvesting with pull-type combines is done on two-thirds to three-quarters of all farms with less than 10 acres of soybeans except in the Northeast and Delta States (table 22). Combining soybeans with self-propelled combines is most important on the larger farms. Self-propelled combines were used extensively on farms with 100 or more acres of beans harvested in the Northern Plains, Applachian, Southeast, and Delta States.

## HARVESTING PEANUTS

Peanuts occupy a small part of the U.S crop acreage. In some States, however, they are an important crop. In 1960, about 60 percent of the total acreage harvested was located in Georgia and Texas. Alabama, North Carolina, and Oklahoma accounted for another third of the acreage harvested.

Peanut acreage has declined gradually since World War II, while yields per acre have increased. In the 1941-45 period, an average of 3 million acres were harvested annually. This was the peak period in peanut production, and poorer lands were brought into production during this time. 1/ Average yields were low, slightly over 650 pounds per acre.

Slightly less than 1.5 million acres of peanuts were harvested annually in the 1956-60 period, a drop of over 50 percent from the peak in World War II days. Much of the production on poorer land was discontinued after the war and the remaining acreage was fertilized more heavily; irrigation was added in many areas to increase production.

There was a near reversal of combining and threshing of peanuts from 1950 to 1960. In 1950, approximately 80 percent of the peanut crop was threshed and 20 percent combined. At the end of the decade, threshing had dropped to 35 percent of the total acreage harvested, and the rest of the crop was combined (table 24). About 94 percent of the combining was done by pull-type machines in 1960.

Over 20 percent of the U.S. peanut crop was combined by custom operators in 1960. Nearly one-half of the crop in North Carolina and Texas was harvested by custom operators. There was no record of custom combining in Alabama and New Mexico, although presumably some custom work was done in both States.

## HARVESTING FLAXSEED

Production of flaxseed has varied over the years depending on demand. The demand varies with the degree of the substitution of other products for linseed oil (which is extracted from flaxseed) in the paint industry and with the amount of competition with flaxseed from cattle feed byproducts, such as soybean and cottonseedmeal concentrates.

Flaxseed acreage harvested dropped noticeably in 1960, compared with the past decade. The average acreage harvested annually in the $1950-59$ period amounted to slightly over 4.3 million acres. In 1960, harvested acreage was 23 percent below this average. Flaxseed acreage dropped in all major producing States except Texas, which in 1960 had one and one-half times the 1950-59 average acreage harvested.

Most of the flaxseed produced is combined from windrow. In 1950, over 90 percent of the flaxseed was combined, 70 percent of that was from windrow. Windrowing

1/ Hansen, P.L., and Mighell, F. L. Oil Crops in American Farming. U.S. Dept. Agr. Tech. Bul. 940, Nov. 1947.
increased and by 1960, 85 percent of this crop was combined in this manner, with a consequent decline in combining from standing stalk and in threshing (table 25).

In the major flax-growing areas, combining from windrow is quite prevalent with other grain crops. The extension of this harvesting procedure to flaxseed production is therefore the most economical method of utilizing the existing equipment. On the other hand, the short growing period affects flaxseed in the same manner as it does other grains, and windrowing is probably the most convenient method of harvesting in face of adverse weather conditions.

## HARVESTING DRY BEANS AND FIELD PEAS

Michigan, California, Colorado, and New York are the leading States in bean production, accounting for about 85 percent of the bean acreage harvested in 1960. Over 85 percent of the dry field peas were grown in Idaho and Washington, and most of the rest were in Minnesota, North Dakota, Colorado, and Oregon.

Michigan had most of its bean production (over 85 percent) combined as standing crop, and the rest threshed, Washington followed with slightly more than 70 percent combined as standing crop (table 26). Combining from windrow was more important in Idaho, Colorado, and California where about two-thirds of the crop was harvested by this method.

## HARVESTING ALFALFA, CLOVER, AND GRASS SEED

Harvested alfalfa- and clover-seed acreages have been declining gradually since World War II. Most of the production of legume seed and grass seed is on small plots and represents a part of a larger farm cropping system.

Nearly all of the legume- and grass-seed crops are combine harvested. Over 85 percent of the grass seed, and about two-thirds of the alfalfa and clover are harvested as standing crop (tables 27 and 28). Combining from windrow is most important in the Northern Plains and Pacific regions. Approximately 50 percent of the alfalfa and clover seed were harvested from windrow in these areas in 1960 (table 27). About one-fourth of the grass seed in the Northern Plains in 1960 was harvested from windrow (table 28).

## CUSTOM HARVESTING

Over 20 percent of small grains, sorghums, and soybeans as a group in the United States was combined by custom operators in 1960 (tables 1, 18, and 21). Custom operators harvested nearly 40 percent of the sorghums, about 25 percent of the wheat, and smaller percentages of the other small grains and related crops in 1960.

Custom harvesting of small grains was highest in the Southern Plains (Texas and Oklahoma), with about 50 percent of the crop combined (table 1). Wheat and sorghums totaled more than 85 percent of the crop acreage harvested in this area.

Hired combining of most of the small grains in the United States varies inversely with the crop acreage. About one-third of the acreage on farms with 10 acres or less of wheat, oats, barley, and soybeans was harvested by custom operators in 1960 (tables $8,11,14$, and 23). As size of crop acreage increased, custom harvesting generally decreased, reaching a level of about 10 percent of the acreage harvested on the larger farms.

Sorghums grown for grain in the United States are the exception to the general trend in using custom operators for harvest operations; here, custom work becomes more extensive as larger acreages are harvested. For example, over 40 percent of the grain sorghum was custom combined on farms with 100 or more acres of sorghum harvested, compared with about 20 percent on farms with under 5 acres harvested.

Any U.S. trend or relationship in the harvesting of grain sorghums is heavily influenced by the methods used in the Southern Plains. In 1960, over half the Nation's grain sorghum was produced in Texas and Oklahoma and nearly 60 percent of this crop was harvested by custom operators. Here custom work increased as size of farm increased. However, the general trend in other areas was in the opposite direction; custom work decreased in most grain-sorghum regions as size of farm increased.

Custom harvesting was less important in combining flaxseed than in alfalfa and clover seed. Custom operators combined 16 percent of the legume seed crops with a high of 25 percent of the acreage in the Pacific area and a low of about 9 percent of the acreage in the Northern Plains (table 27). About 11 percent of the total U.S. flaxseed crop was custom harvested and the only States showing a sizeable amount of custom harvesting (approximately 36 percent of the acreage) were Texas, Montana, and Iowa (table 25).

## LABOR REQUIREMENTS

Labor requirements for harvesting grain crops have dropped faster in the past two decades than in previous periods. However, there are differences among crops, depending on the degree of mechanization used.

In adjusting to rising labor costs, the farmer has expanded the mechanization of corn-harvesting procedures over the past 30 years. Introduction of 1 -row and 2 -row mechanical cornpickers in the periods 1910 and 1930, respectively, reduced considerably the labor necessary to harvest and store an acre of corn. The use of the self-propelled cornpicker-shellers and cornpicker attachments on combines affected a further reduction in labor in the middle $1950^{\prime} \mathrm{s}$. In this process, a considerable part of the harvesting machinery is not used to capacity. To utilize machines more fully and thereby reduce fixed costs per unit of output, many operators either do custom work or acquire and plant additional acreage.

Among the grain crops, the change over a period of time in the harvesting labor required for corn merits special attention. The U.S. corn yield in 1960-63 was over 62 bushels per acre or $21 / 2$ times the yield in the 1935-39 period. During this period, man-hours of labor for corn harvesting declined 75 percent from about 10 hours per acre to 2.5 hours (fig.1). Further decreases in harvesting labor per acre are indicated but the trend is tapering off and will decline much slower in the future.


Figure 1

In 1950, from 1 1/2 to $21 / 2$ man-hours of labor were required to harvest an acre of small grains, soybeans, or sorghums (figs. 2-6). By 1959, labor used for harvesting these crops had dropped to about 1 to $11 / 2$ man-hours per acre.

On the higher side, an average of nearly 4 man-hours were used to harvest an acre of oats in 1950 , and this dropped to about 2 man-hours in 1959 (fig. 3). A large percentage of the oat crop is produced on small acreages and a large portion of this is produced in northern and central United States. Operators with smaller plots use less mechanization in their harvesting processes, and windrowing is more extensive in regions such as the Lake States. These factors are primarily responsible for the more gradual decrease in harvesting labor requirements for oats compared with other small-grain crops.

About one-quarter of the acreage of small grains, soybeans, and sorghums was harvested by custom operator in 1960, and the largest percentage of this by farmers doing part-time work. Since custom work is a prominent part of the harvesting operations for all grain crops, it has definitely reduced the labor used for harvesting.

Mechanized harvesting technology has decreased labor requirements more rapidly than has preharvest technology for most of the small grains and related crops.

For example, in 1950 over 6 man-hours per acre were used in the production of an acre of oats and about two-thirds of this labor was used in harvesting (fig. 3). By 1959, less than 4 hours were used to produce an acre of oats and about 2 hours or 50 percent of the labor was used for harvesting. Nearly all this labor reduction was due to an improvement in harvesting operations. Similar examples are shown for the other grain crops (figs. 4-6).


Figure 2


Figure 3


Figure 4


Figure 5


Figure 6

Harvesting of sorghums and soybeans presents a slightly different picture than that of small grains. About 95 percent of each crop in 1960 was harvested by combines as standing grain. No small-grain crop was harvested as standing grain to this extent. Relative reductions in the labor used in the production of soybeans and sorghums in the 1950-59 period were due principally to increasing the efficiency of labor. This was due to improvements in harvesting processes which included the use of larger and more self-propelled combines (fig.5). During this same period, however, reduction in labor for harvesting soybeans and sorghums was much smaller than it was for most of the small grains. This was mainly because a larger proportion of sorghums and soybeans were combine harvested in 1950 than in previous years.

For the production of soybeans, for example, approximately 6 man-hours of labor per acre were used in 1950, of which 25 percent were used in harvesting. Manhours per acre dropped to about 4.5 in 1959. The decline in hours was split equally between harvest and preharvest labor; but, proportionately, the percentage drop was much greater for harvest compared with preharvest labor (fig. 6).

Labor required to harvest an acre of peanuts in the United States dropped from 20 hours to about 7.5 hours, or over 60 percent, from 1950 to 1959 . Total labor used in the harvesting of peanuts in Texas and Oklahoma was 25 to 50 percent higher for irrigated acreages compared with labor used for dryland peanuts in the same area. This additional labor is used in preharvest operations, mostly for setting up and moving irrigation systems.

## UNITED STATES DEPARTMENT OF AGRICULTURE <br> Economic Research Service Farm Production Economics Division

ERRETA

Harvesting of Corn, Small Grains, and Related Crops: Data on Practices, Statistical Bulletin No. 354, December 1964

Pages 45 and 47, table 22, stub column
Change all "100 to 199 acres" to "100 acres and over"
Page 48, table 23, stub column
Change "100 to 199 acres" to "100 acres and over"
Page 52, table 27, 1ast column
Upposite Pacific change 29 to 25
Opposite United States change 17 to 16

Peanut-harvesting labor varied considerably throughout the producing States, depending on yields and degree of mechanization. The U.S. average for 1959 was 0.7 man-hour per 100 pounds of peanuts harvested. Only 0.2 man-hour was required to harvest 100 pounds of peanuts in New Mexico in 1959 (average yield 1, 800 pounds per acre), compared with over 1 hour in North Carolina (average yield 1,500 pounds per acre). Nearly 95 percent of the peanuts were combined in New Mexico, compared with North Carolina where about 50 percent were threshed.

Approximately 18 hours were required to produce and harvest an acre of dry field beans in 1950, and 15 hours in 1959 or a reduction of over 15 percent. Practically all of the decrease in labor came from improvements in harvesting operations. Labor used to harvest beans during this period dropped about 40 percent, from 6 to 3.6 man-hours per acre. Preharvest labor did not decrease noticeably, mainly due to the expansion of, and extra labor used for, irrigation.

Labor used to produce and harvest an acre of dry field peas was reduced similarly, although the drop per acre in harvesting labor used for peas was much greater from 1950-59 than that used for beans. Pea-harvesting labor dropped over 50 percent in this period from 2.5 hours to 1.1 hours per acre.
 1960 1/

 1960 1/--Continued


1/ Includes wheat, oats, rye, barley, and flaxseed.

Table 2.--Corn for grain: Acreage harvested and percentage harvested with cornpickers, by State and region, specified years


Table 2.--Corn for grain: Acreage harvested and percentage harvested with cornpickers, by State and region, specified years--Con.

|  | Acreage harvested |  |  |  |  |  | Percentage harvested with cornpicker |  |  |  |  |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| State and region | $: 1938$ | $1943$ | $1946$ | $1951$ | $1956$ | $\begin{aligned} & : \\ & : \\ & : \end{aligned}$ | $1938$ | $1943$ | $1946$ | $1951$ | $1956$ | $1960$ |
|  | $\begin{aligned} & 1,000 \\ & \text { acres } \end{aligned}$ | $\begin{aligned} & 1,000 \\ & \text { acres } \\ & \hline \end{aligned}$ | $\begin{aligned} & 1,000 \\ & \text { acres } \\ & \hline \end{aligned}$ | $\begin{aligned} & 1,000 \\ & \text { acres } \\ & \hline \end{aligned}$ | $\begin{aligned} & 1,000 \\ & \text { acres } \\ & \hline \end{aligned}$ | $\begin{aligned} & 1,000 \\ & \text { acres } \\ & \hline \end{aligned}$ | Percent | Percent | Percent | Percent | Percent | Percent |
|  | 1,652 | 1,573 | 1,317 | 946 | 273 | 206 | --- | 2 | 6 | 33 | 37 | 44 |
| Texas------------------: | 4,725 | 4,572 | 3,019 | 2,176 | 1,593 | 1,251 | --- | 1 | 6 | 27 | 50 | 53 |
| Southern Plains----: | 6,377 | 6,145 | 4,336 | 3,122 | 1,866 | 1,457 | --- | 1 | 6 | 29 | 48 | 52 |
|  | 307 | 419 | 437 | 405 | 465 | 319 | 5 | 61 | 72 | 91 | 94 | 79 |
| South Dakota----------- | 2,231 | 2,799 | 3,529 | 2,880 | 3,178 | 3,426 | 18 | 44 | 72 | 95 | 94 | 83 |
| Nebraska---------------: | 6,613 | 7,499 | 7,418 | 6,726 | 4,037 | 6,538 | 4 | 21 | 45 | 90 | 93 | 79 |
|  | 1,944 | 2,987 | 2,469 | 2,187 | 901 | 1,725 | 1 | 12 | 24 | 73 | 78 | 68 |
| Northern Plains----: | 11,095 | 13,704 | 13,853 | 12,198 | 8,581 | 12,008 | 6 | 25 | 49 | 88 | 92 | 79 |
| Colorado--------------- | 777 | 676 | 372 | 370 | 204 | --- | 4 | 12 | 28 | 70 | 76 | --- |
| Other- | 367 | 275 | 188 | 120 | 108 | --- | 1 | 7 | 12 | 22 | 45 | -- |
| Mountain- | 1,144 | 951 | 560 | 490 | 312 | 336 | 3 | 10 | 23 | 58 | 65 | 52 |
| Pacific States--------1 | 92 | 70 | 51 | 49 | 179 | 215 | --- | 13 | 30 | 60 | 28 | 35 |
| United States----: | $82,788$ | 81,906 | 78,410 | 71,826 | 65,333 | 71,649 | 12 | 27 | 41 | 68 | 78 | 75 |

1/ Less than 0.5 percent.

Table 3.--Corn for grain: Methods of harvesting, by State and region, 1956 and 1960


Table 3.--Corn for grain: Methods of harvesting, by State and region, 1956 and 1960--Continued


Table 4.--Corn for grain: Percentage of acreage harvested by specified methods, by crop acreage and region, 1960


Table 4.--Corn for grain: Percentage of acreage harvested by specified methods, by crop acreage and region, 1960--Continued

| Crop acreage and region | Percentage of acreage harvested-- |  |  |  |  |
| :---: | :---: | :---: | :---: | :---: | :---: |
|  | From standing stalk by-m |  |  | By <br> hand <br> and <br> other | By field shelling done by custom operator |
|  | Mechanical picker | Picker-sheller$\left.\begin{array}{l}\text { Grain : Ombine : Other }\end{array}\right]$ |  |  |  |
|  |  |  |  |  |  |
|  | Percent | Percent | Percent | Percent | Percent |
|  | 15 | 4 | --- | 81 | 77 |
|  | 17 | 5 | 2 | 76 | 70 |
|  | 30 | 6 | 3 | 61 | 55 |
| 50 to 99 acres | 44 | 9 | 3 | 44 | 48 |
| 100 to 199 acres-------------1 | 54 | 15 | 5 | 26 | 40 |
|  | 59 | 20 | 7 | 14 | 29 |
| 300 acres and over-n-m-n-m | 58 | 27 | 8 | 7 | 20 |
|  | 42 | 14 | 3 | 41 | 35 |
| Under 10 acres | 11 | 1 | 1 | 87 | 71 |
| 10 to 24 acres | 16 | 3 | 2 | 79 | 63 |
|  | 25 | 6 | 3 | 66 | 47 |
|  | 32 | 12 | 5 | 51 | 37 |
| 100 to 199 acres-------------- | 35 | 16 | 8 | 41 | 32 |
|  | 39 | 20 | 9 | 32 | 24 |
| 300 acres and over | 41 | 31 | 12 | 16 | 17 |
| Delta States | 24 | 9 | 4 | 63 | 34 |
| Under 10 acres | 21 | 4 | -- | 75 | 92 |
|  | 41 | 5 | 2 | 52 | 84 |
|  | 49 | 6 | 2 | 43 | 75 |
|  | 59 | 9 | 3 | 29 | 67 |
|  | 63 | 16 | 3 | 18 | 60 |
| 200 to 299 acres------------ | 71 | 20 | 4 | 5 | 52 |
|  | 55 | 36 | 6 | 3 | 25 |
| Southern Plains | 52 | 14 | 3 | 31 | 49 |
|  | 38 | 12 | 3 | 47 | 66 |
|  | 52 | 15 | 7 | 26 | 59 |
| 25 to 49 acres---------------10-1 | 58 | 20 | 7 | 15 | 53 |
| 50 to 99 acres--n----------- | 61 | 25 | 6 | 8 | 43 |
|  | 61 | 29 | 4 | 6 | 33 |
| 200 to 299 acres-----m------ | 56 | 37 | 5 | 2 | 23 |
|  | 43 | 50 | 7 | $1 /$ | 23 |
| Mountain and Pacific--- | 47 | 35 | 7 | 11 | 28 |
| United States~------- | 75 | 10 | 5 | 10 | 32 |
|  |  |  |  |  |  |

$1 /$ Less than 0.5 percent.

Table 5.--Corn for grain: Custom work; percentage field shelled with hired machines, by corn acreage and region, 1960

| Region | Percentage harvested on farms with corn acreage of-- |  |  |  |  |  |  |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  | Under 10 acres | $10-19$ | $20-29$ | $30-49$ | $50-74$ | $75-99$ | 100 and over | A11 farms |
|  | Percent | Percent | Percent | Percent | Percent | Percent | Percent | Percent |
| Northeast-n---------- | 82 | 67 | 48 | 32 | 25 | 11 | 8 | 34 |
| Lake States---------: | 85 | 81 | 66 | 60 | 48 | 38 | 27 | 32 |
| Corn Belt- | 89 | 82 | 69 | 61 | 52 | 44 | 19 | 31 |
| Northern Plains------ | 84 | 80 | 77 | 69 | 51 | 33 | 22 | 27 |
| Appalachian---------: | 80 | 72 | 66 | 61 | 54 | 31 | 20 | 49 |
| Southeast-- | 83 | 69 | 56 | 48 | 39 | 30 | 20 | 35 |
| Delta States--------- | 69 | 58 | 48 | 37 | 32 | 24 | 17 | 34 |
| Southern Plains----- | 88 | 80 | 77 | 67 | 60 | 52 | 25 | 49 |
| Mountain-------------1 | 85 | 71 | 63 | 39 | 20 | 15 | 8 | 32 |
|  | 50 | 48 | 42 | 40 | 37 | 35 | 35 | 26 |
| United States---: | 80 | 72 | 65 | 59 | 49 | 39 | 21 | 32 |

Table 6.--Wheat: Acreage harvested and percentage of the acreage harvested by specified methods, by State and region, 1950 and 1960


Table 6.--Wheat: Acreage harvested and percentage of the acreage harvested by specified methods, by State and region, 1950 and 1960 --Continued

$1 /$ Less than 0.5 percent.

Table 7.--Wheat: Percentage of acreage harvested by specified methods, by crop acreage and region, 1960


Table 7.--Wheat: Percentage of acreage harvested by specified methods, by crop acreage and region, 1960--Continued


1/ Less than 0.5 percent.

Table 8.- Wheat: Percentage of acreage harvested by specified methods, by crop acreage, United States, 1960


1/ Less than 0.5 percent.

Table $9,-$ Oats: Acreage harvested and percentage of the acreage harvested by specified methods, by State and region, 1950 and 1960


Table 9.--Oats: Acreage harvested and percentage of the acreage harvested by specified methods, by State and region, 1950 and 1960 --Continued


Table 10.--Oats: Percentage of acreage harvested by specified methods, by crop acreage and region, 1960


Table 10.--0ats: Percentage of acreage harvested by specified methods, by crop acreage and region, 1960--Continued

| Crop acreage and region | Percentage of acreage-- |  |  |  |  |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  | Combined-- |  |  |  | Threshed and all other | Combined by custom operator |
|  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |
|  | Percent | Percent | Percent | Percent | Percent | Percent |
| Under 10 acres-- | 20 | 65 | --- | --- | 15 | 39 |
| 10 to 24 acres---------- | 36 | 54 | -- | --- | 10 | 31 |
| 25 to 49 acres---------- | 56 | 40 | --- | --- | 4 | 25 |
| 50 to 99 acres--------- | 75 | 25 | --- | --- | --- | 12 |
| 100 acres and over | 86 | 14 | --- | --- | --- | 11 |
| Delta States------- | 60 | 38 | --- | --- | 2 | 16 |
| Under 10 acres--------- | 36 | 51 | 2 |  | 8 | 38 |
| 10 to 24 acres- | 48 | 41 | 3 | 3 | 5 | 36 |
| 25 to 49 acres---- | 58 | 35 | 3 | 2 | 2 | 33 |
| 50 to 99 acres-- | 66 | 28 | 5 | 1 | $1 /$ | 32 |
| 100 acres and over- | 75 | 20 | 5 | --- | $1 /$ | 21 |
| Southern Plains--- | 65 | 29 | 3 | 1 | 2 | 29 |
| Under 10 acres | 35 | 35 | 10 | 11 | 9 | 41 |
| 10 to 24 acres----- | 39 | 27 | 17 | 9 | 8 | 26 |
| 25 to 49 acres- | 43 | 21 | 21 | 8 | 7 | 14 |
| 50 to 99 acres | 52 | 18 | 17 | 8 | 5 | 6 |
| 100 acres and over | 70 | 10 | 15 | 4 | 1 | 1 |
| Mountain-- | 47 | 24 | 17 | 7 | 5 | 16 |
| Under 10 acres--------- | 41 | 41 | 11 | --- | 7 | 51 |
| 10 to 24 acres- | 53 | 32 | 7 | 3 | 5 | 39 |
| 25 to 49 acres--------1 | 64 | 23 | 6 | 2 | 5 | 27 |
| 50 to 99 acres | 75 | 18 | 4 | 2 | 1 | 22 |
| 100 acres and over | 78 | 17 | 3 | 1 | 1 | 8 |
| Pacific- | 60 | 29 | 5 | 2 | 4 | 19 |
| United States---- | 21 | 35 | 12 | 26 | 6 | 15 |

1/ Less than 0.5 percent.

Table 11.--0ats: Percentage of acreage harvested by specified methods, by crop acreage, United States, 1960


Table 12.--Barley: Acreage harvested and percentage of the arreage harvested by specified methods, by State and region, 1950 and 1960


Table 12.--Barley: Acreage harvested and percentage of the acreage harvested by specified methods, by State and region, 1050 and 1900 --Continued


1/ Less than 0.5 percent.

Table 13.--Barley: Percentage of acreage harvested by specified methods, by crop acreage and region, 1960


Table 13.--Barley: Percentage of acreage harvested by specified methods, by crop acreage and region, 1960--Continued


1/ Less than 0.5 percent.

Table 14.--Barley: Percentage of acreage harvested by specified methods, by crop acreage, United States, 1960


1/ Less than 0.5 percent.

Table 15.--Rye: Acreage harvested and percentage of the acreage harvested by specified methods, by State and region, 1950 and 1960


1/Less than 0.5 percent.

Table 16.--Rye: Percentage of acreage harvested by specified methods, by crop acreage and region, 1960


1/ Less than 0.5 percent.

Table 17.--Rye: Percentage of acreage harvested by specified methods, by crop acreage, United States, 1960


1/ Less than 0.5 percent.

Table 18.--Sorghum: Acreage harvested and percentage of the acreage harvested by specified methods, by State and region, 1950 and 1960


1/ Less than 0.5 percent.

Table 19.--Sorghum: Percentage of acreage harvested by specified methods, by crop acreage and region, 1960

| Crop acreage and region | Percentage of acreage ${ }^{--}$ |  |  |  |  |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  | Combined-- |  |  |  | : |  |
|  | From standing crop by-- : From windrow by-- |  |  |  | Threshed and all other | Combined by custom operator |
|  | Self- | Pull- | Self- | Puli- |  |  |
|  | propelled | type | propelled | type |  |  |
| : | Percent | Percent | Percent | Percent | Percent | Percent |
| Under 5 acres-----------: | 19 | 66 | --- | --- | 15 | 33 |
| 5 to 9 acres------------ | 28 | 58 | --- | --- | 14 | 23 |
| 10 to 19 acres---------: | 39 | 51 | --- | --- | 10 | 22 |
| 20 to 29 acres----------: | 52 | 43 | --- | --- | 5 | 18 |
| 30 to 49 acres--m------- | 64 | 28 | --- | --- | 8 | 16 |
| 50 to 99 acres | 79 | 21 | --- | --- | - | 10 |
| 100 acres and over- | 85 | 15 | --- | --- | --- | 8 |
| Corn Belt- | 53 | 40 | --- | -- | 7 | 19 |
| Under 5 acres | 25 | 62 | 1 | 1 | 11 | 20 |
| 5 to 9 acres------------ | 38 | 51 | 1 | 2 | 8 | 29 |
| 10 to 19 acres --------- | 55 | 36 | 1 | 3 | 5 | 36 |
| 20 to 29 acres----------: | 65 | 27 | 1 | 1 | 6 | 30 |
| 30 to 49 acres---------- | 77 | 18 | 2 | --- | 3 | 22 |
| 50 to 99 acres----------: | 85 | 11 | 3 | --- | 1 | 20 |
| 100 acres and over | 91 | 3 | 5 | --- | 1 | 13 |
| Northern Plains--- | 79 | 15 | 2 | $1 /$ | 4 | 20 |
| Under 5 acres-----------: | 41 | 54 | --- | -- | 5 | 19 |
| 5 to 9 acres---------- | 50 | 46 | --- | 2 | 2 | 25 |
| 10 to 19 acres---------: | 58 | 38 | 2 | 1 | 1 | 33 |
| 20 to 29 acres----------: | 63 | 34 | 2 | 1 | $1 /$ | 36 |
| 30 to 49 acres- | 70 | 29 | 1 | $1 /$ | --- | 46 |
| 50 to 99 acres- | 74 | 25 | 1 | - | -- | 54 |
| 100 acres and over | 85 | 14 | 1 | --- | --- | 60 |
| Southern Plains----: | 79 | 20 | 1 | --- | $1 /$ | 55 |
| Under 5 acres-----------: | 26 | 61 | --- | - | 13 | 54 |
| 5 to 9 acres---------- | 36 | 55 | --- | --- | 9 | 49 |
| 10 to 19 acres--------: | 46 | 47 | --- | --- | 7 | 47 |
| 20 to 29 acres---------- | 59 | 37 | --- | --- | 4 | 44 |
| 30 to 49 acres----------: | 66 | 32 | --- | --- | 2 | 31 |
| 50 to 99 acres----------: | 74 | 26 | --- | --- | --- | 23 |
| 100 acres and over------ | 85 | 15 | --- | --- | --- | 16 |
| Mountain-----------: | 79 | 20 | 1/ | $1 /$ | 1 | 26 |
| United States----: | 77 | 19 | 2 | $1 /$ | 2 | 37 |

1/ Less than 0.5 percent.

Table 20.--Sorghum: Percentage of acreage harvested by specified methods, by crop acreage, United States, 1960


1/ Less than 0.5 percent.

Table 21.--Soybeans: Acreage harvested and percentage of the acreage harvested by specified methods, by $S$ tate and region, 1950 and 1960


Table $21,-$ Soybeans: Acreage harvested and percentage of the acreage harvested by specified methods, by State and region, 1950 and 1960 --Continued


1/ Less than 0.5 percent.

Table 22.--Soybeans: Percentage of acreage harvested by specified methods, by crop acreage and region, 1960

| Crop acreage and region | Percentage of acreage-- |  |  |  |  |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  | Combined-- |  |  |  | : |  |
|  | From standing crop by-- : From windrow by-- |  |  |  | Threshed and a 11 other | Combined by custom operator |
|  |  |  |  |  |  |  |
|  | Self- | Pu11- | Self- | Pu11- |  |  |
|  | rope11ed | type | propelled | type |  |  |
|  | Percent | Percent | Percent | Percent | Percent | Percent |
| Under 10 acres | 62 | 33 | --- | --- | 5 | 35 |
| 10 to 24 acres---------- | 56 | 41 | --- | --- | 3 | 32 |
| 25 to 49 acres- | 47 | 52 | --- | --- | 1 | 30 |
| 50 to 99 acres---- | 39 | 61 | --- | --- | --- | 23 |
| 100 acres and over | 35 | 65 | --- | --- | --- | 14 |
| Nor theast-- | 41 | 59 | -- | - | $1 /$ | 21 |
| Under 10 acres---------- | 7 | 68 | 1 | 19 | 5 | 30 |
| 10 to 24 acres---------- | 14 | 61 | 2 | 21 | 2 | 22 |
| 25 to 49 acres-------- | 19 | 55 | 5 | 20 | 1 | 17 |
| 50 to 99 acres | 29 | 48 | 6 | 17 | --- | 12 |
| 100 to 199 acres- | 47 | 28 | 11 | 14 | --- | 9 |
| Lake States- | 26 | 49 | 6 | 18 | 1 | 15 |
| Under 10 acres | 21 | 71 | --- | 3 | 5 | 43 |
| 10 to 24 acres----~----- | 29 | 66 | 1 | 2 | 2 | 31 |
| 25 to 49 acres- | 35 | 62 | 1 | 2 | 1/ | 22 |
| 50 to 99 acres--------- | 44 | 55 | --- | 1 | - | 14 |
| 100 to 199 acres | 65 | 35 | -- | --- | --- | 8 |
| Corn!Be1t- | 46 | 53 | $1 /$ | 1 | $1 /$ | 16 |
| Under 10 acres- | 30 | 62 | --- | - | 8 | 26 |
| 10 to 24 acres----------: | 45 | 49 | --- | 2 | 4 | 31 |
| 25 to 49 acres---------- | 60 | 37 | --- | 1 | 2 | 26 |
| 50 to 99 acres | 73 | 27 | --- | --- | 1/ | 9 |
| 100 to 199 acres- | 90 | 10 | --- | - | -- | 4 |
| Northern Plains----: | 68 | 31 | - | 1 | $1 /$ | 18 |
| Under 10 acres---------- | 23 | 69 | --- | - | 8 | 42 |
| 10 to 24 acres---------: | 35 | 62 | --- | - | 3 | 36 |
| 25 to 49 acres---------- | 43 | 56 | ~-- | --- | 1 | 25 |
| 50 to 99 acres--------- | 53 | 47 | --- | --- | 1/ | 13 |
| 100 to 199 acres-------- | 77 | 23 | --- | --- | --- | 7 |
| Appala chian--------- | 56 | 44 | --- | --- | $1 /$ | 19 |

Table 22.--Soybeans: Percentage of acreage harvested by specified methods, by crop acreage and region, 1960--Continued


1/ Less than 0.5 percent.

Table 23.--Soybeans: Percentage of acreage harvested by specified methods, by crop acreage, United States, 1960


1/ Less than 0.5 percent.

Table 24.--Peanuts: Acreage harvested and percentage of the acreage harvested by specified methods, by State and region, 1950 and 1960


1/ For selected States in 1960; harvesting data obtained from Virginia, a major producing area, was inconclusive and could not be used in these tabulations.
2) Less than 0.5 percent.

Table 25.--Flaxseed: Acreage harvested and percentage of the acreage harvested by specified methods, by State, 1950 and 1960


1/ Only for States reporting. Includes Texas, Montana and Iowa.

Table 26. - -Dry edible beans and field peas: Acreage harvested and percentage of acreage harvested by specified methods, by State, 1960


Table 27.-A1falfa and clover seed (Red and Alsike): Acres harvested and percentage of acreage harvested by specified methods, by State and region, 1960

|  | Acreage harvested | $\qquad$ $\qquad$ <br> : <br> :From standi <br> : <br> Self- <br> : propelled | Percentage | From wi <br> Self- <br> propelled | Pull-type: $:$ | Threshed and all other | Combined by custom operator |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| : | Acres | Percent | Percent | Percent | Percent | Percent | Percent |
| Ohio----------------- | 191,413 | 33 | 65 | - | --- | 2 | 31 |
| Indiana---m-n--------: | 170,066 | 30 | 65 | --- | --- | 5 | 15 |
| Illinois-------------: | 205,396 | 20 | 67 | --- | --- | 13 | 20 |
|  | 106,442 | 5 | 28 | 2 | 62 | 3 | 11 |
| Missouri---------m---: | 143,251 | 25 | 35 | 2 | 25 | 13 | 12 |
| Corn Belt-n-n--: | 816,568 | 24 | 55 | 1 | 13 | 7 | 19 |
| North Dakota----n---: | 14,121 | 46 | 7 | 26 | 16 | 5 | 9 |
| South Dakota---------: | 75,635 | 30 | 10 | 29 | 30 | 1 | 1 |
| Nebraska-------------- | 109,262 | 40 | 13 | 12 | 29 | 6 | 7 |
|  | 119,625 | 33 | 7 | 29 | 22 | 9 | 17 |
| Northern Plains--: | 318,643 | 35 | 10 | 22 | 26 | 7 | 9 |
| Washington----------: | 20,292 | 38 | 3 | 46 | 5 | 8 | 17 |
| Oregon---------------: | 28,191 | 28 | 17 | 49 | 4 | 2 | 27 |
| Ca1ifornia-----------: | 136,707 | 48 | 4 | 44 | 4 | - | 26 |
| Pacific--------: | 185,190 | 45 | 5 | 45 | 4 | 1 | 29 |
| A11 other------------: | 456,418 | 31 | 38 | 12 | 13 | 6 | 14 |
| United States-: | 1,776,819 | 30 | 39 | 11 | 14 | 6 | 17 |



