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A NORMAL DAY'S WORK FOR VARIOUS FARM OPERATIONS.

By H. H. Mowry,
Assistant Agriculturist, Office of Farm Management, Bureau of Plant Industry.

INTRODUCTION.

In order that farm work may be planned in advance or performed properly from season to season, it is essential to know what may fairly be expected daily of a workman for each kind of work, of any kind and size of implement, of each unit of power, and of any practicable combination of power, workmen, and tools. Data of this character are peculiarly valuable when a new and unfamiliar enterprise is to be undertaken by the farmer, and particularly where a partial or general reorganization of the farm business is contemplated. Such data are also necessary to insure that adequate labor and equipment are provided for and that the former is occupied to its fullest extent throughout the season, to determine the feasibility of a cropping system or rotation, to plan a practicable distribution of labor, and to insure that normal daily efficiency is secured from man and horse or to make certain that they are not overtaxed. The immediate demand that at least general averages of this character be made available for the farm-reorganization work of the Office of Farm Management has resulted in the accumulation of the data presented in the following pages. Since the normal daily efficiency of equipment and workmen is an element or factor both of the planning and execution of farm work, the average or normal day's work for each operation is referred to in the text and tables as a "daily factor."

RELATION OF FARM EQUIPMENT TO FARM MANAGEMENT.

From the practical standpoint, each individual farm must be considered as a business entity as well as a physical unit, and farm management is concerned with the planning, adjustment, and seasonal manipulation of the elements of farm production (land, crops, live stock, labor, tools, and structures), so that all will mutually operate to secure the greatest profit without impairing the efficiency of any factor of production. In attempting to bring about and maintain this profitable adjustment, every farmer consciously or otherwise utilizes and is limited by physical and economic factors peculiar to the farming business.

From the investigational viewpoint, the individual farm with its cropping system, practice, equipment, current operations, and general organization is a means to an end, and farm management is concerned with the farm unit only in so far as it affords impersonal data from which general principles can be formulated and applied to farms of its type and the conditions and possibilities of its locality. For purposes of investigation as well as use, the elements of farm equipment which affect the management of farms have been considered in two classes, which are here briefly referred to and defined in order to develop the relation between the science and practice of farm management and the subject matter of this bulletin. One class of elements relates to the investment in equipment and the other to the operation of equipment, the first being termed "investment factors" and the second "operating factors." Operating factors are further classified into "seasonal" and "daily" factors.

INVESTMENT FACTORS.

By assembling masses of data from many farms, covering either the entire organization of each or selected elements only, useful facts and factors not previously known can be made available. As a comparatively simple illustration, let it be assumed that it is necessary to determine the optimum investment to be made in outbuildings for a certain 200-acre farm. It is not safe to depend upon direct mathematical calculation on the basis of the physical needs for farm storage, since the investment is limited by the farm income and the physical demands must be to a certain degree subordinated to the economic. Neither would it be wise to depend upon the example of but one practical farmer who had recently decided the matter for himself, since the individual must have had but little information to guide him and may have made serious errors, such as building in a year of big crops and investing so much that his farm pays no interest on the expenditure, or he may have been compelled to build in a "lean" year and may have invested so little as to be unduly cramped for space and may be incurring losses through damage and inconvenience.

If, however, many 200-acre farms in an area are examined, a normal investment factor, representing a considerable period of time and typical of those farms which are both physically adequate and financially solvent, can be taken as the optimum factor desired. Similarly, the distribution of investment in all classes of equipment can be obtained. From such data the principles and relationships for wise investment can be worked out, which might possibly be recognized by the occasional individual, but which must at best be apprehended only vaguely by the majority, if they are not quite without the purview of the man confined to the duties and experience of one farm.

SEASONAL OPERATING FACTORS.

Under practical farm conditions, work can be planned intelligently and successfully executed only when allowance is made for rainy days and other climatic conditions which interrupt the various operations in their respective seasons. Conclusive data of this character for any region can be secured only by long-continued observations of the weather in connection with its interfering effect on farm work. However, approximate seasonal factors for farm operations can often be calculated for any locality from the current practice with any crop.[1]

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[1] In the southern part of the corn belt one man with a 2-horse team can plow, harrow three times, and plant 40 acres in corn from about March 10 to May 10. What fraction of this period is available for field work?

A man can plow 1.75 acres, harrow 10 acres, or plant 11 acres per day. Hence, to plow, harrow three times, and plant 1 acre will require—

$$\left(\frac{1}{1.75}+\frac{3}{10}+\frac{1}{11}\right) \text{ day. To do 40 acres will require } 40\left(\frac{1}{1.75}+\frac{3}{10}+\frac{1}{11}\right) \text{ days.}$$

Another expression for this number of days may be found as follows: The whole number of days from March 10 to May 10 is 61; if F represents the fraction of this period available for field work, then $F \times 61$ is the number of available days. Thus, we have two expressions for the number of days available for field work, and these two expressions may therefore be equated. This gives us the equation—

$$40\left(\frac{1}{1.75}+\frac{3}{10}+\frac{1}{11}\right)=F\times 61.$$

Solving this equation, we find F equals 0.631. That is, 63.1 per cent of the period is available for field work.

The following more general formula, based on the above considerations, is useful in many ways:

$$A\left(\frac{t}{a}+\frac{t'}{b}+\frac{t''}{c}+\ldots\ldots\right)=FS.$$

In this formula A stands for the number of acres of land involved; t, t', t'', etc., represent the number of times the various operations are performed; a, b, c, etc., represent the area covered in a day in each of the various operations performed; F is the fraction of time available for field work; and S is the number of days in the season during which the work must be done.

Another use to which this formula may be put is illustrated in the following problem: Assuming that during March one day in two is available; during April and May, two days in three; that oat land is plowed, harrowed once, and drilled; that corn land is plowed, harrowed three times, and planted; that a day's work is plowing 1.75 acres, harrowing 10 acres, drilling 8 acres, or planting 11 acres of corn; and that the rotation used calls for equal areas of corn and oats; what area of each of these two crops can one man put in between March 1 and May 10? Our formula now becomes—

$$A\left(\frac{1}{1.75}+\frac{1}{10}+\frac{1}{8}\right)+A\left(\frac{1}{1.75}+\frac{3}{10}+\frac{1}{11}\right)=\frac{1}{2}\times 31+\frac{2}{3}\times 40.$$

From this we find A equals 24 acres. That is, one man can plant 24 acres each of corn and oats.

If in the foregoing problem we omit the plowing and harrowing for the oats and simply drill them in the old corn stubble by means of a disk drill, as many farmers do, how many acres can the man put in of each of these crops? For this problem the formula now becomes—

$$A\left(\frac{1}{8}\right)+A\left(\frac{1}{1.75}+\frac{3}{10}+\frac{1}{11}\right)=\frac{1}{2}\times 31+\frac{2}{3}\times 40.$$

Approximate seasonal factors having general application to the States of Nebraska, Iowa, Illinois, and Indiana are presented in Table I, being averages of the best judgment of practical farmers for the respective operations in the States named during the growing season from March to November, inclusive.

TABLE I.—*Approximate seasonal factors for farm work in four States of the Middle West.*

PERCENTAGE OF TOTAL DAYS AVAILABLE FOR WORK AT EACH SEASON.

Operation, weather, etc.	Indiana.	Illinois.	Iowa.	Nebraska.
Spring plowing	64.2	69.0	72.1	75.3
Spring harrowing	60.7	63.8	70.5	71.4
Spring seeding	60.4	63.1	65.7	67.5
Spring corn planting	62.5	68.9	71.1	73.5
Cultivating	73.7	75.1	77.5	79.7
Haying	67.8	68.0	70.1	70.5
Grain harvest	71.8	73.0	74.9	76.5
Corn harvest	74.3	73.0	75.1	76.2
Thrashing	72.5	72.3	72.4	74.9
Potato harvest	64.6	67.0	68.4	70.2
Fall plowing	76.4	78.3	78.5	79.2
Fall harrowing	73.9	73.8	77.2	78.9
Fall seeding	70.5	75.5	75.6	76.2
Husking corn	73.3	79.5	82.3	82.6
State average	69.0	71.3	73.7	75.2

AVERAGE MONTHLY WEATHER CONDITIONS, MARCH TO NOVEMBER, INCLUSIVE.

Operation, weather, etc.	Indiana.	Illinois.	Iowa.	Nebraska.
Normal temperature ° F.	59.0	59.5	55.2	57.5
Normal rainfall inches.	30.6	29.7	29.3	24.0
Rainy days in 1911 (0.01 inch and over)	9.5	8.8	7.8	5.7
Entirely clear days in 1911	12.0	13.9	14.4	15.9
Entirely cloudy days in 1911	8.9	8.3	7.3	5.5
Partly cloudy days in 1911	9.2	8.2	8.7	8.9

It will be observed that, except in four instances, there is a regular increase in the percentage of available time for each operation from Indiana to Nebraska. It will also be seen that there is a regular decrease of rainy days and a regular increase of entirely clear days from Indiana westward, according to the weather records for the season of 1911. The normal rainfall also decreases regularly from Indiana westward for the 9-month period. In each percentage in the table from 50 to 100 estimates are submitted in terms of days

From this we find that A equals 38.8 acres.

Another problem. With the rates of work assumed here it is known that one man can plow, harrow three times, and drill 40 acres of wheat during the months of August and September. What is the percentage of available time. For this problem we have—

$$40\left(\frac{1}{1.75}+\frac{3}{10}+\frac{1}{8}\right) = F\times 61.$$

This gives F equal to 65.3 per cent, or practically two days in three.

In all cases where the area is known on which a man can perform certain operations within a given period—that is, when the seasonal duty of a man is known—the use of the above general formula enables us to determine the average percentage of available time for the season and locality concerned.

A very good way of determining the percentage of available time during the early summer is to ascertain the area of corn or other cultivated crop one man can till, the area he can till in a day, and how often the crop should be cultivated. Thus, in the corn-belt States one man can till 40 acres of corn. He can cultivate 6 acres a day, and the corn should be cultivated once every 10 days. From these facts it follows that $40\left(\frac{1}{6}\right)=F\times 10$; whence, $F=\frac{2}{3}$, which means that two days in three are available.—W. J. Spillman.

available in the respective operating seasons. The farmers reporting used figures of their own choice in expressing their judgment, and the percentages were computed separately from these and averaged. The uniform increase in available working time from Indiana westward is so in harmony with the weather conditions recorded by the Weather Bureau that any deviation from the true seasonal factors for these States must be common to all of the figures in the table. While Table I is presented here only for purposes of illustration and definition, it also suggests a rapid method for arriving at general seasonal factors for farm work in any locality.

DAILY OPERATING FACTORS.

Methods of Investigation.

Two methods have been followed in obtaining the data presented in this bulletin. The first, which contemplated extreme accuracy and a long period of study of the subject, was based on personal observations in the field by agents of the Department working in limited areas having uniform conditions. These field observations extended over periods varying in length from 30 minutes to one or more hours. During part of each period the speed in motion was observed under the watch, the length of the speed observation being more or less according to the circumstances which determined convenient distances to be fixed as starting and stopping points. At the same time the agent recorded the entire length of his observation in each case, measured off the acres covered by the workman, and noted the working size of the implement, depth worked, width of rows, distance between turns, kind and condition of soil, amount of power, size of horses, bulk of product handled, and all other factors tending to affect the amount of work performed, so that all data could be compared and variations accounted for. While, in theory, the method of personal and detailed observations should give absolutely accurate and dependable results, because no vital condition is overlooked and the observations are personally and scientifically made, it was found that the variation in observed speed in motion and in surveyed acres per hour in the same area and under identical conditions was quite as wide as the variation in the estimates for a fair day's work by practical farmers reporting for every condition in the United States. It was also apparent from experience with personal observations that these should cover not less than a day and that a very great many of them would be necessary before an average of value could be obtained. The very great cost of the more exact method rendered it available only as a means for furnishing limited data with which to check up results secured by more general and inexpensive methods.

Many of the activities of the Office of Farm Management are predicated on prior experience, from which it has been found that facts and principles not generally available and often not recognized by those giving the basic information can be deduced from records obtained from farmers. All of the subsequent tables in this bulletin were obtained by taking advantage of this principle. A circular of inquiry covering practically all of the operations of farming was mailed to 25,000 selected farmers distributed throughout every State and Territory. The form was so prepared that every controlling condition affecting any operation, such as the working size of the implement, width, depth, power used, bulk handled, etc., was given blank space to be filled in by each farmer according to his practice and the local conditions with which he was familiar. The answers, therefore, as a whole represented the best judgment in the light of long experience of those who cooperated by sending in replies. Incidentally, since the method permitted each correspondent to record his own local practice, much supplemental information relating to farm equipment and farm management not contemplated by the inquiry was furnished. These features are discussed in connection with the respective tables. The figures represent averages of general conditions in the United States. No attempt has been made to classify the material according to geographic divisions. It is fully realized as regards certain farm operations that the averages of the farmers' estimates from the several agricultural regions are not strictly applicable to any particular district. When sufficient data are obtained from each distinct region, complete tables will be compiled that will take into account differences existing in the time requirements for the several farm operations.

On account of certain conditions affecting the method by which the data in the following tables were obtained, it is believed that many of the averages are too high. While an equal number of inquiries were sent to each State in the Union, the majority of the replies came from the North-Central States, where climate, topography, and short seasons tend relatively to increase the daily duty for farm workmen beyond the average. Again, in making estimates of this character, the human tendency to recall only the exceptionally large day's work rather than the unnoticed normal, or average, would also operate to raise the figures. A third influence tending to raise the estimates would be the natural desire of the correspondent to report a generous amount of work as within his own capacity. Still a fourth influence would be the desire to set high standards for hired help. On account of these biased influences, which are all one sided, it was deemed advisable in presenting the original data of the tables to also include adjustments representing considerable reductions from the reported averages, since for the practical purposes to which these tables will be put it is wiser to use factors which are too low than to make farm plans with factors that are too high. Reductions from

5 to 20 per cent have been made in some of the tables, although some are presented without such adjustments. These adjustments are noted in connection with the respective tables.

Determining the Net Working Day.

In order that the factors obtained might be brought to a uniform basis and so be comparable throughout and with other and similar data, the inquiry was so worded as to develop the net hours actually in the field or at work, during each operation. The time employed in making ready, hitching and unhitching, going and coming, and for meals, has been subtracted and a net working day established in terms of which the respective operations are tabulated and discussed. The respective net hours worked are given in the heading of each appropriate table.

Analysis of the Data.

In the following tables only a small part of the total number of averages for each operation, respectively, is included. Original averages are given in each table only for those widths, sizes, crews, teams, etc., for which the largest numbers were reported. Adjustments and scales of allowances are then included in the respective tables from which the work factor for any feasible width, depth, team, or crew can be computed, using the average for the most common unit of equipment as the standard. These adjustments and allowances are based in each case upon analytical tables covering the entire number of reports for the respective operations. In this analysis the original data were tabulated in every pertinent arrangement and factors deduced for each variation in working size of implement, load, crew, and team. From these deduced factors the scales of allowances in the tables have been derived. The analytical tables referred to were too extensive to be included in this discussion. They covered several groupings each for reports on 1,852 walking plows, 1,056 sulky plows, 822 gang plows, 2,075 spike-tooth harrows, 823 spring-tooth harrows, 1,670 disk harrows, 442 fertilizer drills, 860 manure spreaders; 984 reports on spreading manure from a wagon box with a fork, 597 on spreading manure from piles with a fork, 765 on loading, hauling, and dumping manure in piles, 973 on loading manure into spreader, 112 on spreading lime from piles, 119 on spreading lime from a wagon box, 480 on scooping grain into a wagon, 1,014 on milking cows, 105 on picking strawberries, 626 on digging and picking up potatoes by hand, 110 on digging Irish potatoes with a an ordinary plow, 1,375 on picking up Irish potatoes after an ordinary plow, 429 on picking up Irish potatoes after an elevator digger, 38 on digging sweet potatoes with a sweet-potato plow, 334 on hauling potatoes from field to cellar, 306 on planting Irish potatoes with a planter, 534 on marking potato rows, 925 on dropping potatoes by hand, 840 on covering seed potatoes, 382 on picking apples, 2,358 on grain binders, 771 on stacking grain from shock, 199 on harvesting grain with header, 1,650 on shocking grain, 153 on thrashing flax, 80 on thrashing alfalfa or clover, 48 on thrashing timothy, 782 on thrashing oats, 895 on thrashing wheat, 760 on harvesting corn with a corn binder, 221 on harvesting corn with a platform cutter, 356 on cutting and shocking corn by hand, 679 on tying and shocking corn after a binder, 778 on husking corn from the shock, 689 on husking standing corn continuously, 969 on husking, hauling, and unloading standing corn, 1,750 on cultivating, 318 on digging Irish potatoes with a digger, 169 on cutting seed potatoes with a cutter, 760 on cutting seed potatoes by hand, 1,493 on grain drills, 1,224 on land rollers, 1,722 on planting corn and cotton with a planter, 386 on planting corn with a hand planter, 358 on planting sweet potatoes, cabbage, and tomatoes by hand, 100 on bean planters, 573 on broadcast seeders, 145 on knapsack sowers, 212 on wheelbarrow sowers, 100 on spreading lime with a spreader, 160 on spraying fruit, 157 on spraying field crops, 2,320 on mowing hay, 2,105 on raking, 539 on hay tedders, 1,122 on cocking hay, 415 on stacking hay with sweep rakes, 459 on stacking hay without sweep rakes, 1,019 on hauling hay from cocks to a barn, 407 on hauling hay using a hay loader, 427 on baling hay with sweep power, 213 on baling hay with an engine, 226 on plowing with a traction engine, and 4,402 on hauling produce to market.

A Normal Day's Work for Given Farm Operations.

PLOWING.

Out of 1,852 reports for walking plows 31 per cent use a 14-inch implement, 27 per cent the 12-inch, about equal numbers use the 10 and 16 inch sizes, and only 19 per cent use other sizes than these. Nearly twice as many report a depth of 6 inches as are reported for any other depth, while nearly equal percentages are reported for 5, 7, and 8 inch depths. This fact may be accounted for by the general tendency of the human mind to employ round numbers in discussing magnitudes not exactly known. In this case the actual practice of farmers, if known, would doubtless cause these percentages to be so distributed as to increase that for 5 and 7 and somewhat reduce that for 6 inch depths. Teams of two horses are used by 73 per cent of farmers. The 3-horse teams are used chiefly on the 16-inch widths and on the 14-inch widths when plowing 7 or more inches deep.

When the walking-plow data were arranged by widths with the depths averaged it was seen that the depth decreased as the width was increased. This was less pronounced with three horses than with two. Only the 10, 12, 14, and 16 inch widths had sufficient numbers reported to warrant conclusions. A progressive increase in the work done per day and per horse appeared as the width increased, but a much smaller increase per 1,000 pounds of horse was evident, since the heavier horses were used on the wider plows. With a 2-horse walking plow the average load is about 35 square inches in cross section, and 0.72 acre is required daily of each 1,000 pounds of horse.

With the 3-horse teams the depth averaged greater except in the case of the 16-inch width, which showed a smaller average depth than the 2-horse plow of the same width and a much greater acreage daily, as would be expected. Variations from what would normally be expected in the averages for these principal widths could nearly always be explained by some other features of the data, a consideration which augurs well for the unbiased method used in assembling the material and the general accuracy of the results obtained. With a three-horse walking plow the average load was about 25 square inches in cross section and 0.65 acre was required to be plowed daily by each 1,000 pounds of horse.

Where the data for walking plows were arranged by depth with averaged widths, only the 4, 5, 6, 7, 8, and 10 inch depths contained sufficient numbers in the averages to give them value. There was a progressive decrease in the daily acreage as the depth increased, while peculiarities in the figures were accounted for by other elements of the table. Thus, the daily acreage for the 2-horse, 5-inch depth was greater than that for the 4-inch depth, but the width was 0.72 inch greater and the horses considerably heavier. The averages per 1,000 pounds of horse showed about the same decrease in the daily acreage with the increasing depth as did the acreage per horse, since the horses reported for each depth weighed nearly the same, although there was a slight tendency to increase the weight of the horses for the greater depths.

In Table II the reported acreages for walking plows at the 6-inch depth have been arranged by the widths of plows reported and by the number of horses in the team. Adjusted factors for each reported width at the 6-inch depth have been computed and appear in the fourth column opposite the respective plowing units. In the fifth column is a scale of allowances for other depths than 6 inches for each width of plow, expressed in decimal parts of an acre. In the sixth column is shown the depths that can normally be plowed with each width and team without overloading. From columns 4 and 5 the daily duty for any width of plow at any desired depth can be ascertained. Thus, if it is desired to know what may fairly be expected of two horses with a 14-inch plow cutting 9 inches deep, the daily duty is readily found by subtracting from 1.80, the allowance, 0.12 acre, multiplied by the difference between 9 and 6, giving a work factor of 1.44 acres.

TABLE II.—*A normal day's work with a walking plow, giving the daily acreages reported at 6-inch depths for each width, adjustments for these widths, and a scale of allowances for other depths.*

[Net hours in the field, 9.65.]

Team and width.	Plowed per day.	Number averaged.	Adjusted acreage.	Allowance per inch in depth.	Practicable depths.
Two-horse teams:	*Acres.*			*Acres.*	*Inches.*
8 inches	1.69	18	1.50	0	3 to 12
10 inches	1.62	64	1.60	0	3 to 12
11 inches	1.67	19	1.65	0	3 to 12
12 inches	1.76	143	1.70	.10	3 to 10
14 inches	2.00	151	1.80	.12	3 to 9
16 inches	2.11	22	1.90	.15	3 to 8
Three-horse teams:					
8 inches	1.50	1	1.70	0	3 to 12
10 inches	2.10	5	1.90	0	3 to 12
11 inches	1.50	2	2.00	0	3 to 12
12 inches	2.40	10	2.10	0	3 to 11
14 inches	2.32	38	2.30	.10	3 to 10
16 inches	2.77	65	2.50	.12	3 to 9

From the tabulation of 1,056 reports on sulky plows it appears that that implement is not in such general use as the walking plow, only half as many of this type being reported. A considerable number reported the 18-inch width, while the 12, 14, and 16 inch widths are the most popular. A 16-inch sulky is used by 57 per cent, the 14-inch by 23 per cent, while only 20 per cent use other widths. As in the case of the walking plow, there was concentration on the 6-inch depth, the percentage for which was the same for both walking and sulky plows, while for depths greater than 6 inches the sulky plows show a smaller percentage than the walking plows. Of those reporting, only 12 per cent plow at depths other than 4, 5, 6, 7, 8, and 9 inches with this implement. It was also found that 76 per cent of sulky plows are drawn by three horses and 10 per cent by four horses. The draft of the implement is so great that only 12 per cent of the users attempt to operate it with two horses. The sulky plow is used for cutting wider furrows, but not for such deep plowing as is the walking plow.

When the data for sulky plows were grouped by widths with the depths averaged it was seen that the acreage plowed increased as the width increased and that heavier horses were used on the greater widths. The average load required of each 1,000 pounds of horse was 34 square inches for 2-horse teams, 25 square inches for 3-horse teams, and 21 square inches for 4-horse teams. The respective acreages plowed by these teams per 1,000 pounds of horse was 0.71, 0.72, and 0.64. A team of two horses is necessarily overloaded by a sulky plow, and four horses are not economical except on very hard or unsubdued land.

When the sulky plow data were grouped by teams working at reported depths with the widths averaged, the width decreased as the depth increased and the same was true of the acreage per day and per horse. On account of the greater width of sulky plows as compared with walking plows, the cross section increases rapidly with increased depth, thus limiting the implement to more shallow work with a given amount of power. When four horses are used, the acreage per 1,000 pounds of horse was practically the same at all depths reported, indicating that a cross section of about 26 inches and a daily acreage of 0.65 acre is a comfortable and reasonable task for each 1,000 pounds of horse with this implement.

Comparison of the data for walking and sulky plows indicated that for the same widths and depths with the same number of horses in the teams the sulky plow is somewhat more efficient than the walking plow from the standpoint of area covered in a day, but that the sulky type is limited to more shallow plowing.

In Table III the data for sulky plows have been brought together by horses in the team and under each team the averages for the 6-inch depths are given for the 12, 14, and 16 inch widths. This table is in all respects similar to Table II. The daily duty of any team, width, and depth can be ascertained by inspection of the fourth and fifth columns.

TABLE III.—*A normal day's work with a sulky plow, giving the daily acreages reported at 6-inch depths for each width, adjustments for these widths, and a scale of allowances for other depths.*

[Net hours in the field, 9.65.]

Team and width.	Plowed per day.	Number averaged.	Adjusted acreage.	Allowance per inch for other depths.	Practicable depths.
Two-horse teams:	*Acres.*			*Acres.*	*Inches.*
12 inches	1.84	11	1.65	0.10	3 to 8
14 inches	1.93	18	1.75	.12	3 to 7
16 inches	2.31	4	1.85	.15	3 to 6
Three-horse teams:					
12 inches	1.93	7	2.20	0	3 to 10
14 inches	2.41	59	2.40	.10	3 to 9
16 inches	2.94	171	2.60	.12	3 to 8
Four-horse teams:					
12 inches	3.00	1	2.30	0	3 to 12
14 inches	2.83	6	2.50	0	3 to 12
16 inches	3.19	25	2.80	.10	3 to 10

Compilation of the data for gang plows indicated that 58 per cent of the gang plows used have 14-inch bottoms, 30 per cent use two 12-inch bottoms, while only 12 per cent use other sizes. A limited number use a light gang with two 10-inch bottoms. It was seen also that deep plowing is practiced less with gang plows than with sulky plows, 29 per cent reporting 5 inches deep, which percentage would doubtless be largely increased if correction were made for concentration on the 6-inch depth. Less than 2 per cent reported depths greater than 8 inches, whereas for the walking, sulky, and gang plows, respectively, the percentage plowing at 8 inches deep is 17, 12, and 5. Four horses are used by 58 per cent, five horses by 25 per cent, and six horses by 10 per cent. Many find it necessary to use more than six horses where the same horses work all day or on very heavy plowing. In the Central West gang plowing is often done with four horses working half days alternately. This inquiry has not separated these from the general averages in the table, since it was not feasible to provide space for this practice in the blank on which the information was obtained.

When the gang-plow data were brought together by widths with averaged depths and vice versa, it would seem that the users of the wider plows had heavier horses and also did not plow so deep. With increased power at a given width, the depth increased. In general, the depth decreased as the width increased, while the acreages per day and per horse increased, and conversely. The analysis indicated that each 1,000 pounds of horse is loaded with 29 square inches in a cross section of the furrow with four horses, 25 square inches with five horses, and 23 square inches with six horses, and that these teams plow 0.86, 0.79, and 0.68 acre per day per 1,000 pounds of horse, respectively.

A comparison of the reported acreages per 1,000 pounds of horse for sulky and gang plows indicates that the gang plows are somewhat more efficient when working at the same widths and depths. The fact that a smaller proportion of farmers use 4-horse teams on gang plows than use 3-horse teams on sulky plows indicates that four horses are much overloaded by a gang plow. This conclusion is also borne out by the fact that plowing deep is not so general with gang plows, as well as by the general opinion of farmers in regions where gang plows are used. The operation of plowing is a severe tax on horses, but its magnitude and cost encourage the tendency to load them to the limit of their capacity. The greater acreages plowed by the gang type are due in part to the more level land, to freedom from obstructions in the soil, and to the greater speed required of horses in the sections where sulky and gang plows are used. They may also be accounted for by the mechanical construction of the sulky frame, which makes it possible to hold the plow to its rated or other desired width more uniformly than can be done with walking plows when the horses are overloaded. In plowing, anything over 25 square inches in cross section and 0.65 acre daily per 1,000 pounds of horse appears generally to be an overload.

In Table IV data for gang plows have been compiled in a manner similar to that for Tables II and III. The daily duty for any desired unit of equipment and depth can be readily ascertained by inspection of the fourth and fifth columns.

TABLE IV.—*A normal day's work with a gang plow, giving the daily acreages reported at 6-inch depths for each width, adjustments for these widths, and a scale of allowances for other depths.*

[Net hours in the field, 9.65.]

Team and width.	Plowed per day.	Number averaged.	Adjusted acreage.	Allowance per inch for other depths.	Practicable depths.
Four-horse teams:	*Acres.*			*Acres.*	*Inches.*
24 inches	4.23	71	4.00	0.12	3 to 8
28 inches	4.72	73	4.25	.15	3 to 7
Five-horse teams:					
24 inches	5.00	8	4.50	.10	3 to 9
28 inches	5.14	69	4.80	.12	3 to 8
Six-horse teams:					
24 inches	4.50	4	4.75	0	3 to 10
28 inches	5.05	31	5.25	.10	3 to 10

Limited data on plowing with traction engines have been assembled in Table V by the rated horsepower of the engines used. In the last column of the table the adjusted factors have been included, these being based on the average efficiency of the total number reporting, then weighted according to the rated horsepower opposite each, respectively, in the first column, and finally reduced 10 per cent. With this type of equipment the total day in the field is from 1 to 1½ hours longer than with horse-drawn plows, while the time actually in motion with engines is nearly as long as the entire day in the field with horses. The depths at which the traction outfits work is considerably less than the practice with the ordinary plows in the humid sections. On sod, the width of cut is less and the depth plowed is about two-thirds of that on stubble. From 20 to 25 per cent greater areas can be plowed daily with the same equipment on stubble than can be turned in sod. From average compilations it appears that the daily efficiency of tractors in plowing is about 0.90 acre on stubble and 0.70 acre on sod for each unit of rated power, while the load for each unit of power is 31 square inches in cross section on stubble and 20 inches in breaking sod.

TABLE V.—*A normal day's work in plowing stubble and sod with traction engine, giving the average acreage reported, according to the horsepower of tractor.*

PLOWING STUBBLE.

[Net hours in the field, 10.97; net hours in motion, 9.25.]

Horsepower of engine.	Width of cut.	Depth.	Reported acreage.	Number averaged.	Adjusted acreage.
	Feet.	*Inches.*			
15	7.4	5.9	15.4	5	12
20	7.9	6.2	18.4	20	16
22	9.7	5.8	21.0	14	18
25	11.3	6.0	22.6	54	20
30	11.5	6.2	24.7	33	24
32	14.6	6.3	32.5	26	26
40	15.3	5.6	33.3	11	32
45	10.0	5.9	22.0	13	36
60	12.3	7.0	27.2	12	42

TABLE V.—*A normal day's work in plowing stubble and sod with traction engine, giving the average acreage reported, according to the horsepower of tractor*—Continued.

PLOWING SOD.

[Net hours in the field, 11.32; net hours in motion, 8.83.]

Horsepower of engine.	Width of cut.	Depth.	Reported acreage.	Number averaged.	Adjusted acreage.
	Feet.	*Inches.*			
15	5.2	4.4	10.3	4	9.7
20	6.1	4.4	13.5	16	13.0
22	7.9	4.2	15.7	12	14.3
25	9.8	4.4	18.3	43	16.2
30	9.7	4.5	20.3	27	19.5
32	13.0	4.7	27.0	24	20.8
40	13.8	4.3	28.2	11	26.0
45	8.4	4.5	17.2	10	29.2
60	9.3	5.4	18.0	6	35.0

HARROWING.

Data were accumulated on the operation of harrowing with the spike-tooth or smoothing type, the spring-tooth type, and the disk or pulverizing type. With the spike-tooth harrow it appears that 41 per cent of farmers use two horses, 29 per cent use four horses, and 23 per cent use three horses. Only 7 per cent use other numbers of horses in their teams. The most popular width of harrow is 10 feet with 17 per cent, the 8-foot width being second with 15 per cent. In other sizes, from 4 to 26 feet, the percentage in use is quite evenly distributed between the limits of 4 to 7 per cent. The draft of this implement is comparatively light for its width, so that the harrowing of large areas daily or the careful preparation of smaller areas is possible and economical.

Analysis of the data showed that on freshly plowed land about 20 per cent less can be covered per day than on well-packed fields. The average area reported for 3-horse outfits was less than would be expected from an increase of 50 per cent in power, but the width was not increased in proportion. With the four horses the width reported averaged more than twice that of two horses and showed an acreage more than 100 per cent greater. With the spike-tooth harrow, which is an implement of comparatively light draft, those farms which can economically utilize more horses in the team throughout the season can also secure greater efficiency per horse in harrowing than is commonly obtained by the majority who use the smoothing harrow with one or two horses. When the data for spike-tooth harrows were consolidated by widths, it was seen that the acreage covered per day per horse and per foot in width increased directly in proportion to the width. In general, each foot in width of the harrow should cover from 1.5 to 1.75 acres daily, and each horse could be loaded with 4½ feet in width and go once over from 6 to 6.5 acres without inconvenience on freshly plowed land. On well-packed land each foot in width should harrow from 1.75 to 2 acres and each horse could be expected to work from 7.25 to 8 acres.

In Table VI the original data for the most common widths of spike-tooth harrows are tabulated by horses in the team. Adjusted acreages have been computed for these widths and allowances indicated for other widths. From an inspection of this table the daily duty of any spike-tooth harrow unit and team can be readily ascertained, as well as the limit of feasible width for the respective teams.

TABLE VI.—*A normal day's work with a spike-tooth harrow, giving the average acreages reported for the widths most frequently used and adjustments for other widths.*

[Net hours in the field, 9.65.]

Number of horses.	Width of harrow.		On freshly plowed land.				On well-packed land.			
	Range.	Most common width.	Harrowed per day.	Number averaged.	Adjusted acreage.	Allowance for each foot in width.	Harrowed per day.	Number averaged.	Adjusted acreage.	Allowance for each foot in width.
	Feet.	*Feet.*	*Acres.*			*Acres.*	*Acres.*			*Acres.*
2	4–12	8	10.8	224	9.50	1.2	12.9	194	11.5	1.5
3	8–16	10	15.3	149	13.5	1.5	19.0	140	17.5	1.8
4	10–26	16	28.3	112	25.0	1.8	35.1	102	32.0	2.0

Analysis of the data for spring-tooth harrows indicated that 49 per cent of farmers use two horses, 33 per cent use three horses, and 11 per cent use four horses. The 6-foot harrow is used by 38 per cent, or twice as many as use any other width, while about equal percentages use 5, 7, and 8 foot widths, and very limited numbers use any other size. Since the widths used in spring-tooth equipment (Table VII) average only half that of spike-tooth harrows, it appears that the draft of this type of implement on the soils where it is used is twice that of the smoothing harrow on the soil where the latter is found practical. The spring-tooth harrow is better adapted to stony soils, where the ordinary harrow would not work well. For 2-horse, 3-horse, and 4-horse teams the acreage per horse decreased somewhat and the acreage per foot of width increased to some extent as horses were added, indicating that a width over 2½ feet per horse is generally an overload. On freshly plowed land each foot in width should cover from 1.2 to 1.5 acres daily and each horse could conveniently draw from 2¼ to 2¾ feet in width and cover 3 to 3.25 acres. On well-packed land each foot in width could be expected to cover from 1.4 to 1.7 acres daily and each horse from 3.5 to 4 acres. About 20 per cent less can be done on freshly plowed than on well-packed soil. This is doubtless due more to the poor footing and consequent high stepping, which tires the horses, than to any difference in draft. With increasing width the daily duty of spring-tooth harrows increases only half as fast as that of the spike-tooth harrow.

In Table VII the original data for the most common widths have been brought together by horses in the team. The table is parallel in all respects to Table VI for spike-tooth harrows. The duty of any team and width can readily be found by inspection. In using these tables it should be borne in mind that the widths most commonly used have doubtless been found from experience to be the most efficient, so that the factors for other widths, if required in practice, would doubtless be underloads in the smaller sizes and overloads in the larger sizes.

TABLE VII.—*A normal day's work with a spring-tooth harrow, giving the average acreages reported for the widths most frequently used and adjustments for other widths.*

[Net hours in the field, 9.65.]

Number of horses.	Width of harrow.		On freshly plowed land.				On well-packed land.			
	Range.	Most common width.	Harrowed per day.	Number averaged.	Adjusted acreage.	Allowance for each foot in width.	Harrowed per day.	Number averaged.	Adjusted acreage.	Allowance for each foot in width.
	Feet.	*Feet.*	*Acres.*			*Acres.*	*Acres.*			*Acres.*
2	4–8	6	7.4	180	6.5	0.60	8.6	169	7.5	0.70
3	6–10	6	8.2	120	7.4	.70	10.2	113	9.2	.80
4	6–12	8	13.1	22	11.8	.75	14.8	23	13.3	.90

Compilation of the data for disk harrows showed it to be an implement of very heavy draft, since 52 per cent of farmers find it necessary to use four horses on an implement which is not frequently found in widths over 8 feet. This width is one-half that of the largest practicable size in the spring-tooth type and one-fourth that for the largest spike-tooth harrow. The relative draft per foot of these implements appears to be in the proportion of 4, 2, and 1. About the same proportion, 23 per cent, that report using two horses with the spring and spike tooth harrows use three horses in disking. The 8-foot width is somewhat more generally used than the 6-foot width and 75 per cent of the disk harrows reported are from 6 to 8 feet wide. The 16-inch disk is most generally used; 17 per cent have the 18-inch type, and a somewhat smaller proportion use the 12, 14, and 20 inch sizes. Well-packed land is about 20 per cent easier to disk than freshly plowed land from the standpoint of acreage covered in a day. When the power is increased, the average acreage per day increases, while the acres per horse tends slightly to decrease and the acres per foot of width increase, indicating an overload by this implement with the smaller numbers of horses. The area disked by 3-horse teams does not increase over that by 2-horse teams in the proportion that the acreage for four horses increases over that for two horses. The same variation appears as between the 4-horse and 5-horse teams when compared with the difference between 4-horse and 6-horse teams. This is in part explained by the fact that the widths reported for the three and five horse units do not increase in the same proportion as the power, and in part by the apparent inefficiency of 3-horse and 5-horse hitches and the difficulty to the average teamster in handling them. In general, each horse was loaded with 2 feet in width and must harrow 2.5 to 3 acres on freshly plowed land and from 3 to 3.75 acres daily on well-packed land. The duty of each foot in width of harrow is from 1.3 to 1.5 acres daily on freshly plowed land and from 1.5 to 1.8 acres on well-packed land, assuming adequate power at the normal speed of horses.

In Table VIII original data for the most commonly used widths and teams in disking are presented, together with adjusted factors for these widths and a scale of allowances for other widths. The daily duty for any team and width can be ascertained from this table by inspection.

TABLE VIII.—*A normal day's work with a disk harrow, giving the average daily acreage reported for the widths most frequently used and adjustments for other widths.*

[Net hours in the field, 9.65.]

Number of horses.	Width of harrow.		On freshly plowed land.				On well-packed land.			
	Range.	Most common width.	Harrowed per day.	Number averaged.	Adjusted acreage.	Allowance for each foot in width.	Harrowed per day.	Number averaged.	Adjusted acreage.	Allowance for each foot in width.
	Feet.	*Feet.*	*Acres.*			*Acres.*	*Acres.*			*Acres.*
2	4–8	6	7.2	159	6.5	0.50	7.5	147	6.7	0.60
3	5–10	6	7.5	163	6.8	.60	9.1	165	8.0	.70
4	6–10	8	12.8	414	11.5	.80	15.4	432	14.0	.90
5	7–10	8	11.3	7	12.0	.85	13.4	7	14.5	.95
6	7–10	8	15.4	16	13.5	1.00	18.0	19	16.0	1.10

ROLLING WITH LAND ROLLER.

The land roller is not an implement of heavy draft, 83 per cent of users finding two horses adequate for a considerable range in width. The 8-foot width is most generally used, while about equal numbers use 6, 7, and 10 foot widths. Widths of 12 and 14 feet are not uncommon. A 3-horse team is used by 6 per cent and four horses by 8 per cent of farmers. Where three or four horses are used, the acreage per horse is slightly less than with two horses. With the 2-horse teams each foot in width covers less area daily than with larger teams, indicating that the latter move on the average somewhat more rapidly than two horses. With land rollers it appears to be economical to use the larger sizes, since more land can be covered in a given time without adding greatly to the work of the available horses. A width of 4 or 5 feet is a reasonable load per horse and 5 to 7 acres daily per unit of power can be normally expected. The duty of each foot in width is from 1.6 to 1.9 acres daily.

In Table IX the original averages for the widths most frequently used, shown in the second column, have been given, together with adjustments for these acreages and a scale of allowances for other widths of rollers. From the table, computations can readily be made for determining the daily duty of any team and width of roller.

TABLE IX.—*A normal day's work with a land roller, giving the average daily acreage reported for the widths most frequently used and adjustments for other widths.*

[Net hours in the field, 9.65.]

Number of horses.	Width of roller.		Rolled per day.	Number averaged.	Adjusted acreage.	Allowance for each foot in width.
	Range.	Most common width.				
	Feet.	*Feet.*	*Acres.*			*Acres.*
2	5–12	8	13.2	442	12.0	1.10
3	6–14	8	13.5	24	12.5	1.15
4	8–18	8	15.2	37	14.0	1.20

PLANTING OPERATIONS.

With the grain drill the popular sizes range between 4 and 12 feet in width, a greater number, 23 per cent, using the 8-foot width than any other, with the 6-foot width next. Only 9 per cent use three horses with grain drills, two horses being used by 46 per cent and four horses by 41 per cent of farmers. From the general averages it was seen that the acreage per day per foot of width increased with added power, suggesting a slight overload per horse on the smaller drills with 2-horse teams. The larger teams are used on the larger fields. It was found also that with increasing width and power the acreage planted per day increased, except for the 12-foot width, the limit of practicable width from a mechanical standpoint doubtless being approached in this size. In general, each horse can be loaded with 2½ to 2¾ feet in width of drill, and should be expected to cover from 4 to 4.5 acres in a day. The duty of each foot in width of drill is from 1.5 to 1.75 acres per day, assuming adequate power. When the grain-drill data were arranged by length of the field it was found that between lengths of 40 and 160 rods there appeared to be no advantage in favor of larger fields. This was found to be true of other data arranged by distance hauled or length of field, indicating, without exception, that within the limits of 40 to 200 rods distance is not a factor in the day's work.

In Table X, for grain drills, the average acreage for the most common widths and teams is presented, together with adjusted acreages and a table of allowances for other widths. From this table reasonable widths of drills for each size of team can be chosen and the daily duty of any width found from the factors in columns 6 and 7.

TABLE X.—*A normal day's work with a grain drill, giving the average daily acreage reported for the widths most frequently used and adjustments for other widths.*

[Net hours in the field, 9.62.]

Number of horses.	Width of drill.		Drilled per day.	Number averaged.	Adjusted acreage.	Allowance for each foot in width.
	Range.	Most common width.				
	Feet.	*Feet.*	*Acres.*			*Acres.*
2	4–8	6	8.8	239	7.0	1.40
3	6–10	8	11.7	40	10.5	1.50
4	8–12	8	14.0	178	12.5	1.75
6	8–12	8	16.3	6	14.5	2.00

The reported and adjusted data for seeding with a broadcast seeder, a knapsack sower, and a wheelbarrow sower are brought together in Table XI. With the wheelbarrow seed sower the 14-foot width was used by 40 per cent of farmers, the 16-foot width by 23 per cent, and the 12-foot sower by 18 per cent. While the acreage planted daily increased with the increasing width, it was seen that the proportion of increase fell off at the same time, indicating that the 16-foot width approaches the mechanical limit to convenience in manipulation.

TABLE XI.—*A normal day's work in seeding with the broadcast seeder, knapsack sower, and wheelbarrow sower, giving the average daily acreage reported and adjustments for other widths of sower.*

[Net hours in the field, 9.68.]

Implement.	Width.		Seeded per day.	Number averaged.	Adjusted acreage.	Allowance for each foot in width.
	Range.	Most common width.				
	Feet.	*Feet.*	*Acres.*			*Acres.*
Broadcast seeder			13.5	573	12.0	
Knapsack sower			22.3	145	20.0	
Wheelbarrow sower	10–16	14	20.3	82	18.0	1.50

In Table XII there are grouped the original averages for planting corn and cotton in rows 42 inches apart, the most common width. Adjusted acreages are also included and a scale of allowances for each 6 inches difference in width of row. As with other tables in this bulletin, Table XII is based on analytical tables covering the entire number reporting for these operations. It was found that 41 per cent of farmers plant corn and cotton in rows 42 inches wide, while about equal percentages plant in rows 36, 44, and 48 inches apart, respectively. Throughout the country the range is from 10 to 72 inches. In these operations two horses are used by 61 per cent, and 39 per cent use one horse. The 2-row planter is used by 54 per cent and the 1-row planter by 46 per cent. Comparatively few growers use two horses with a 1-row planter, but the meager data for this group indicated that the addition of one horse and the advantage of the high-wheeled type increase the daily efficiency of the implement from 40 to 90 per cent, making this equipment nearly as efficient as the 2-row planter with two horses. On the 2-row planter it is, of course, necessary to take considerable time in changing the check wire. The 2-row planter with two horses is essentially twice as rapid as the 1-row planter with one horse. With an inexpensive hand planter a man can plant from 60 to 75 per cent as much corn as can be done with a man and one horse using the horse-drawn type of implement.

TABLE XII.—*A normal day's work in planting corn or cotton, giving the average daily acreage reported for the widths of row most frequently used and adjustments for other widths of row.*

[Net hours in the field, 9.67.]

Power.	Planter.	Most common width of row.	Planted per day.	Number averaged.	Adjusted acreage.	Allowance for each 6 inches in width.
		Inches.	*Acres.*			*Acres.*
One horse	One row	42	6.9	226	6.25	0.80
Two horses	...do	42	10.9	57	8.75	.90
Do	Two-row	42	13.6	430	12.25	1.25
Hand	Hand	42	4.4	162	4.00	.60

Work factors for planting sweet potatoes, cabbage, and tomatoes by hand are arranged by crews in Table XIII. On account of the limited data for each crop, the data for the three crops are averaged in the table. Planting sweet potatoes can be done somewhat more rapidly than planting cabbage, while tomatoes can be set out somewhat more rapidly than sweet potatoes. The duty of a man at work of this character is not less than 0.75 acre per day. Comparative data for planting these crops with a transplanting machine were not made available because of the limited number reporting transplanters.

TABLE XIII.—*A normal day's work in planting sweet potatoes, cabbage, and tomatoes by hand, giving the average daily acreage for designated crews and adjustments for each crew and width of row.*

[Net hours in the field, 9.85.]

Number of men.	Number of horses.	Width of row.	Planted per day.	Number averaged.	Adjusted acreage.	Allowance for each 6 inches in width of row.
		Inches.	*Acres.*			*Acres.*
1	1	36	1.0	51	0.90	0.10
2	1	38	1.6	61	1.70	.12
	2	32	1.9	60	1.90	.14
3	2	40	2.4	28	2.60	.16

In Table XIV are presented the averages for cutting seed potatoes by hand and with the mechanical cutter, respectively. The cutter does the work somewhat more than 100 per cent faster than it can be done by hand. Only one practical grower in five used the cutter, however, the majority believing that the certainty of having an eye on each seed piece is worth the extra expense in the cutting. The original averages have been adjusted by reducing them about 12 per cent.

TABLE XIV.—*A normal day's work in cutting potatoes for seed, giving the average number of bushels per day for cutting by hand and with cutter and adjustments for each method.*

[Net hours at work, 9.48.]

Method of cutting.	Cut per day.	Number averaged.	Adjusted work factor.
	Bushels.		
By hand	15.03	760	13.50
With cutter	32.24	169	28.00

The acreages reported for covering seed potatoes after planting are averaged in Table XV according to the number of horses used and these averages adjusted by reducing them about 10 per cent. A 2-horse team covers somewhat more ground than one horse, and 60 per cent of farmers find it more practical to use two horses.

TABLE XV.—*A normal day's work in covering seed potatoes after planting, giving the average daily acreage and adjusted factors.*

[Net hours in the field, 9.53.]

Number of horses.	Covered per day.	Number averaged.	Adjusted factors.
	Acres.		
1	4.63	299	4.15
2	5.96	541	5.35

The averages for the operation of marking off land for planting are grouped in Table XVI by horses in the team and the width most frequently used. These averages are reduced about 10 per cent to give the adjusted acreage in the table, while the allowances for each difference of 1 foot in width were determined from analytical tables. The 3, 3½, 6, 9, and 12 foot widths are in most general use. The wider markers are in the minority, 31 per cent using a 3-foot marker, and 14 per cent a 3½ foot, with smaller percentages for other widths. On the light soils of the Atlantic Coastal Plain, where extensive trucking operations are carried on, the wider markers are in vogue. There appears to be no economy in using more than one horse with markers less than 12 feet wide, although 59 per cent of planters use two horses in this operation.

TABLE XVI.—*A normal day's work in marking rows for planting, giving the daily acreages reported for designated widths and adjustments for each width.*

[Net hours in the field, 9.53.]

Number of horses.	Width of marker.	Width of rows.	Marked per day for each 3 feet in width of marker.	Number averaged.	Adjusted acreage.	Allowance for each foot in width.
	Feet.	*Feet.*	*Acres.*			*Acres.*
1	3-12	3	5.68	89	5.1	0.75
2	3-12	3	6.81	78	6.2	.65

The operation of planting Irish potatoes by hand and with the 1-man and 2-man type of potato planter is reported in Table XVII. Out of 925 reports, 31 per cent name two acres as a reasonable day's work in dropping potatoes by hand and 26 per cent allow one acre. With the potato planter the 2-man type is somewhat slower than the automatic-feed type. The former is in more general use, since planters feel more certain that seed is placed in every hill with the hand-feed type. The picker (1-man) type of planter also tends to spread disease from one seed tuber to another if disease, such as scab, is present. The original averages have been adjusted by reducing them about 10 per cent.

TABLE XVII.—*A normal day's work in planting Irish potatoes, giving the average acreages reported and adjusted factors for each method.*

[Net hours in the field; 9.53.]

Operation.	Number of men.	Number of horses.	Planted per day.	Number averaged.	Adjusted factors.
			Acres.		
Dropping by hand	1		1.98	925	1.8
Planting with planter	1	2	5.48	132	5.0
	2	2	4.91	174	4.4

HANDLING MANURE.

In Table XVIII the operation of hauling and spreading manure with a manure spreader is shown for loads of less than 60 cubic feet and for 60 cubic feet and over. The heavy draft of this implement renders the use of three or more horses necessary in 70 per cent of cases. A 2-horse team is used by 30 per cent, three horses by 45 per cent, and four horses by 25 per cent of those owning spreaders. The larger loads and teams are all reported from the Mississippi Valley region. Fewer of the larger loads can be handled in a day, but with the increased power used they are unloaded more quickly and spread more evenly. From 1½ to 1¾ more loads daily can be spread on sod than on plowed land. For practical purposes the original averages have been adjusted and reduced about 10 per cent.

TABLE XVIII.—*A normal day's work in hauling and spreading manure with a spreader, giving the average work factors reported and adjusted factors averaged according to the size of load.*

[Net hours at work, 9.57.]

Item.	Size of load.			
	Below 60 cubic feet.		60 cubic feet and over.	
	Reported averages.	Adjusted factors.	Reported averages.	Adjusted factors.
Horses in team	2.56	2 or 3	2.88	3
Distance hauled, rods	75.4	....	79.9	....
Loads on sod	13.9	12.0	13.1	11.0
Loads on stubble	12.7	11.5	11.7	10.5
Loads per acre	7.6	7.5	6.6	6.5
Minutes to load	23.6	30.0	25.9	35.0
Minutes to unload	10.0	15.0	9.8	14.0
Number averaged	320	....	485	....

In Table XIX, spreading manure from a wagon box with a fork, it appears that the average time to unload a 42-bushel load of manure is about 28 minutes, irrespective of the distance spread. With the spreader much larger loads can be thrown off in a period of 10 minutes. In this operation 54 per cent of farmers cover a strip 16 feet wide or more with each load, 36 per cent spread from 9 to 15 feet, and only 10 per cent unload in strips less than 9 feet wide.

TABLE XIX.—*A normal day's work in spreading manure from a wagon with a fork by one man, giving the time to unload averaged according to the distance spread.*

Distance spread.		Size of load.	Time to spread.	Number reporting.
Range.	Average.			
	Feet.	*Bushels.*	*Minutes.*	
8 feet or less	6.84	42.6	28.11	88
9 to 15 feet	11.77	42.10	27.98	323
16 feet and over	20.56	43.94	28.54	465

In Table XX the practice of hauling and dumping manure in piles for later spreading by hand is reported. According to 45 per cent, a fair day's work is between 8 and 10 loads a day, the average for all conditions being about 12 loads daily. Farmers who practice this method haul loads averaging from 40 to 45 bushels in bulk.

TABLE XX.—*A normal day's work in loading, hauling, and dumping manure in piles by one man with a team.*

Number of loads per day.		Size of load.	Distance hauled.	Number averaged.	Percentage reporting.
Range.	Average.				
		Bushels.	*Rods.*		
Under 8	5.74	44	99	120	16
8 to 10	9.22	43	77	344	45
11 to 15	12.87	42	69	207	27
Over 15	20.92	42	67	94	12

In Table XXI the subsequent operation of spreading manure from piles previously placed in the field is arranged by the size of the piles, the percentage reporting each size being also given. Comparison of this table with the similar operation of spreading lime from piles (Table XXIII) reveals the same general features. In each an increase in the size of piles is accompanied by a decrease in the number spread and an increase in the number of bushels spread in a day. Piles containing about 6 bushels are most common, while smaller piles averaging 3 bushels each are more frequent than those containing over 10 bushels.

TABLE XXI.—*A normal day's work in spreading manure from piles with a fork by one man.*

[Net hours in the day, 9.57.]

Size of piles.		Spread per day.		Number averaged.	Percentage reporting.
Range.	Average.	Piles.	Bushels.		
	Bushels.				
Under 5 bushels	2.99	199	595	166	37
5 to 9 bushels	5.70	147	842	200	44
10 to 14 bushels	10.18	102	1,047	88	19

In many respects the data for the several operations in handling manure are less satisfactory and lack uniformity to an extent not found in any other operation reported on. For this arduous work there appears to have developed among farmers less definite ideas than might be expected as to what constitutes a fair amount of work for the respective processes. The great variation in the character and weight of the material handled doubtless complicates the problem of forming definite conclusions regarding these operations, while the practice of doing work of this character at times when other work is not pressing doubtless operates to make unnecessary the formation of definite ideas regarding a fair day's work.

SPREADING LIME AND FERTILIZER.

The data for spreading lime by hand from a wagon box are presented in Table XXII, averaged according to the size of load. While the number in the respective averages is limited, the table shows anticipated relations between the size of load and the number of loads handled daily. Those hauling the larger loads are able to spread greater quantities in a day, but can not haul so many loads.

TABLE XXII.—*A normal day's work in spreading lime from a wagon, giving the number of loads daily, averaged according to the size of the load.*

[Net hours at work, 9.48.]

Size of load.		Weight per load.	Spread per day.		Number averaged.
Range.	Average.		Bushels.	Loads.	
	Bushels.	*Pounds.*			
25 bushels or less	22	1,530	201	9.23	24
30 to 40 bushels	34	2,033	261	7.71	45
45 to 50 bushels	49	2,907	321	6.52	35
55 to 75 bushels	64	2,700	495	7.8	10
Over 75 bushels	106	6,000	500	4.72	5

In Table XXIII the operation of spreading lime from piles previously laid down in the field is arranged by size of piles in terms of bushels. The data were too limited to be arranged into more groups than those chosen. The amount spread in a day increases with the amount used per acre, as was the case with spreading manure from piles in Table XXI.

TABLE XXIII.—*A normal day's work in spreading lime from piles, giving the number of piles spread daily, averaged according to the size of the piles.*

[Net hours in the field, 9.48.]

Size of piles.		Spread per day.		Number averaged.
Range.	Average.	Piles.	Bushels.	
	Bushels.			
0 to 1 bushel	1	227	227	40
2 to 5 bushels	3.5	136	477	40
6 to 50 bushels	25.6	35	917	21

The essential features of the operation of distributing lime with a lime spreader and fertilizer with a fertilizer drill are shown in Table XXIV. The original averages for the widths most commonly used are given, these averages being adjusted by reducing about 10 per cent, and a scale of allowances for each difference of 1 foot from the tabulated width has been deduced. The 8-foot lime spreader is somewhat more popular than the 10-foot size. Lime spreaders are drawn by two horses in 75 per cent of cases. With the fertilizer drill the 6-foot width is preferred by 30 per cent and the 8-foot width by 20 per cent of planters, equal numbers reporting the 5 and 7 foot widths, while 81 per cent of fertilizer drills are drawn by two horses.

TABLE XXIV.—*A normal day's work in spreading lime with a lime spreader and fertilizer with a fertilizer drill, giving the average acreages reported for the widths most frequently used, adjusted acreages for these widths, and allowances deduced for other widths.*

[Net hours in the field, 9.81.]

Implement.	Range of width.	Most common width.	Number of horses in team.	Spread per day.	Number averaged.	Adjusted acreage.	Allowance for other widths (acreage per foot).
	Feet.	*Feet.*		*Acres.*			
Lime spreader	4–12	8	2	10.65	20	9.50	0.75
Fertilizer drill	4–10	6	2	8.44	122	7.50	.70
	6–12	8	3	10.40	15	9.35	.70

CULTIVATING.

The averages for cultivating corn, potatoes, beans, cabbage, and cotton, arranged according to the number of horses to the cultivator, are set out in Table XXV. From the standpoint of acreage covered in a day, two horses are about 40 per cent more efficient than one horse. About 40 per cent of those reporting use two horses in cultivating. A 1-horse cultivator can be expected to cover 4 to 5 acres and a 2-horse cultivator from 6 to 8 acres. Cultivating beans and cabbage is slower work than that for corn and cotton on account of the narrower rows and greater care required with these low plants. The original averages have been adjusted by reducing them about 10 per cent. When the data were assembled by widths of row, no marked relation was found between the width and the amount of work done daily. This may in part be explained by the meager number reported for widths other than 36, 42, and 44 inches, and also by the consideration that the width of planted row is not a factor in cultivating, since the entire surface of the field must be stirred, regardless of the interval between the rows.

TABLE XXV.—*A normal day's work in cultivating corn, potatoes, beans, cabbage, and cotton, giving the average daily acreages reported according to the number of horses used and adjustments for each cultivating unit.*

[Net hours in the field, 9.79.]

Crop.	Number of horses.	Cultivated per day.	Number averaged.	Adjusted acreage per day.
		Acres.		
Corn	1	4.8	791	4.30
	2	7.72	448	7.00
Potatoes	1	4.25	403	3.80
	2	6.53	210	5.90
Beans	1	3.87	228	3.50
	2	6.30	163	5.70
Cabbage	1	4.08	220	3.70
	2	6.06	136	5.45
Cotton	1	4.72	112	4.25
	2	7.35	76	6.80

SPRAYING.

The averages for the spraying of fruit trees are shown in Table XXVI by the number of men in the crew for both hand-power and gasoline-power equipment. Striking increases in the number of trees sprayed are shown for each addition to the force of men in the crew, the other conditions for each type of sprayer being comparatively uniform. Greater numbers of trees are reported for the respective crews with the hand-power type than with the sprayer operated by gasoline engine, but the size of the trees for the hand-power equipment is seen to be very much less. In the same table the data for both types of sprayer have been consolidated by height and spread of trees. Increased height is accompanied by a corresponding spread and distance between trees and a reasonably uniform decrease in the number of trees sprayed, the crews being practically the same. There are, of course, many variations in the construction of spraying equipment which affect this operation, such as number of nozzles, leads of hose, pressure used, and type of sprayer. In a more detailed investigation averages in terms of gallons per day or hour, as well as other useful factors, could be made available. Since it was not practicable to cover all of these features in a general inquiry of this kind, further observations are necessary to secure exhaustive data.

TABLE XXVI.—*A normal day's work with an orchard sprayer, giving the average number of trees sprayed daily.*

[Net hours at work, 9.6.]

SPRAYING BY DESIGNATED CREWS.

Type of sprayer.	Number of men.	Capacity of tank.	Height of trees.	Spread of trees.	Number of trees sprayed per day.	Number averaged.
		Gallons.	*Feet.*	*Feet.*		
Gasoline power	1	250	25	28	110	1
	2	180	20	19	191	20
	3	196	20	21	252	24
Hand power	1	50	18	13	54	4
	2	57	20	19	134	89
	3	68	18	16	305	20

NUMBER OF TREES SPRAYED ACCORDING TO THEIR HEIGHT.

Height of trees.	Average spread.	Number of men.	Number of trees sprayed per day.	Number averaged.
	Feet.			
12 feet or less	11	2.4	329	33
13 to 20 feet	17	2.3	182	83
Over 20 feet (average 28.23)	26	2.2	129	51

Limited data for spraying field crops planted in rows with a knapsack sprayer and with a horse-drawn field sprayer are reported in Table XXVII. Knapsack sprayers and poison dusters are used on truck and small-fruit crops or in young orchards. In spraying with a field sprayer on potatoes and other field crops there appears to be only a slight gain for 2-horse over 1-horse teams, although most users of this equipment employ two horses. A 4-row sprayer will cover from 12 to 14 acres in a day. The reported averages in the table have been adjusted by reducing them about 10 per cent, and the allowances for each difference in width of 6 inches have been derived from analytical tables.

TABLE XXVII.—*A normal day's work in spraying with a knapsack sprayer and field sprayer, giving the average acreages reported and adjustments for widths sprayed.*

[Net hours at work, 9.6.]

Sprayer.	Width sprayed.	Number of rows.	Number of horses.	Acres per day.	Number averaged.	Adjusted acreage.	Allowance for each 6 inches in width (acreage per day).
	Feet.						
Knapsack	3	1	....	3.04	35	2.75	0.40
Field	11.5	4	1	12.76	66	11.50	.50
	11.0	4	2	13.54	90	12.25	.60

HARVESTING HAY.

In Table XXVIII the original averages for the operations of mowing, raking, tedding, and cocking hay for those widths and teams most frequently used have been brought together. These averages have been adjusted by reducing them about 10 per cent, and a scale of allowances per foot in width for other feasible widths in each case has been erected.

In mowing hay the 2-horse unit is practically universal. In the analytical tables there was a slight increase in acreage per foot of width with increase of the width of the sickle for sizes up to 7 feet. The limit of mechanical efficiency appears to be approached at 7 feet wide.

From 2,105 reports on raking hay it appears that a 2-horse team is about 45 per cent more efficient than one horse when used with rakes of the widths reported. The duty of each foot in width of rake is from 1.45 to 1.60 acres daily. Each horse should cover from 9 to 14 acres. The 8-foot width is the most used with one horse and the 10-foot width with two horses.

In tedding hay with a hay tedder or kicker two horses appear to be 45 per cent more efficient than one, and 82 per cent use 2-horse teams for this work. Each foot in width of tedder should cover from 1.4 to 1.7 acres daily, and each horse could be expected to go over from 7 to 10 acres.

The factor for cocking hay after bunching with a rake is for an average yield for the 1,122 reports of 1.87 tons per acre.

TABLE XXVIII.—*A normal day's work in mowing, raking, tedding, and cocking hay, giving the average acreages reported for sizes most frequently used, adjustments for these sizes, and allowances deduced for other sizes.*

[Net hours in the field: For mowing, 9.52; for raking, 8.44; for tedding, 8.26; and for cocking, 9.12.]

Operation.	Most common width.	Number of horses.	Acreage per day.	Number averaged.	Adjusted acreage.	Other reported widths.	Allowance for other widths per foot.
	Feet.					*Feet.*	*Acres.*
Mowing	5	2	8.85	1,251	8.0	4–7	1.70
Raking	8	1	11.99	238	10.8	6–12	.75
	10	2	17.91	885	17.0	8–16	.80
Tedding	6	1	9.75	36	8.7	5–10	.65
	10	2	15.88	113	14.3	6–12	.85
Cocking (1 man)	....	....	6.29	1,122	5.7	....	....

In hauling hay from windrows to barn, using a hay loader in the field, 36 per cent of farmers do the work with three men, 23 per cent with two men, and 14 per cent with four men, while much smaller percentages use larger crews. It also appears that two horses are used by 38 per cent and four horses by 31 per cent, while 42 per cent use an 8-foot, 17 per cent the 6-foot, and 15 per cent the 10-foot loader. From analytical tables it was also evident that the odd man in three and five man crews adds very little to the amount accomplished daily, and also that the hay sling or fork increases the efficiency of the equipment from 30 to 40 per cent. Increases in the number of men or horses are not attended by proportional increases in the amount of work done, the smaller units being most efficient. A relative decrease in efficiency per man or per horse with an increasing size of crew is uniformly found in all of the tables for crew work. In this operation the duty of a man with the organization stated is from 1.5 to 2.5 acres daily when unloading by hand and from 2.25 to 3 acres when unloading with sling or hay fork. The 2-horse and 4-horse crews are most efficient from the standpoint of total acreage cleared daily, odd horses adding very little to the efficiency of the organization. Those crews having only two men appear to be most effective, owing probably to having the proprietor to set the pace, while the larger crews give opportunity for lost motion through help working only for wages and the limited ability of the average farmer to direct the efforts of others as he can his own. When unloading by hand with the equipment under consideration, the duty of each horse is from 1.75 to 2.25 acres, and when the sling is used this duty should be raised to from 2.5 to 3.5 acres per horse per day. Each foot in width of loader should cover from 0.70 to 1 acre when the loads are thrown off by hand and from 1 to 1.4 acres when unloading with sling or hay fork. In the operation of haying, for distances under 200 rods, the tabulation of the data by distance hauled shows no relation between distance from stack or barn and the acreage cleared in a day.

In Table XXIX the original averages for the crews most commonly used in hauling hay from windrows to barn with a hay loader are given, with adjusted acreages for these crews. The adjustments were made by reducing the two-man averages 20 per cent, the three-man averages 15 per cent, and the four-man averages less than 10 per cent. From the adjusted acreages the daily duty of crews of any size in this operation can be calculated.

TABLE XXIX.—*A normal day's work in hauling hay from windrows to barn with a hay loader, giving the average acreages reported for crews most frequently used and adjusted work factors for each crew.*

[Net hours in the field, 9.53.]

Number of men.	Number of horses.	Unloading by hand.			Unloading with sling or fork.		
		Acreage per day.	Number averaged.	Adjusted acreage.	Acreage per day.	Number averaged.	Adjusted acreage.
2	2	5.29	59	4.25	7.66	71	6.15
	4	6.50	6	5.20	6.62	8	7.30
3	2	5.86	69	5.00	7.84	88	6.70
	4	7.05	37	6.00	8.98	48	7.90
4	4	7.81	26	7.00	10.16	37	9.15
	6	7.66	6	8.00	10.37	8	10.25

In hauling hay from cocks to barn the work is done with two men by 41 per cent of farmers, 40 per cent use three men, and 19 per cent use larger crews. Only two horses are used by 73 per cent and 19 per cent use four horses. Although three-man crews are much less efficient from the standpoint of acres cleared in a day than two and four man crews, nearly as many of the former are used in this operation as are reported with two men. Arrangement of the data by length of haul showed no relation between distance to stack or barn and the amount done daily. Any time that may be lost in hauling 200 rods or less as compared with shorter distances within this limit is apparently regained through increased efficiency of the crew in other directions. The size of the load does not appear to be a factor affecting the acreage cleared in a day, since those reporting larger loads and somewhat increased acreages also used somewhat larger crews, on the average. The hay fork and sling add from 30 to 50 per cent to the efficiency of the crews in this work. It was also found that those who haul hay directly from the field with hay loaders can put away about one-third of an acre more daily per man than those who haul it from cocks, other conditions being equal. With hay loaders the operation of bunching and cocking is also eliminated.

In Table XXX the reported acreages for crews used in hauling hay from cocks to barn have been brought together, only the more common crews being presented. In deriving the adjusted acreages the original data for two men were reduced 20 per cent; those for three men, 10 per cent; those for four men, 10 per cent; those for five men, 10 per cent for the 6-horse crews; and those for 6 men were raised 10 per cent or more. From the adjusted acreages the daily duty of any combination of men and horses can be ascertained.

TABLE XXX.—*A normal day's work in hauling hay from cocks to barn, giving the average daily acreage reported for the crews most frequently used and adjusted work factors for each crew.*

[Net hours in the field, 9.38.]

Number of men.	Number of horses.	Unloading by hand.			Unloading with sling or fork.		
		Acreage per day.	Number averaged.	Adjusted acreage.	Acreage per day.	Number averaged.	Adjusted acreage.
2	2	4.39	398	3.50	6.14	287	4.90
	4	5.30	15	4.30	7.94	17	6.10
3	2	4.55	331	3.90	6.44	315	5.50
	4	6.14	55	4.75	8.16	70	6.65
4	4	7.17	84	6.45	10.14	77	9.10
	6	9.33	3	7.25	14.25	4	10.25
5	4	7.70	22	7.70	10.70	30	10.70
	6	9.71	7	8.66	12.33	12	11.90
6	4	8.03	19	8.80	10.52	22	12.45
	6	9.11	9	9.85	11.53	15	13.60
	8	5.00	1	10.80	11.60	5	14.80

In stacking hay in the field with the aid of sweep rakes or hay buckers 32 per cent of farmers use a crew of four men and about equal numbers use three and five man crews, while only 9 per cent undertake the operation with two men. From the limited number reporting this method of making hay it appears that two, four, and six horses are equally common. Comparison of the results attained in haying with sweep rakes and without them shows an advantage in favor of this simple and inexpensive addition to the equipment of about 40 per cent, while much of the cost of raking and cocking is also eliminated. Analysis of this data also shows decreasing efficiency per man and per horse as the crews become larger.

In Table XXXI the original averages for the most common crews used in stacking hay with sweep rakes are given, together with adjusted acreages for each of these crews. From this table the daily duty of crews of any size can be ascertained. In arriving at the adjusted acreages the original data for the smaller crews were reduced from 10 to 20 per cent more than that for the larger crews.

In Table XXXI the data for stacking hay in the field by hand have been brought together by the same method used for other haying tables. The reported acreages for the smaller crews have been reduced, while some of the acreages for the larger crews have been raised, in arriving at the table of adjusted factors set out in the last column.

TABLE XXXI.—*A normal day's work in stacking hay in the field, with and without sweep rakes, giving the average daily acreages reported for the crews most frequently used and adjusted acreages for each crew.*

[Net hours in the field, 9.70.]

Using sweep rakes.					Without sweep rakes (by hand).				
Number of men.	Number of horses.	Stacked per day.	Number averaged.	Adjusted acreage.	Number of men.	Number of horses.	Stacked per day.	Number averaged.	Adjusted acreage.
		Acres.					*Acres.*		
2	2	9.70	37	6.10	2	2	4.85	103	3.90
	4	13.75	4	9.20		4	....	....	5.90
3	2	9.77	48	7.80	3	2	5.38	80	5.10
	4	15.48	33	10.90		4	8.03	26	7.15
	6	14.55	11	13.80	4	2	8.30	27	6.60
4	2	11.32	31	9.40		4	9.52	82	8.90
	4	15.22	38	12.20		6	14.06	8	11.20
	6	18.75	47	15.00	5	2	9.00	11	7.40
5	4	12.80	19	12.90		4	9.37	46	9.60
	6	19.70	42	15.80		6	12.50	10	11.90
	8	23.50	8	18.60	6	4	7.50	12	11.20
6	6	24.66	6	18.20		6	12.20	12	13.00
	8	20.33	15	20.40		8	10.00	2	14.80

Of those farmers who stack hay in the field by hand, about equal numbers use two, three, and four men in the crew, five and six men being comparatively rare. In 49 per cent of cases, two horses are used, 36 per cent use four horses, and 8 per cent use six horses. Odd numbers of horses are seldom reported and add nothing to the efficiency of the crew.

BALING HAY.

In baling hay with the horsepower type of press it appears that 34 per cent of crews consist of four men, while about 25 per cent consist of three men and an equal proportion of five men. In 75 per cent of the instances reported two horses are used. The capacity of balers is much greater than the demands made upon them by the average crew of four men or less. The 2-horse type has somewhat greater capacity than the 1-horse baler. The daily duty per man is about 2.25 tons with the sweep type, and with the gasoline-engine-driven type, which averages a larger press, the daily duty is 2.75 tons.

In Table XXXII the original averages for each size of crew under the 1-horse and 2-horse types are given, together with adjusted tonnages based on the average tons per man for each type. In the same table limited data are also given for baling with a gasoline engine for power arranged according to the number of men in the crew. The six-man crew is the most common and crews larger than eight men are not frequently found practicable. Within limits of four to eight men the output of balers is in proportion to the available men to bring the hay to the hopper. A 10 or 12 horsepower engine is most generally used in this operation, smaller engines than this being generally overloaded in this work.

TABLE XXXII.—*A normal day's work in baling hay from the stack or barn with sweep power and with an engine, giving the average number of tons baled daily as reported for the crews commonly used, with adjusted factors for each crew.*

[Net hours at work, 10.10.]

USING HORSEPOWER.

Type of baler.	Number of men.	Baled per day.	Number averaged.	Factor for each crew per day.
		Tons.		*Tons.*
1-horse sweep	2	3.6	4	4.8
	3	7.2	35	7.2
	4	9.1	17	9.6
	5	12.5	2	11.9
2-horse sweep	2	10.0	1	5.1
	3	8.6	75	7.4
	4	9.6	123	9.6
	5	10.7	95	11.9
	6	10.9	26	14.1
	7	15.5	11	16.4
	8	15.5	2	18.6

USING GASOLINE ENGINE.

Number of men.	Horse-power of engine.	Baled per day.	Number avereged.	Factor for each crew per day.
		Tons.		*Tons.*
3	5.44	13.56	16	7.7
4	6.28	10.63	31	10.5
5	8.29	13.20	39	13.4
6	10.41	16.26	44	16.3
7	12.09	20.17	32	19.1
8	12.53	20.29	31	21.9
9	16	26.66	6	24.8
10	11.90	27.50	10	27.6
11	14	31.25	4	30.5

HARVESTING GRAIN.

The grain binder is an implement of comparatively light draft in proportion to its width of cut. With this machine the efficiency per horse increases as the width of cut is increased, as does also the acreage per foot in width. Since the draft of the binder is due principally to the propelling of the gearing mechanism, increases in the width of cut up to 8 or 10 feet add little to the load on the horses except the side draft. The daily duty per foot of cut is about 2 acres and that per horse is about 4 acres. With the grain header the daily duty per foot in width is about 2.35 acres, and the duty per horse about 5.5 acres.

With a combined header and thrasher meager data indicate that a fair day's work is from 22 to 28 acres, depending upon the width of cut, which usually ranges from 10 to 14 feet.

In Table XXXIII the original averages for those widths of binder and header most frequently used are given, together with adjusted acreages and allowances for other numbers of horses. From this table the daily duty of grain-harvesting equipment can be readily determined for any width and practical unit of horsepower.

TABLE XXXIII.—*A normal day's work in harvesting grain with a binder and header, giving the average acreages reported for widths most frequently used, adjusted factors for those widths, and scale of allowances for other teams.*

[Net hours in the field, 10.33.]

Implement.	Width of implement.	Number of horses generally used.	Harvested per day.	Number averaged.	Adjusted acreage.	Other teams reported.	Allowance for each other horse.
	Feet.		*Acres.*				*Acres.*
Grain binder	5	3	9.26	91	8.35	2.4	1.50
	6	3	10.96	782	9.90	2.4.5	1.70
	7	4	15.24	329	13.80	3.5.6	1.90
	8	4	18.19	354	17.25	3.5.6	2.10
Grain header	10	6	24.18	11	23.70	4.5.6	1.30
	12	6	28.56	107	25.70	4.5.6.8	1.35
	14	6	28.46	13	26.40	8	1.40

The data for setting up grain in shocks after the grain binder are given in Table XXXIV in terms of one man according to the yield per acre. Through inadvertence the inquiry did not specify the kind of grain affected, so that the data of the table must be taken as a composite for oats, barley, and wheat, and is probably most accurate if the crop is assumed to be oats.

TABLE XXXIV.—*A normal day's work in shocking grain by one man, giving the average daily acreage according to the yield per acre.*

[Net hours in the field, 9.91.]

Yield per acre.	Shocked per day.	Number averaged.
	Acres.	
1 to 20 bushels	10.09	766
21 to 40 bushels	8.73	698
41 to 60 bushels	8.46	164
61 bushels and over	7.36	22

The averages for crew work in stacking grain from the shock are arranged in Table XXXV by crews most frequently used. In general, the daily duty per man is from 2.75 to 3.5 acres in stacking in the field, and from 2.5 to 3 acres when hauling to the barn. From the table of adjusted acreages in columns 5 and 8 the daily duty of any crew in work of this character can be approximated. In those regions where stacking grain is practiced, crews of more than four men are not common.

TABLE XXXV.—*A normal day's work in stacking grain from the shock, giving the average daily acreage reported for crews most frequently used and adjusted factors for each crew.*

Number of men.	Number of horses.	Stacking in the field.			Stacking at the farmstead.		
		Stacked per day.	Number averaged.	Adjusted acreage.	Stacked per day.	Number averaged.	Adjusted acreage.
		Acres.			*Acres.*		
2	2	8.02	226	6.40	6.69	189	5.30
	4	10.64	7	9.30	7.16	3	8.00
3	2	8.32	72	6.70	7.22	64	5.80
	4	14.35	132	9.60	11.45	92	8.40
4	4	13.72	222	12.30	11.09	167	10.00
	6	23.25	4	15.60	19.75	4	13.00
5	4	14.05	53	12.60	12.23	44	11.00
	6	19.00	6	15.90	15.20	5	14.00
6	4	14.00	10	15.00	12.12	8	13.00
	6	18.00	7	18.20	18.20	5	16.00
	8			21.50			18.90

HARVESTING CORN.

The reports for harvesting corn with a binder have been brought together in Table XXXVI according to the number of horses used with the harvester and by yields under each number of horses. With one exception the data show a decreasing acreage with increasing yield in all three groups. This decrease is less pronounced as horses are added, indicating a considerable overload for two horses with this implement. A reasonable figure for the duty per horse in this operation is from 2 to 2.5 acres per day.

TABLE XXXVI.—*A normal day's work in harvesting corn with a binder, giving the average acreages reported according to the number of horses for designated yields.*

Number of horses.	Yield per acre.	Harvested per day.	Number averaged.
		Acres.	
2	1 to 40 bushels	7.47	52
	41 to 60 bushels	6.70	59
	61 bushels and over	5.57	49
3	1 to 40 bushels	7.63	225
	41 to 60 bushels	7.16	179
	61 bushels and over	6.30	68
4	1 to 40 bushels	8.16	54
	41 to 60 bushels	8.27	60
	61 bushels and over	7.21	14

In Table XXXVII the harvesting of corn with a platform cutter is arranged according to the number of men in the crew. The platform cutter cuts two rows at a time, and its capacity is determined largely by the number of men available to tie and set up the corn as it is cut. The average acreage per man is 2.93 and the average acreage per horse 4.17 acres. In this table the adjusted acreages have been computed by decreasing the reported averages for two men and increasing those for three and four men.

TABLE XXXVII.—*A normal day's work in harvesting corn with a platform cutter, giving the average daily acreages reported for crews commonly used and adjusted factors for each crew.*

Number of men.	Number of horses.	Harvested per day.	Number averaged.	Adjusted acreage.
		Acres.		
2	1	5.08	118	4.60
	2	5.80	35	5.20
3	1	5.70	10	5.90
	2	4.50	4	6.80
4	2	8.00	24	8.20
	4	9.00	2	10.00

In Table XXXVIII the reported averages for cutting, shocking, and tying corn by hand, using the ordinary corn knife, have been brought together by yield per acre. Increases in the yield add to the bulk of the stalks to be handled and reduce the acreage cut daily. From 1.4 to 1.7 acres daily can be harvested by one man in this manner. The operation of tying and shocking corn after the corn binder is also reported in the table in the same way. The daily duty of a man at this work is from 3 to 5 acres, depending upon the yield.

TABLE XXXVIII.—*A normal day's handwork in harvesting corn, giving the average daily acreages for one man according to the yield per acre.*

Operation.	Yield per acre.	Harvested per day.	Number averaged.
		Acres.	
Cutting, shocking, and tying corn by hand	1 to 40 bushels	1.65	141
	41 to 60 bushels	1.50	143
	61 bushels and over	1.40	72
Tying and shocking corn after binder	1 to 40 bushels	4.65	300
	41 to 60 bushels	3.71	268
	61 bushels and over	3.15	111

In Table XXXIX husking corn from shock is reported by those farmers who practice this method of handling the crop. The daily duty is from 42 to 55 bushels, depending upon the yield. Where corn is husked continuously from standing stalks, about 60 per cent more can be husked than when the work is done with corn in the shock, the reported daily duty being from 75 to 90 bushels per acre. Where one man husks, hauls, and unloads from standing stalks it is seen that corn can be husked about 25 per cent more rapidly than can be done from shocks into piles on the ground. The daily duty of a man husking, hauling, and unloading is reported as ranging from 50 to 70 bushels, depending upon the yield. In the table the adjusted factors have been derived by reducing the reported acreages from 10 to 20 per cent.

TABLE XXXIX.—*A normal day's work in husking corn, by one man, giving the average daily work factors, in bushels of ears, according to the yield per acre.*

[Net hours at work, 9.58.]

Operation.	Yield per acre.	Husked per day.	Number averaged.	Adjusted factor per day.
		Bushels.		*Bushels.*
Husking from shock	1 to 40 bushels	42.67	222	35
	41 to 60 bushels	45.92	336	42
	61 bushels and over	54.48	220	50
Husking from standing stalks continuously	1 to 40 bushels	76.2	224	60
	41 to 60 bushels	85.97	318	70
	61 bushels and over	87.14	147	75
Husking, hauling, and unloading, from standing stalks.	1 to 40 bushels	50.26	388	45
	41 to 60 bushels	68.05	450	55
	61 bushels and over	69.73	131	62

HARVESTING POTATOES.

In Table XL harvesting potatoes with plows and diggers is grouped by the method employed and number of horses used. The reported acreages have been reduced 10 per cent in arriving at the adjusted acreage in the last column of the table. For plowing out Irish potatoes with an ordinary plow, about equal numbers, out of the 108 which were averaged, reported 1, 2, 3, and 4 acres. Potato rows are often planted in every other furrow of the ordinary 12 or 14 inch plow, and the work of plowing them out is done more carefully than simple field plowing. Twice the daily duty of a 2-horse walking plow being about 3.70, the allowance for the care required in the plowing of potatoes should reduce this acreage toward that given in the average, indicating that the factor 2.40 is substantially correct. In digging Irish potatoes with an elevator digger a 3-horse team is not often used, but the 4-horse team is almost as general as two horses. The acreage increases with increase of power, each additional horse adding about 20 per cent to the amount done daily. A digger drawn by two horses appears to be 40 per cent more efficient from the standpoint of acreage covered in a day than the ordinary 2-horse plow, but two horses are probably much overloaded by this implement. Meager data on digging sweet potatoes with a sweet-potato plow are also included in the table. Since sweet potatoes are planted in rows as much as twice the distance apart given to Irish potatoes, it is apparent from comparing these data with that for plowing out Irish potatoes that the deeper and wider furrow should result in an acreage for this operation about equal to the average of 3.60 reported in the table.

TABLE XL.—*A normal day's work in digging potatoes, giving the average acreages reported.*

[Net hours at work, 9.58.]

Operation.	Number of horses.	Dug per day.	Number averaged.	Adjusted acreage.
		Acres.		
Digging sweet potatoes with sweet-potato plow	2	4.02	38	3.60
Digging Irish potatoes with ordinary plow	2	2.73	108	2.40
Digging Irish potatoes with potato digger	2	3.84	164	3.45
	3	4.06	25	3.70
	4	5.21	129	4.70

The quantity of Irish potatoes that can be picked up after plowing out with an ordinary plow and elevator digger is shown in Table XLI in terms of yield per acre. The amount that can be dug with a fork and picked up is also given in the same table. Where the yields are the same, it is seen that 40 per cent more can be picked up after an elevator digger than can be gathered after an ordinary plow. It appears also that twice as much human labor is required to dig and pick up a bushel of potatoes by hand as is required to pick up after an elevator digger.

TABLE XLI.—*A normal day's work in picking up Irish potatoes, giving the average number of bushels per day per man by designated yields.*

[Net hours in the field, 9.58.]

Operation.	Yield	Picked up per day.	Number averaged.
		Bushels.	
Picking up after ordinary plow	75 bushels	59.31	475
	125 bushels	76.04	458
	200 bushels and over	95.21	442
Picking up after elevator digger	75 bushels	82.03	211
	125 bushels	103.76	218
Digging and picking up by hand	1 to 125 bushels	32.31	285
	126 to 200 bushels	42.67	290
	200 bushels and over	46.35	51

Averages for the operation of hauling potatoes from the field and unloading into the cellar are given in Table XLII by bushels in the load in terms of bushels in a day. The larger loads are the most economical from the standpoint of work accomplished daily. Arrangement of this data by distance hauled showed no relation between the distance and amount of work done daily.

TABLE XLII.—*A normal day's work in hauling potatoes from field to cellar, giving the average daily factors in bushels according to the size of load.*

[Net hours at work, 9.58.]

Size of load.	Hauled per day per man and team.	Number averaged.
	Bushels.	
1 to 30 bushels	194.16	55
40 bushels	223.35	73
50 bushels	276.46	120
60 bushels	353.71	35
65 to 75 bushels	459.87	16

THRASHING OPERATIONS.

In Table XLIII the original data for those thrashing crews most frequently reported are tabulated by thrashing from shock and by thrashing from stack or barn, the averages being given for each crop. Taking the reported output for each crew and crop as standards, there is included in the table a scale of allowances for each departure of one man and for each difference in yield of 1 bushel, together with the range in the number of men found by experience to be reasonably adequate in each case. From analytical tables it was found that increases in the crew were not attended with proportional increases in the daily output of thrashed grain. In calculating the duty for any crew other than those in the table it is therefore advisable to reduce the result obtained for the larger crews from 5 to 10 per cent and to increase the results computed for smaller crews in like proportion.

In thrashing from stack or barn more than four horses are rarely found necessary. In thrashing from the shock a horse for each man is the rule. The length of cylinder used ranges from 18 to 44 inches, the 36-inch length being in most general use, with the 32 inch second in favor. Increased capacity is attended by increased output daily when accompanied by adequate crews, the capacity of the larger machines when properly fed being considerably in excess of the ability of the average crew to deliver the grain to the machine. Much larger crews are used in shock thrashing, but the amount done per day and per man is about the same for crews of the same size. The larger crews used in shock thrashing give larger quantities per day, but the output per man and per horse decreases with increased crew, thus adding to the thrashing cost per bushel. The thrashing charge against clover and alfalfa is about 4 to 5 times that for timothy, 15 to 20 times that for flax, 20 to 25 times that for wheat, and 30 to 40 times that for oats.

TABLE XLIII.—*A normal day's work in thrashing grain, giving the daily averages in bushels per day for crews most frequently used, with adjustments for different crews and yields.*

[Net hours at work, 9.6.]

Method used and crop.	Men in crew.	Yield per acre.	Thrashed per day.	Number averaged.	Allowance per day for each difference of—		Other feasible crews (number of men).
					One man in crew.	One bushel in yield.	
From stack or barn:		*Bushels.*	*Bushels.*		*Bushels.*	*Bushels.*	
Wheat	12	22	1,050	166	87	20	8–14
Oats	12	40	1,802	153	150	25	8–14
Flax	10	11	690	26	69	10	6–12
Alfalfa, clover	10	4	50	66	5	4	8–14
Timothy	13	7	262	42	21	6	10–16
From shock:							
Wheat	20	23	1,349	121	67	20	10–24
Oats	20	40	2,358	104	117	25	10–24
Flax	16	13	837	20	52	10	8–20
Alfalfa, clover	9	3.5	55	85	6	4	6–14
Timothy	12	6.5	200	56	17	5	10–16

MISCELLANEOUS WORK.

In Table XLIV the average data for picking apples and strawberries, for scooping grain, and for milking cows are tabulated. The duty of one man in picking apples ranges from 34 bushels where the trees yield less than 10 bushels each to 45 bushels where the yield per tree is over 10 bushels. The reports for picking strawberries ranged from 50 to 200 quarts, a wide variation explained by the equally wide variation in yields at different seasons and at different pickings in the same season, also by the practice of paying by the quart, so that growers are not put to the necessity of knowing how much the laborer earns at such work. At the average rate reported for scooping grain it would be necessary to handle $1\frac{1}{3}$ bushels or about 6 to 8 scoopfuls each minute, a rate that can be greatly exceeded, if necessary, in intermittent work of this character. While the average for 1,014 reports on milking cows can doubtless be taken as reasonably conclusive, for practical purposes a reduction of 10 per cent, placing the hourly duty for this operation at 7 cows per hour, should be found more acceptable.

TABLE XLIV.—*A normal day's work in miscellaneous operations, giving the average work factors in terms of designated units per man per day or hour.*

Operation.	Net hours at work.	Conditions.	Work factors.		Number averaged.
			Daily.	Hourly.	
Picking apples	9.58	1 to 10 bushels per tree	33.96 bushels		221
		Over 10 bushels per tree	44.84 bushels		161
Picking strawberries	9.48	At average yields	99.71 quarts		105
Scooping grain		From bin or box		2.47 tons	480
Milking cows		Cows per hour		7.94	1,014

HAULING FARM PRODUCE TO MARKET.

In Table XLV data on the operation of loading, hauling to market, and unloading certain farm commodities have been assembled by distance to market and expressed in loads per day for each distance. Inspection of the averages for each product shows a fairly uniform decrease with increasing distance, with the exception of 8 instances out of 100, these exceptions being in cases where very few reports were made. The average for all commodities shows no irregularities. The number of loads hauled daily is seen to vary with the time taken to load and unload or with the nature of the product or manner of handling it. From the limited number who reported for distances greater than 10 miles it appears that smaller loads are hauled for this than for the shorter distances, doubtless on account of poorer roads and greater grades in the more remote localities. The average weight of loads ranged from 2,267 to 2,843 pounds. The average distance from market of some 3,000 farmers furnishing these data is 4.4 miles. Inspection of Table XLV shows differences in cost of marketing the different commodities ranging as high as 50 per cent.

TABLE XLV.—*A normal day's work in hauling to market with wagon for one man and two horses (loading, hauling, and unloading), giving the number of loads per day, by distance hauled, for each commodity.*

Distance hauled, etc.	Baled cotton.	Corn from crib.	Barrels.	Bags.	Baled hay.	Small grain from bin.	Cabbage.	Loose cotton.	Potatoes from cellar.	Loose hay.	All commodities.	Number averaged.
1 mile	6.57	5.00	4.57	5.29	5.25	4.51	3.87	2.50	3.17	3.64	4.39	204
2 miles	3.86	3.75	3.89	3.91	3.92	3.37	3.27	2.53	3.02	2.69	3.43	734
3 miles	3.63	2.95	3.20	3.23	3.05	2.93	2.58	2.50	2.29	2.19	2.79	859
4 miles	2.62	2.47	2.80	2.64	2.51	2.52	2.34	2.09	2.06	1.99	2.37	724
5 miles	2.29	2.15	2.11	2.11	2.19	2.14	1.89	1.81	1.78	1.72	2.02	802
6 miles	2.55	1.99	2.06	2.04	2.03	1.99	1.80	2.00	1.66	1.82	1.94	467
7 miles	2.33	1.79	1.57	1.87	1.87	1.71	1.70	2.50	1.46	1.48	1.72	130
8 miles	1.66	1.31	1.12	1.27	1.44	1.40	1.15	1.14	1.22	1.22	1.30	177
9 miles	1.00	1.18	1.33	1.25	1.50	1.42	1.25	1.00	1.10	1.30	1.26	74
10 miles	1.33	1.17	1.09	1.19	1.10	1.16	1.00	1.21	1.10	1.09	1.14	231
Number averaged	114	767	204	294	688	735	271	114	532	683	4,402	......
Average number of loads, 1 to 10 miles	2.86	2.69	2.66	2.67	2.75	2.56	2.28	2.00	2.09	2.07	2.51	......
Average number of miles	4.9	4.2	4.5	4.4	4.2	4.34	4.4	4.8	4.4	4.3	4.37	......

While there are wide differences in the cost per load for loading, hauling to market, and unloading the various farm products, inspection of the averages for all commodities suggests certain relationships between the length of haul and the number of loads that can be transported daily. These relationships are indicated in Table XLVI. Under line *a* the length of haul is given, and below these distances in line *b* is recorded the number reporting for each distance, while in line *c* the average loads reported for each distance is given. In lines *d* and *e* are given loads per day computed for each distance as follows: The distances computed in line *d* are based on the number of loads reported for 3 miles (2.79), since a greater number (859) haul that distance than any other. The distances in line *e* are based on the reported number of loads for 5 miles (2.02), since the second largest number (802) report for that distance. In both *d* and *e* the computed loads for the other distances from 1 to 10 miles are found by solving inverse proportions between the basic number of loads and the square root of the respective distances to market. Inspection of the results so obtained as compared with the original averages for all commodities in line *c* indicates that, within a radius of 8 miles from market where transportation is effected with horses and wagons, the marketing advantage that one farm has over another may be considered to be inversely proportional to the square root of the length of haul.

TABLE XLVI.—*A normal day's work in marketing, giving the average number of loads hauled daily for all commodities for each distance from 1 to 10 miles and the relation of distance to market to the number of loads that can be loaded, hauled to market, and unloaded.*

Character of data.	*a.* Distance to market (miles).									
	1	2	3	4	5	6	7	8	9	10
b. Number reporting	204	734	859	724	802	467	130	177	74	231
c. Average number of loads at each distance	4.39	3.43	2.79	2.37	2.02	1.94	1.72	1.30	1.26	1.14
Number of loads based on—										
(*d*) 3-mile average	4.82	3.32	2.79	2.41	2.16	1.98	1.82	1.70	1.60	1.54
(*e*) 5-mile average	4.50	3.19	2.60	2.25	2.02	1.84	1.61	1.59	1.50	1.42

SUMMARY.

(1) Daily and seasonal working factors for farm labor and equipment are of primary importance in farm organization and management.

(2) The seasonal and daily duty of men and equipment for an agricultural area can be reliably approximated by averaging many estimates for each operation made by farmers in the region. Figures so obtained are as accurate for practical purposes as those secured by more refined methods.

(3) Data secured in this manner will yield dependable averages in proportion to the experience of those giving the original data and to the care with which the estimates are made. They are, then, not guesses, but the concrete expression of seasoned judgment.

(4) Those engaged in farming have quite definite conceptions of the duty for the simpler operations where but one or two men and one or two teams are involved.

(5) Where many men and units of equipment are used in an operation there is less definite conception of what constitutes a fair day's work, since fewer have had experience with the larger crews, and the range of variation is greater. More data are therefore necessary to insure useful averages.

(6) With implements of heavy draft and also with many of the lighter implements, the increase in dimensions is not attended with proportional increases in work accomplished. For this reason the widths, sizes, and crews most frequently used are taken as affording the most reliable standards, the duty of variations from these being calculated by the use of factors included in the tables.

(7) The increase in the number of men in the crew and in the complexity of the operation are attended by lost motion and decrease in efficiency per unit of labor and equipment. The simpler operations are the most economical from the standpoint of work done daily.

(8) Since certain sizes and units of equipment are used by the majority of farmers, it would be impossible by any method to secure sufficient original data for the less common sizes and crews to yield averages of value. In the tables, therefore, factors have been deduced for some of the less common units of equipment. These deduced factors are based on an analysis of general tabulations for each operation. For practical reference purposes the tables are thus made complete.

(9) In arriving at work standards by the method here used it is believed that certain biased influences operate to produce averages somewhat above normal. In many of the tables, therefore, compensation has been made for the bias by reducing the adjusted factors from 5 to 20 per cent below the original averages.

(10) The daily duty for nearly all of the major operations in American agriculture can be ascertained from the tables in this bulletin. These work factors represent the average of conditions in the United States and can not be too strictly applied to every climate, topography, or soil.

(11) For convenient reference, averages of the data relating to field implements referred to in the text have been summarized in Table XLVII.

TABLE XLVII.—*Summary of work factors for operations with field implements.*

Operation or implement.	Power unit (number of horses).	Daily duty per foot of width.	Range of reported widths.	Most usual width per horse.
		Acres.		*Feet.*
Walking plow	2	1.62	8 to 14 inches	0.50
	3	2.00	10 to 16 inches	.44
Sulky plow	2	1.61	10 to 16 inches	.58
	3	2.13	12 to 16 inches	.44
	4	2.23	14 to 18 inches	.33
Gang plow	4	2.08	18 to 28 inches	.58
	5	2.21	24 to 28 inches	.47
	6	2.20	24 to 32 inches	.39
Traction engine gang	15 to 60 horse-power.	2.00	4 to 30 feet	.33
Spike-tooth harrow:				
On fresh plowing	2	1.40	6 to 12 feet	4.00
On well-packed land		1.60		
On fresh plowing	3	1.50	8 to 16 feet	3.50
On well-packed land		1.80		
On fresh plowing	4	1.70	10 to 26 feet	4.25
On well-packed land		2.00		
Spring-tooth harrow:				
On fresh plowing	2	1.20	4 to 8 feet	3.00
On well-packed land		1.40		
On fresh plowing	3	1.30	5 to 10 feet	2.33
On well-packed land		1.60		
On fresh plowing	4	1.50	6 to 12 feet	2.00
On well-packed land		1.70		
Disk harrow:				
On fresh plowing	2	1.10	4 to 8 feet	3.00
On well-packed land		1.20		
On fresh plowing	3	1.20	6 to 10 feet	2.25
On well-packed land		1.50		
On fresh plowing	4	1.60	6 to 10 feet	2.00
On well-packed land		1.90		
Land roller	2	1.60	5 to 12 feet	4.00
	3	1.65	5 to 12 feet	2.00
	4	1.75	8 to 16 feet	2.50

TABLE XLVII.—*Summary of work factors for operations with field implements*—Con.

Operation or implement.	Power unit (number of horses).	Daily duty per foot of width.	Range of reported widths.	Most usual width per horse.
		Acres.		*Feet.*
Grain drill	2	1.40	4 to 8 feet	3.25
	3	1.50	6 to 10 feet	2.50
	4	1.75	6 to 12 feet	2.25
	6	1.90	8 to 12 feet	1.75
Corn or cotton planter:				
1-row	1	2.20		3.00
Do	2	3.00	36 to 48 inches between rows	1.50
2-row	2	3.75		1.50
Covering seed potatoes	1	2.00	24 to 32 inches between rows	2.00
	2	2.50		2.33
Marking planting rows	1	1.50	3 to 12 feet	3.00
	2	2.00		6.00
Potato planter:				
1-man	2	2.35	24 to 32 inches between rows	2.33
2-man		2.10		2.33
Lime spreader	2	1.10	6 to 12 feet	4.00
Fertilizer drill	2	1.30	5 to 10 feet	3.00
	3	1.40	6 to 12 feet	2.66
Field sprayer	1	1.10	3 to 4 rows each trip	11.00
	2	1.25		6.00
Mowing hay	2	1.60	4 to 7 feet	2.50
Raking hay	1	1.50	6 to 12 feet	9.00
	2	1.60	8 to 16 feet	6.00
Tedding hay	1	1.40	6 to 8 feet	7.00
	2	1.70	6 to 10 feet	4.25
Grain binder	3	1.85	4 to 7 feet	2.00
	4	2.15	5 to 8 feet	2.00
	5	2.25	5 to 8 feet	1.66
Grain header	4	2.10	10 to 12 feet	3.00
	5	2.20	10 to 12 feet	2.25
	6	2.30	12 to 14 feet	2.33
Corn binder	3	2.00	Rows 36 to 48 inches (average yields)	1.50
Cultivating	1	4.25		
	2	6.75		
Knapsack sprayer		1.00		
Wheelbarrow seed sower		1.40	10 to 16 feet	
Hand corn planter		1.30	36 to 48 inches between rows	