

A STUDY OF THE CARE, REPAIR, OPERATION AND ADJUSTMENT OF
TILLAGE MACHINERY AS TAUGHT IN VOCATIONAL FARM SHOP

by

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INTRODUCTION

In the Summer School Session of 1933, the writer had as a term paper "The Teaching of Farm Machinery in the Vocational Farm Shop", under the direction of Doctor Bradford of the University of Nebraska, then on the Summer School Faculty of Kansas State College of Agriculture and Applied Science.

At that time we were near the bottom of the trough in the great depression, farmers were not able to purchase new machines and in many cases even to purchase needed repairs. As a teacher of Vocational Farm Shop the writer realized the value of first, a more thorough knowledge of information and operation of farm machinery; second, the care and repair of same as it might be taught in the vocational farm shop. It was at this point that the writer decided to use this study for a thesis problem. The realization that the subject of farm machinery is very broad resulted in narrowing down the field of study to tillage machinery, including only the Mold Board Plow, Disk Harrow, Cultivator, and Spike and Spring Tooth Harrow.

Since Farm Shop holds an important place in the Vocational Agricultural program, the writer was interested in finding out how extensively phases of farm machinery

were being taught and the methods of procedure, also the use of these machines for home practice work.

The writer has observed from several years teaching experience that farm shop jobs have been made up too largely from farm carpentry, blacksmithing and sheet metal jobs, following more or less the exercise plan. It seems that under present circumstances farm shop work should reach out to the farm, locate machines needing repair, analyze the situation under present farm conditions and bring the whole machine to the shop if feasible, and give it as complete repair as possible.

Because of the apparent need of further study along this line it was decided to make a survey of the methods used in other schools on this subject.

PURPOSE

The purpose of this study was:

1. To find out how many vocational agricultural instructors were teaching the care, repair, operation and adjustment of tillage machinery in their farm shop course.
2. What year of the course in vocational farm shop are the jobs offered?
3. What methods do vocational agricultural instructors use in teaching farm machinery.

4. To determine the time of instruction.
5. Are the jobs used for home practice?

PROCEDURE

A questionnaire was sent to fifty-five selected Kansas Vocational Agricultural Instructors and ten instructors in each of four other states. The questionnaire included a list of jobs on four machines fairly common to the communities where the survey was made. Each instructor was asked to check a list of jobs under the following headings:

1. Do you teach this job?
2. Reasons not taught.
3. What year of the Farm Shop course are the jobs taught.
4. Give a rating under methods of instruction.
5. Indicate time of instruction.
6. Do you use any of these jobs for home practice?

Each machine listed in this survey will be checked under two different headings, Information and Operative Jobs, and Repair Jobs.

FINDINGS

Mold Board Flows: Walking, Sulky, Gang and Tractor

Information and Operative Jobs. (1) General: It will be noted from the accompanying table that the number of teachers reporting ranged from 9 to 30. The wide variation is no doubt due to the nature of the jobs listed. Specific jobs commonly taught in Vocational Farm Shop have received a more uniform rating as the later following tables will indicate.

It will be noted that the largest number reported on job "b" Location of Center of Draft, while the job receiving least emphasis as reported was "f" Estimated Storage Space. Jobs "c" and "d" shared equally in the number of reports. The remaining jobs varied in frequency of use ranging from 14 to 29 (See Table 1).

Under the heading of "Years Taught" there is a decided tendency for this work to be offered in the second and third year of the course, with a few more teachers reporting jobs taught in the second than in the third year. This, no doubt, is due to the fact that there are not as many departments offering third year work as there are second.

Under methods of instruction the table would indicate a majority of teachers would present these jobs first, to

the class, second, to the group and, third, to the individual. There were a few scattered instances where the procedure was varied. Further classification would indicate that the teachers would much prefer teaching through one study discussion route. Of the teachers reporting there were two to three times as many using the above method as there was all the other methods combined.

Under time of instruction most of the teachers indicated that the instruction would be given at a time indicated by the teacher.

Only a very few teachers reported that they used the jobs in No. 1 for home practice work.

Because of the general nature of the jobs listed in Number 1 the reports were somewhat scattered but there were certain definite trends as above indicated.

(2) Plow Bottoms: As the accompanying table will indicate the number of teachers reporting on the four jobs listed under number 2 was about the same. The range being from 21 to 30. The consistency of these reports is, no doubt, due to the universal character of the jobs. (See Table 2).

Under the heading of "Reasons Not Taught", only a few reported that the jobs were not practical. One reported that job "d" "Purpose of under point suction in landside

and throat of share" was not practical. Five reported that job "c", Use of soft center steel bottoms, was not practical. Just a few scattering reports indicated a lack of reference material, no demand, and lack of equipment.

Under the heading of "Years Taught" 60 per cent more of the jobs are taught in the second year than in the third year. Less than one-third of the teachers reporting offer the work in the first year.

Under the method of instruction the teachers reporting would favor the following rating, first class; second, to the group; and third to the individual as in the preceding list of jobs the report would indicate a preference for the study discussion method of presenting the work, with only slight variations from this procedure.

Under the heading of "Time of Instruction" almost all of the teachers reporting indicated that the jobs would be handled at a time set by the instructor. They were universal in their response that none of these jobs would be used for home practice. Because of the nature of the jobs under "Plow Bottoms" the response was rather uniform and no marked difference of opinion was evident.

(3) Beams, Coulter and Jointer: The accompanying tables indicate that the number of teachers reporting that they taught these jobs ranges from 14 to 26. It will also

be noted that the number reporting that they did not teach these jobs ranged from 5 to 15. The above would indicate quite a wide variation in the demand for these jobs. No doubt, the geographical location would play a part in the types of jobs taken up in the farm shop (See Table 3).

Under reasons not taught the range of reports varied from 1 to 5. It will be noted that there isn't any particular trend in any one direction. The reports are well scattered.

Following this heading with "Years Taught" we find a majority of the teachers reported this work being taught in the second year. There were as many reported the work taught in second year as both first and third combined.

The foregoing table under the heading of "Methods of Instruction, carries the same general trend as indicated in part 1 and 2, that the instruction will come first to the class; second, to the group; and third, to the individual.

As to the procedure in putting this instruction across the teachers reporting were all in favor of the study discussion method for first place. The same group of teachers reported as favoring the job sheet, as a second choice for job "a" and "b". The method of handling the rest of the jobs did not indicate any definite trend.

Continuing Table 3 with "Time of Instruction" the number of reports would indicate almost a unanimous choice for the time to be set by the instructor. Under job "f", Purpose and types of weed covering devices, three teachers indicated the time for instruction would be when the boy has the job. For job "g", Adjustment of coulter, four teachers indicated the same as mentioned above for job "f".

Only two teachers reported that they used the jobs in 3 for home practice work.

Under the heading of "Years Taught" "Method of Instruction, "Time of Instruction" and "Use of the job for Home Practice" the trends were rather clear cut.

(4) Wheels and Wheel Bearings: From Table 4 it will be noted that the number of teachers reporting ranges from 10 to 21. Ten teachers reported they taught job "a" type of wheel used, while 15 reported that they did not teach this job. The rest of the jobs received a uniform number of reports ranging from 17 to 21. No doubt, this difference has occurred because jobs "b", "c", "d" and "e" are brought to our attention more often. Job "e", Proper angle of furrow wheels, received the largest number of reports while "b", "c" and "d" shared equally in number of reports (See Table 4).

Under "Reasons not taught" the number of reports ranged from 2 to 4, stating that the jobs were not practical. The reports ranged from 2 to 6, indicating that there was a lack of reference material.

When it comes to the year in which this is taught the teachers reporting did not show any choice between second and third year course. There was, however, a marked difference when compared with the first year course. The evenness between the choice for second and third year for teaching these jobs is largely due to the fact that a number of departments do not teach these jobs. As third year courses are organized this type of job is included.

Since the type of jobs in 4 is very much like the type of jobs in the preceding sections the method of instruction, as reported on by the teachers, is very much the same. All the teachers that rated the method of instruction rated the class room instruction first, group instruction second and individual instruction third. All the teachers making the rating mentioned above put study discussion first, job sheet second, exercise sheet third, and student plan work last. Under time of instruction most of the teachers indicated that the instruction would be given at a time indicated by the teacher.

The jobs in Table 4 were not used for home practice work.

(5) Frame, Eveners, and Tongue: The number of teachers reporting on part 5 varied from 11 on job "a", type of wood used, to 23 on job "c", kind of wood used, in eveners and tongues. The wide range is, no doubt, due to the first two jobs being of minor importance and job "c" a more or less universal job. Fourteen reported that they did not teach job "a". Twelve did not teach job "b", while only 6 reported they did not teach job "c" (See Table 5).

Under "Reasons not Taught" the range was from 4 to 5, indicating that the three jobs were not practical. Lack of reference material was indicated by some as a reason for not teaching these jobs.

The second year course of vocational agriculture was favored by the largest number of teachers reporting as the time to offer the jobs listed in part 5. The third year course was second with the first year the last choice.

The rating given by the teachers reporting would indicate that the method of instruction should first, be presented to the class; second, to the group; and third, to the individual. Further classification would indicate the work would be represented first by study discussion, second, job sheet; third, exercise sheet; and fourth, student plan work.

More than three times as many teachers reported favoring time of instruction be set by instructor, than all other methods combined.

Only four reported using these jobs for home practice.

Job "c", kind of wood used in eveners and tongues, might be considered as a universal job, in that these parts would be used on most any farm machine.

(6) Rigid, Beam Tractor Plows: There were only a few reporting that they taught this job. The range being from 6 to 10. The number reporting that they did not teach this job ranged from 14 to 20.

Under "Reasons not Taught" the range was from 5 to 6 teachers reporting on each job, indicating that the job was not practical. For lack of reference material the reported ranged from 3 to 8.

There is a definite change in the years taught in the jobs listed under 6. The accompanying table indicates that of the teachers reporting, no one offered these jobs in the first year course. Table 6 indicates a range of from 5 to 8 reports offering this work to the third year class and 4 to 6 reports offering it to the second year class (See Table 6).

The method of instruction follows the same general trend as found in previous parts of this section. The work

was presented first to the class, second to the group and third to the individual. The method of procedure was to present it first, in a class discussion; second, let the student plan his work; third, use of job sheets and fourth, the use of exercise sheet.

Under time of instruction there were two rather definite trends as indicated by the reports. One was that the time of instruction would be set by the instructor, and the other was that the time for instruction would be when the machine was in the shop. The two remaining procedures, as Boy Has Job and Home Project Supervision, received only a few indications that they would be used. The range was from 0 to 1.

No doubt, there are Vocational Departments located in communities where there are only a very few tractors and possibly there would be departments where none of the boys would have tractors at home. This would in part account for the variation in the reports from preceding divisions.

Repair Jobs. (1) General: It will be noted from the accompanying table that there are only two repair jobs under general. Seventeen teachers reported they taught job "a", paint plow. Nineteen reported that they taught job "b", Cleaning and Polishing Mold Board and Share. Seven said they did not teach job "a" and 5 did not teach job "b".

Under "Reasons not Taught", 3 reported there was "No Demand" for painting a plow. Two reported "No Demand" for "Cleaning and Polishing Mold Board and Share (See Table 7).

There is a decided tendency for these jobs to be offered in the second year of the course. The next largest number reporting was for the first year of the course, with the third year receiving the least number of reports.

The order of ranking under "Method of Construction" as taken from the teachers' reports is Individual, Group and Class, a further rating covering a report of these two jobs place first, Student Plan Work; second, Job Sheet; third, Study Discussion; and fourth, Exercise Sheet.

Under "Time of Instruction" 6 reported job "a", Paint Plow, would be considered, As Boy has Job, and 7 reported job would be taught when machine was in the shop. Job "b", Cleaning and Polishing Mold Board and Share, received 5 reports favoring instruction As Boy has Job, and 7 reported instruction was given when Machine was in the Shop. Other procedures received a few scattering reports.

About one-half of the teachers reporting indicated that they used these jobs for home practice.

(2) Plow Bottoms: The number of teachers reporting on this job ranged from 6 to 19. It will be noted that the least number reported on job "b", Repoint Shares, while the

jobs receiving the largest number of reports was "a", Sharpen Shares, and "e", Check and Reset Outward Suck in Landside of Share. The remaining jobs varied in frequency of use ranging from 10 to 18 (See Table 8).

There were only scattering reports given for "Reasons Not Taught", ranging from 3 to 19 for "Not Practical". Ten teachers reported that it was "Not Practical" to point shares. Three reported it was "Not Practical" to teach job "j", grease share and moldboard. Another range of reports was from 2 to 9 listing "Lack of Equipment" as a reason for not being taught.

Judging from the reports listed in the accompanying table the jobs listed in number 2 are presented to the classes in the following order: Second year, third year and first year.

Because of the varied nature of the jobs the "Method of Instruction" will vary; for example, jobs "a", "b", "d", "e" and "i" have a rating of Individual, group and class, while jobs "c", "f", "g", "h", and "j" carry a rating of Class, group and Individuals. The use of Study Discussion, Student Plan Work, Job Sheet and Exercise Sheet was the choice of those reporting for jobs "a", "b", "c", "d", "e", "g", "h", and "i". Job "f" received reports favoring Student Plan Work, Use of Job Sheet, Study Discussion and

Exercise Sheet, while job "j" receives reports favoring Study Discussion, Job Sheets, Exercise Sheet and Student Plan Work.

The nature of the jobs in number two are such that a majority of teachers reported that the time of instruction would be when "The Boy Has Job". Other methods received only a few reports indicating their value in number 2.

Three-fourths of the teachers used these jobs for Home Practice. Many of the jobs listed are considered as major farm shop jobs; however, the reports were not very consistent, possibly because they are not taught in many farm shops.

(3) Beams, Coulter, and Jointer: The number of teachers reporting on this section of repair jobs ranged from 12 to 17. Job "a", Remove and Straighten Beams if Bent, received 12 reports, while job "e", Proper Adjustment of Coulter and Jointer, received 17 reports (See Table 9).

Teachers reporting that they did not offer these jobs ranged from 11 to 14.

Table 9 will also indicate that they reported the jobs under the heading of "Not Practical", ranging from 1 to 6. "No Demand" ranged from 2 to 4. Under "Years Taught" the report favored, first, offering these jobs to the second year course boys; second, to third year course boys; third, to first year course boys.

The following rating was given under "Method of Instruction" Individual, Group and Class for jobs "a", "c", and "d". Class, Group and Individual for jobs "b", "e", "f" and "g".

Further methods of instruction as listed by the teachers reporting would have Student Plan Work, Study Discussion, Exercise Sheet, and Job Sheet in order mentioned, for jobs "b", "e", "f" and "g". Remaining jobs received varied ratings.

Under "Time of Instruction" the teachers reporting favored the method of offering the work "As Boy Has Job". The reports ranged from 6 to 10, while the range of reports in other procedures varied from 1 to 2 up to 2 to 5.

A few more teachers reported using these jobs for "Home Practice" than those that did not.

(4) Wheels and Wheel Bearings: It will be noted from the accompanying table that the number of teachers reporting varied from 11 to 18. Job "c", Adjust Ball Bearings, received 11 reports, while Job "a", Replace Worn Wheel Boxes", and Job "i", Adjust Furrow Wheels for Proper Alignment", received 18 reports. The remaining jobs varied in number of reports from 12 to 17 (See Table 10).

The range of reports under "Reasons not Taught" was from 1 to 2, indicating the jobs were not practical. Only scattering reports indicate a lack of materials. The reports varied from 4 to 5, indicating "No Demand". Only scattering reports were given for lack of equipment.

Reports on "Years Taught" indicate there is a tendency for the work to be offered in the second year of the course. The range of reports here was 5 to 10. The range of reports indicating the work taught in the third year course was 5 to 10. However, the total of the two years is greater for the second year of work.

Under "Methods of Instruction" the table would indicate that the teachers favored the following rating for job "a", "f", and "g", offering the work first to the individual, group and class. Job "b", "c", "d", "e", and "h", offered their work to the class, group, and individual. Further classification would indicate that the teachers would much prefer the following rating for the entire list of jobs under Number 4: Study Discussion, Job Sheet, Exercise Sheet, and Student Plan Work.

Under "Time of Instruction" most of the teachers indicated that the instruction would be given at a time when the "Boy Has the Job". The range of reports here was from 4 to 10. Other methods of offering the instruction received only scattering reports.

A few more teachers indicated that they would use these jobs for Home Practice work than indicated they would not.

Because of the general nature of these jobs the range between the highest and lowest number of reports was not very great.

(5) Frame, Eveners, and Tongue: The number of teachers reporting on Number 5 ranged from 14 to 27. The job receiving the least number of reports was "c", Adjusting Tension of Lever Spring. While job "j", Repairing Eveners, received 27 reports. No doubt, the difference here is due to the fact that job "j" is encountered in almost any farm machine, while "c" is a job that does not require so much attention. As a whole the number of reports was fairly uniform. Such jobs as "a", Repairing or Straightening Any Part of Frame, job "d", Replace old or broken lift, job "g", Splice Plow Handles, are common farm shop jobs, and are receiving a fairly uniform number of reports. Job "k", Replace Worn Clevis Bolts", received 23 reports (See Table 11).

Only a few teachers reported that these jobs were not practical, the range being from 1 to 4.

Under heading "Years Taught" the range of reports varied from 7 to 18, indicating they offered the work in the second year. The range for the third year was from 6 to 12. The range for the first year was from 2 to 9.

Under "Method of Instruction" the teachers reporting would favor the following rating: first, Individual, group and class for jobs "a", "b", "f", "g", "h", "i", "j", and "k". A slight variation from this was reported for jobs "c", "d", "e". Jobs "a", "b", "c", "d", "e" and "f" received reports from the teachers favoring Study Discussion, Student Plan Work, Job Sheet, and Exercise Sheet, as method of offering instruction for those jobs. The remaining jobs received varying reports.

Under the heading of "Time of Instruction" the range of reports varied from 8 to 16, favoring the method indicated "As Boy Has Job". The reports here were 3 to 4 times as many as any other one single method of indicating "Time of Instruction".

Of the teachers reporting on the use of these jobs for "Home Practice", the range was from 7 to 10, indicating they used the jobs in Number 5 for home practice work. Only about half as many indicated they did not use these jobs for home practice work.

The large number of teachers reporting on Number 5 would indicate the list of jobs are more popular as farm shop jobs.

(6) Rigid Beam Tractor Flows: The accompanying table indicated that the number of teachers reporting that they taught these jobs ranges from 4 to 8. It will also be noted

that the number reporting they did not teach these jobs ranged from 15 to 18. No doubt, this is due to the fact that the teachers reporting live in an area where tractors are none too common (See Table 12).

Under "Reasons not Taught" the reports varied from 4 to 6, indicating the jobs were not practical. Under the heading of "Repair Jobs Not Taught" the reports varied from 1 to 4. Reports ranging from 4 to 6, indicated the jobs had no demand. Lack of reference material and lack of equipment received only scattering reports.

Under "Years Taught" of the jobs listed in Number 6, there were about as many taught in the second as in the third year. There were no reports indicating that these jobs were taught in the first year.

Under "Methods of Instruction" the teachers rated the following methods as follows: Class, group and individual, for all of the jobs except "g" and "h", which were rated: Individual, group, and class. Further classification would indicate that the teachers favored the Study Discussion Method, Student Plan Work, the use of the Job Sheet, and the Exercise Sheet for all the jobs listed under Number 6.

Continuing Table 12, under "Time of Instruction", of the teachers reporting, they seem to favor by a slight majority, teaching the job as the boy has the work in the shop. Other methods receiving reports range from 2 to 5.

The number of teachers reporting that they use jobs listed in Number 6 for "Home Practice Work" range from 3 to 4. While those indicating that they would not use these jobs for home practice range from 2 to 5.

Because a large number of the teachers reporting on these jobs did not live in sections where tractors are common, it is well to use a number of these jobs as "Home Practice" jobs because of the difficulty of bringing the machine or large parts to the shop.

The Disk Harrow

Information and Operative Jobs. (1) General: Table 13 indicates a range of reports varying from 12 to 23, indicating that these jobs were taught in their classes. Jobs "d" and "f" received 12 reports each, which is the least number of reports, while job "e", Part Disk Plays in Tillage, received 23 reports. The variation in reports were no doubt due to the jobs not in common use. The range of reports indicating that they did not teach these jobs were from 10 to 16. (See Table 13.)

Under "Reasons not Taught" the range of reports indicating that the jobs were not practical varied from 3 to 5. Other reasons why job was not taught received only scattering reports.

Under "Years Taught" more of the teachers indicated these jobs were taught in the second year, the range being 7 to 17. Of those reporting the range was from 6 to 11, indicating they offered the work to the third year. Very few offered any of the jobs under Number 1 in the first year course.

Under "Method of Instruction" the teachers were unanimous in their reports in rating the methods of teaching this work. First, to the class; second, the group; and third, the individual. The same uniform report is shown by Table 13 in that the teachers favored the following methods: First, Study Discussion; second, Student Plan Own Work; third, Job Sheet; fourth, Exercise sheet.

Under "Time of Instruction" the number of reports ranged from 10 to 18, indicating that the jobs would be taught at a time set by the instructor. Other methods received only a very few reports as the Table 13 indicates. The teachers were also well agreed to the fact that they would not offer these jobs for home practice work. Only 4 indicated that they would use these jobs for home practice work.

(2) Gangs: Because of the large number of jobs under this heading the reports ranged from 1 to 14. Job "a", Types of Disks, received only 1 report while job "d", Material used in Disks, and job "i", Kind of Wood Used in

Bearings, received 14 reports. The range of teachers reporting that they did not teach any of these jobs was from 1 to 20 (Table 14).

Under heading of "Reasons not Taught" the range of reports for "Not Practical" was from 4 to 7. Under "Repair Job not Taught" the report ranged from 1 to 2. This was not a wide range but there was a report on every job under Number 2. The reports varied from 1 to 2, indicating a lack of reference material.

It will be noted from Table 14 that none of the teachers reporting offered these jobs to freshmen. Again the second year leads with a range of reports from 5 to 9. The reports for the third year varied from 4 to 7. There was not a lot of difference here, but a few more indicated that the work was taught in the second year.

Table 14 also indicates a uniform rating of "Methods of Instruction", which are as follows: First, class; second, group; third, individual. Further rating by the teachers indicated first, Study Discussion; second, Student Plan Work; third, job sheet; fourth Exercise sheet. Under "Time of Instruction" almost 100 per cent of the teachers offered this work at a time set by the instructors.

All of the teachers reported that they would not use these jobs for home practice.

(3) Frame and Trucks: Only a few teachers reported on the jobs under Number 3, the range being from 5 to 11. This may be due partly to the general nature of these jobs. The jobs that are listed are jobs that do not require much special attention (See Table 15).

Table 15 indicates under "Reasons not Taught" that the range of the reports was from 7 to 10, indicating the jobs were not practical. Only a few scattering reports were listed under "Lack of Reference Material".

Like the preceding list of jobs in Table 14, the teachers reporting did not offer them to the Freshmen. The second and third year courses received about the same number of reports.

The class, group, and individual was the choice of the teachers reporting, under "Method of Instruction", followed by first, Study Discussion; second, Student Plan Work; third, Job Sheet; fourth, Exercise Sheet.

Under "Time of Instruction" all of the teachers but 4 reported that the jobs would be taught at a time set by the instructor.

All of the teachers reporting indicated that they did not use these jobs for Home Practice.

Again the general nature of the jobs in Table 15 brought rather uniform reports. Possibly because of the general nature of these jobs and the difficulty of using

them for Home Practice work, also the difficulty of handling them in class without direct supervision of the instructor brought about a more or less uniform report.

Repair Jobs. (1) General: Only three jobs are listed here as Table 16 will indicate. The range of reports was close, varying from 13 to 16. According to the reports previously considered, Repair Jobs received a more uniform rating and a larger number of teachers report on them than they do on Information and Operative Jobs (See Table 16).

Under "Reasons not Taught" there were only scattering reports ranging from 2 to 4, indicating jobs were not practical, and range from 4 to 6 indicating there was no demand.

Under "Years Taught" there were as many teachers reporting that jobs would be offered in the second year of the course as there were for both first and third years combined.

Under "Method of Instruction", Table 16 indicates that the teachers offered these jobs, first, to the individual; second, to the group; third, to the class. Further methods indicate their first choice that the Student Plan Work; second, Job Sheet; third, Study Discussion; fourth, Exercise Sheet.

As to "Time of Instruction" the number of reports would indicate that the teachers were about equally divided as to whether the jobs would be offered when the boy has the project in the shop or at a time set by the instructor.

Twice as many teachers indicated that they would use these jobs for home practice as indicated that they would not.

(2) Gangs: The range of reports, as indicated in Table 17, vary from 13 in job "b", Polish Rusted Disk, to 19 in job "m", Clean Grease Tubes. The remaining jobs received reports varying from 14 to 18, which would indicate that they are fairly popular as farm shop jobs. The range of reports indicate that the teachers did not teach these jobs, ranging from 9 to 15. The commonness of the tool from which these jobs are taken would indicate that they make good farm shop work (See Table 17).

Under "Reasons not Taught" there were only a few reporting that the jobs were not practical, the range being from 1 to 4. Such headings as "Repair Job not Taught", "No Demand", and "Lack of Equipment" received reports ranging from 1 to 6. Most of them, however, being from 1 to 3. One of the things that will be noted from Table 17 is that not a single teacher reported lack of reference material for this large list of jobs.

Under "Years Taught" the number of reports ranged from 9 to 14, indicating the work was offered to the second year boys. The next largest report was in favor of offering the work to the third year boys. The report of the teachers ranged from 1 to 3, indicating that they offered the work to the first year.

Under "Methods of Instruction" the procedure followed by all of the teachers reporting was to offer the work first to the individual; second, to the group; third, to the class. Table 17 will also indicate that the teachers favored the following methods: first, the Student Plan his own Work; second, Job Sheet; third, Study Discussion; fourth, the Exercise Sheet, for all of the jobs except "o", which received the rating of Study Discussion, first; Student Plan Work, second; Job Sheet, third; and Exercise Sheet, fourth.

It would seem from the table that most of the teachers would not offer these jobs unless there was a demand made by the student, or when he had the job in the shop. The range of reports was from 7 to 12. Reports for other jobs listed under "Time of Instruction" varied from 2 to 5, with an average of 3.

A large number of the teachers reporting that they used these jobs for home practice in this division.

It will be noted from the list of jobs that they are well broken up and might be somewhat difficult to get to the shop unless the machine was brought in.

(3) Frame and Trucks: As you will note from the following table, the reports on the jobs under Frame and Trucks varied from 6 to 14. Job "g", Replace Cast Iron Bearing Sleeve, received 6 reports while job "c", Check and Replace Tongue Truck, received the largest number of reports. Reports in between varied from 8 to 13; even though this machine is common the range of reports indicate that the teachers did not teach these jobs and ranged from 13 to 18. There is, no doubt, a tendency to leave out jobs that are not common, or are new and handle only those jobs that have been common. It is also possible that certain jobs listed would receive more wear and would, through necessity, need to be repaired more often than others, hence the possibility of finding their way to the shop (See Table 18).

Under "Reasons not Taught" only a few report that the jobs were not practical. Under heading of "No Demand" the reports ranged from 5 to 11. Under "Lack of Equipment" the report ranged from 0 to 3.

We also notice that under "Years Taught" there are certain types of jobs that are not offered in the first year of the course. The figures in Table 17 indicate that fact in this list of jobs. Almost all of these jobs were

taught in the second year of the course.

It will be noted from the table under "Method of Instruction" that the teachers offered these jobs to the students, first, to the individual; second, to the group; third, to the class. A further rating was that Student Plan his Work; use of the Job Sheet; Study Discussion; and last the use of the Exercise Sheet.

As in the preceding list of jobs under Number 2, the teachers reporting in Table 18 offered this work "As the Boy has Job". This is another example of jobs that are more or less specific and cannot be very well carried out unless there is a definite demand for this repair job on this particular machine. Only a few teachers reported favoring other jobs listed under "Time of Instruction".

The reports were about equally divided as to whether the jobs would be used for home practice work. The range of reports indicate that they would be used from 4 to 6, those indicating they would not be used ranged from 2 to 4.

Cultivators (Shovel, for Row Crops)

Information and Operative Jobs: (1) General. It will be noted from Table 19 that we have changed to a definite type of machine which is used to cultivate row crops; whereas, the preceding machines have been for tillage and

general cultivation. This fact will be evidenced in a wide range of reports because of geographical location of the teachers reporting, the range here being 7 to 27, indicating that they taught these jobs. Job "a", Types of Shovel Cultivators, received the 27 reports, while job "c", Types of Seats on Riding Cultivators, received the least number which was 7 (See Table 19).

Only scattering reports are listed in Table 19, indicating that these jobs were not taught, the range would average from 1 to 5 for all of the reasons listed.

The range of reports indicating the year in which the work is offered is as follows: 5 to 20 for the second year work; 4 to 11 for the third year work; and 4 to 7 for the first year work. Because the Shovel Cultivator is uniformly used in the Corn Belt area for most row crops. We find that more of the teachers reporting teach these jobs in the first year course than many of the preceding lists of jobs. Possibly one thing that brought about this demand is the fact that first year students often have a row crop for their project, hence, it would be necessary for the student to undertake these jobs in farm shop.

Under "Methods of Instruction" the choice of the teachers reporting was to offer the work first to the class, second, to the group and, third, to the individual. Study Discussion; Job Sheet; Exercise Sheet; Student Plan Work

was the rating given by all of the teachers reporting on these methods.

Under "Time of Instruction" there were as many teachers reporting that the work would be offered at a time set by the instructor, as there were on other methods combined. Most of the teachers indicated that they did not use these jobs for home practice. The range of reports indicating that they would be used was from 1 to 3. Information and Operative Jobs necessarily require more reading and general information and less actual contact with the machine, hence, not many of the jobs were used for home practice.

(2) Gangs: The number of teachers reporting on the jobs under the heading of Gangs was fairly even, the range being from 15 to 21. The range of reports indicate that the jobs were not taught by 12 to 17. It will be noted from Table 20 that these jobs are more specific in character than the jobs in the preceding group. This is, no doubt, the reason why the number reported that the jobs were not taught (See Table 20).

Under the heading of "Reasons not Taught" the number of reports were fairly uniform but only a few reported. The range in the lowest one being from 1 to 2, which was "Repair Job not Taught" and 1 to 2 under the heading "Lack of Reference Material".

If you will note from Table 20, the range of reports by the teachers indicated that these jobs would be offered in the second year. The second choice was that these jobs would be offered in the third year and few reported they would be offered in the first year.

The rating given under "Methods of Instruction" is just the same as the preceding table. At a time set by the instructor seems to be favored as time of offering these jobs. The second choice was "As Boy Has Job". Other methods received only a few reports.

Almost all of the teachers said they would not offer these jobs for home practice.

(3) Frame: Table 21 will indicate a range of reports from 12 to 14. It will be noted that these jobs are not so numerous but yet they received a fairly uniform report by the teachers. However, there were just a few more reported that they did not teach these jobs than reported that they did (See Table 21).

Under "Reasons not Taught" there were only a few scattering reports ranging from 1 to 4 listed as reasons that these jobs were not taught. It will be noted from the table that no particular trend is indicated.

Under "Years Taught" the range of reports was from 9 to 11 indicating jobs were taught in the second year. The range was from 6 to 8 in favor of the third year, with one

report for each job for the first year.

Under "Method of Instruction" the rating given under both headings continues to be the same as that listed in the preceding lists of jobs. Under "Time Set by Instructor" there were more teachers reporting as favoring this method than all the rest of the methods combined.

The range of teachers reporting that they did not use these jobs for home practice was from 6 to 8.

It will be noted by this time that headings of a general nature do not receive quite as detailed a report on the various jobs as machines or parts of machines that are more common in use.

Repair Jobs. (1) General: The number of teachers reporting on the jobs listed in the accompanying table ranges from 16 in job "a", Paint Cultivators, to 22 in job "d", Clean and Polish Shovels. The jobs listed in Table 22 are all common jobs for the machine mentioned but because of the nature of some of them they are not popular farm shop jobs (See Table 22).

Under "Reasons not Taught" there is nothing to indicate any definite trend in any direction. The reports ranged from 1 to 4 indicating no demand. Each job received 3 reports indicating a lack of equipment.

Under the heading of "Years Taught" the range of reports was from 9 to 10, which offered the work to the second year group. The next choice was to offer the work to the third year group.

Job "a", "b", "c", "e", and "f" reported the following procedure under "Method of Instruction". Offering the work first to the individual, second to the group, and third to the class. The one exception to this was found in job "d", Clean and Polish Shovels" which had the following rating: first, to the class; second, to the group; and third, to the individual. Further consideration under "Method of Instruction" indicates three varied opinions. Jobs "a", "b", and "f" favored the following method of offering the instruction: First, Student Plan Work; second, Job Sheet; third, Study Discussion; and fourth, Exercise Sheet. While jobs "c", "d", and "e" would offer the work as follows: Study Discussion; Student Plan Work; Job Sheet; and Exercise Sheet. No doubt, such things as equipment in the shop, the ability of the instructor, machines in common use, from which these jobs are taken, influence, to some extent, the way in which the jobs are presented.

"As Boy has Job" seems to be the favorite method of the teachers reporting to offer the instruction on a job in Table 22. "Time Set by the Instructor" received a range of reports from 4 to 5, which was less than half of the reports under the above mentioned method of instruction. The other 2 methods, Home Project Supervision and Machine in Shop, received only scattering reports.

Three times as many teachers reported using these jobs for home practice as those that did not.

(2) Gangs: The number of teachers reporting on the jobs listed under Gangs varied from 9 to 21. The job "k", Adjust Foot Guides, received the lowest number of reports, while job "a", Sharpen Shovels, received 21 reports. The remaining jobs received reports from 11 to 17. It will be noted that jobs receiving the least number of reports are jobs of less importance as well as jobs that do not require as much attention as the job receiving the greater number of reports. For example: Sharpen Shovels, which is a job that most any farm boy can get, especially in their continued use and necessity of repair (See Table 23).

Under "Reason not Taught" there were a few teachers and the range reported was from 2 to 4, indicating that some of these jobs, even though they seem important, indicate that they were not practical. The remaining jobs received only scattering reports for the other headings.

Under "Years Taught" there were more reports indicating that these jobs were taught in the second year of the course than both the first and third year combined.

The rating in the first part of "Methods of Instruction" was uniform throughout the table, indicating as their choice individual, group, and class. Further rating indicated that the Study Discussion, Student Plan Work, Job Sheet, and Exercise Sheet would be the choice for this group of jobs.

Because of the nature of these jobs, again the reports indicate the jobs would be offered "As the Boy has the Job" in the shop. Such headings as "Time Set by Instructor", "Home Project Supervision" and "Machinery in Shop", received reports ranging from 1 to 4 with an average of 3.

The range of reports was from 5 to 11, indicating that they use this group of jobs for home practice work. This was more than twice as many that indicated they did not use jobs in Table 23 for home practice work.

(3) Frame: The accompanying job will indicate that the number of teachers reporting on the jobs listed in the Table 24 ranged from 8 to 13. It would seem from Table 24 that as the jobs become more general and deal with parts that require little attention, the number reporting became fewer. It will be noted further that the number reporting

that they did not teach these jobs ranged from 11 to 18 (See Table 24).

Under "Reasons not Taught" the only heading that received enough reports to indicate anything of significance was for "No Demand". This ranged from 4 to 7. Other reasons for not teaching these jobs received reports varying from 1 to 3.

Under "Years Taught" there were a few more offering these jobs to the second year group than to the third year group. There was just one report for job "b", Replace or Repair Bent or Broken Parts, indicating it would be offered from the first year course.

There was some difference in opinions under "Method of Instruction" as Table 24 will indicate. It was the choice of those reporting that jobs "a", "d", "e" and "f" be offered first to the class, second, to the group, and third, to the individual. While jobs "b", "c" and "g" preferred to offer the work first to the individual, second to the group, and third to the class, which, as you will note, is just the reverse of the first group. The second rating received a uniform report throughout. The choice was Study Discussion, Job Sheet, Exercise Sheet, and Student Plan Work.

Under "Time of Instruction" the choice here was to offer the work "As Boy has Job", the range of these

reports was from 5 to 8. The next choice was to offer the work as "Home Project Supervision", the range here was from 3 to 5.

Table 24 will indicate that the majority of the teachers would use these jobs for home practice work. A few, however, would not do so.

Harrow (Spike and Spring Tooth)

Information and Operative Jobs. (1) General: Of all the tools mentioned in this survey the tool from which these jobs are taken is probably the most common of them all. However, the reports ranged from 5 to 17. The job receiving the least number of reports was "d", Types of Cross Bars Used. While the job receiving the most number of points was "a", Name Parts of Harrow. The remaining jobs receiving reports ranging from 8 to 16, with the distribution in between about equal. With the reports on each of the jobs no more than they are, there is an indication that this tool does not furnish a great deal with which to work. Some of the jobs, as Table 25 will indicate, are rather specific and exacting, and because of that they do not require a great deal of attention with an information or operative view point (See Table 25).

Under "Reasons not Taught" there is no trend in any direction. The number of reports ranged from 1 to 4. The

second year still seems to be the choice, with the third year as second choice for offering jobs listed in Table 25.

Again we have a uniformity in the method of instruction. The first rating being to offer these jobs to the class, group, and individual. The second rating, Study Discussion, Job Sheet, Exercise Sheet, and Student Plan Work. Jobs of this nature that may be considered general can be disposed of more rapidly in a class discussion than in any other way.

The number of reports ranged from 5 to 14, indicating that the jobs would be taught at a time set by the instructor. The teachers here were unanimous in their reply that these jobs would not be offered as home practice.

(2) Teeth: The number of teachers reporting on part 2 ranged from 5 to 9. The general nature of these jobs indicated in Table 26 was, no doubt, responsible for the few reporting (See Table 26).

Each job received 4 votes indicating that they were not practical. The range of reports under "Lack of Reference Material" was from 3 to 5. Each job under "Repair Job not Taught" received 2 reports.

The reports were about equally divided as to the year this work would be offered. The reports varied from 1 to 4 for the second year course, and 3 to 5 for the third year course.

Under "Method of Instruction" the rating given in both groups was the same as that in Table 25.

The same tendency was indicated by the teachers under "Time of Instruction" and that was that the job would be offered at a time set by the instructor which was the same as Table 25. These jobs would not be used for home practice work as Table 26 indicates.

It will be observed from Tables 25 and 26, that the total number reporting that they taught these jobs was low, and that same general trend was evidenced in both tables.

Repair Jobs. (1) General: The range of the teachers reporting on this list of repair jobs ranged from 11 to 23. The job received the least number of points was "a", Paint Harrow and Draw Bar. Job "c", Straighten Bent Lever Bar, received the largest number of reports. It will be noted that job "c" received more than twice as many reports as "a" and it will also be noted that the two jobs are of about equal importance. If anything, job "a" which received the least number of reports would be more common (See Table 27).

Under "Reasons not Taught" only a few scattering reports indicate that the jobs were not practical. The range of reports under "No Demand" was from 1 to 4, and under "Lack of Equipment" no reports were turned in. Under "Lack

of Reference Material" only a few scattering reports indicating the reason that these jobs were not taught were recorded.

Under "Years Taught" the range of reports was from 9 to 15, indicating that the teachers would offer the work to the second year group, second choice was to the third year group, with only a few reporting in favor of the first year group.

The "Method of Instruction" for job "a", Paint Harrow and Draw Bar" was to offer the work first to the class, group, and individual. The remaining reports for the jobs listed in 27 was just the reverse of this. All jobs from "a" to "n", inclusive, reported as favoring the Study Discussion, Student Plan Work, use of Job Sheet, and Exercise Sheet, as a method of approaching these jobs.

The "Time of Instruction" on this list of repair jobs would be "As Boy has Job". The range of reports were from 7 to 16 which is more than the combined reports of the 3 remaining methods.

Most of the teachers reported that they would use this list of jobs as home practice work.

As has been indicated in preceding tables the nature of the jobs listed in Table 27 is general in nature and could not very well be taken up in the shop, unless the boy had this particular job out on the farm. It is also

evidence that with one or two years of shop work these jobs, or at least most of them, could be handled very nicely as Home Project work.

(2) Teeth: The accompanying table indicates a range of reports of 18 to 23. As previously indicated, repair jobs bring about action in the shop and seem to be more popular and create more interest than Information and Operative Jobs; hence, the number reporting is almost three times as many as reporting in Table 26, on Information and Operative Jobs (See Table 28).

Under "Reasons not Taught" there was only one report indicating that job "c", Replace or Repair Tooth Fasteners, was not practical.

The range varied from 2 to 3, indicating "No Demand". The range was from 1 to 3, indicating "Repair Jobs not Taught".

Of all of the reports listed under "Years Taught" the number reporting, as indicated in Table 28, favored offering the work to the second year group. The number indicated here was equal to the total number in both the first and third year. The range was 13 to 18.

Under "Method of Instruction" the choice of these reporting was to offer the work first to the individual, second to the group, and third to the class. Further rating under "Method of Instruction" was as follows:

presentation of the work, first by the Job Sheet; second, Exercise Sheet; third, Study Discussion; fourth, Student Plan Work.

As indicated in previous tables the very nature of the job makes it such that it will be handled in the farm shop as the "Boy Has Job". There are a few scattering reports ranging from 2 to 5 under the heading of "Time Set by Instructor", "Home Project Supervision", and "When Machine is in Shop".

The reports were almost equal on the choice of these jobs for home practice work. The few more reported, however, that they used the time for home practice than those who did not.

CONCLUSIONS

1. The teaching of the care, repair and operation of farm machinery in the Vocational Farm Shop affords a splendid opportunity to tie up the interests and needs of the farm boy with farm shop skills.

2. Greater effort should be made by shop instructors to tie up shop skills with actual live farm machinery jobs from the boy's home.

Mold Board Plows
Walking, Sulky, Gang, and Tractor Plows

1. General:

- Mold Board Plows
Walking, Sulky, Gang, and Tractor Plows

7. General:

- | | | | | | | | | | | | | | | | | | | | | |
|--|--|----|----|----|---|---|---|----|----|----|----|---|---|---|---|----|----|----|----|---|
| a. Paint plow | | 17 | 7 | 4 | 1 | 3 | 8 | 14 | 6 | 1 | 2 | 3 | 4 | 2 | 3 | 16 | 4 | 5 | 7 | 6 |
| b. Cleaning and polishing mold board and share | | 19 | 5 | 1 | | 2 | 7 | 12 | 6 | 1 | 2 | 3 | 4 | 2 | 3 | 15 | 4 | 1 | 7 | 7 |
| 8. Plow Bottoms: | | | | | | | | | | | | | | | | | | | | |
| a. Sharpen shares | | 19 | 10 | 4 | 2 | 2 | 5 | 2 | 15 | 8 | 1 | 2 | 3 | 4 | 3 | 1 | 2 | 12 | 2 | 2 |
| b. Repoint shares | | 6 | 20 | 10 | 4 | | 9 | | 5 | 2 | 1 | 2 | 3 | | | | 3 | 1 | 1 | 1 |
| c. Replace shares | | 14 | 13 | 5 | 2 | 1 | 2 | 3 | 1 | 7 | 7 | 3 | 2 | 1 | | | 6 | 5 | 2 | 3 |
| d. Check and reset downward suck in landside of share | | 18 | 10 | 4 | 1 | 1 | 3 | | 11 | 9 | 1 | 2 | 3 | | | | 14 | 5 | 2 | 2 |
| e. Check and reset outward suck in landside of share | | 19 | 11 | 3 | 1 | 1 | 4 | 1 | 12 | 9 | 1 | 2 | 3 | | | | 10 | 7 | 2 | 2 |
| f. Replace landside | | 11 | 15 | 7 | | 1 | 1 | 3 | 1 | 4 | 8 | 3 | 2 | 1 | 4 | 2 | 3 | 1 | 6 | 6 |
| g. Tighten all bolts in plow bottom | | 16 | 11 | 4 | 1 | 1 | 1 | 3 | 2 | 7 | 10 | 3 | 2 | 1 | 4 | 3 | 1 | 2 | 8 | 7 |
| h. Replace rusted and lost bolts and nuts in plow bottom | | 14 | 12 | 4 | 2 | 1 | 1 | 3 | 2 | 7 | 9 | 3 | 2 | 1 | 4 | 3 | 1 | 2 | 7 | 4 |
| i. Inspect for uneven joints between share and mold board and between share and landside | | 10 | 15 | 6 | 2 | 2 | 2 | 3 | 3 | 5 | 5 | 1 | 2 | 3 | 4 | 3 | 1 | 2 | 4 | 3 |
| j. Grease share and moldboard | | 18 | 8 | 3 | 1 | 1 | 1 | 2 | 4 | 9 | 12 | 3 | 2 | 1 | 3 | 2 | 1 | 4 | 8 | 5 |
| 9. Beams, Coulter, and Jointer: | | | | | | | | | | | | | | | | | | | | |
| a. Remove and straighten beams if bent | | 12 | 14 | 6 | 2 | 1 | 2 | 3 | 2 | 9 | 8 | 1 | 2 | 3 | 4 | 3 | 2 | 1 | 8 | 3 |
| b. Repair or adjust vertical hitch adjustment on beam | | 13 | 12 | 3 | 2 | | 2 | 2 | 1 | 8 | 7 | 3 | 2 | 1 | 4 | 3 | 1 | 2 | 6 | 5 |
| c. Sharpen coulter and jointer | | 14 | 15 | 5 | 1 | 2 | 4 | 3 | 3 | 7 | 8 | 1 | 2 | 3 | 4 | 2 | 3 | 1 | 9 | 4 |
| d. Adjust or replace coulter bearings | | 13 | 11 | 1 | 1 | 1 | 4 | 2 | 2 | 8 | 5 | 1 | 2 | 3 | 3 | 2 | 4 | 1 | 7 | 2 |
| e. Proper adjustment of coulter and jointer | | 17 | 9 | 2 | | | 3 | 1 | 1 | 9 | 9 | 3 | 2 | 1 | 4 | 3 | 1 | 2 | 10 | 4 |
| f. Cleaning and polishing coulter and jointer | | 13 | 11 | 3 | 1 | | 4 | 1 | 1 | 9 | 6 | 3 | 2 | 1 | | | | 7 | 4 | 2 |
| g. Grease coulter and jointer | | 16 | 11 | 4 | 1 | | 3 | 1 | 3 | 10 | 6 | 3 | 2 | 1 | | | | 10 | 4 | 2 |
| 10. Wheels and Wheel Bearings: | | | | | | | | | | | | | | | | | | | | |
| a. Replace worn wheel boxes | | 18 | 10 | | 3 | 1 | 4 | 3 | 2 | 10 | 9 | 1 | 2 | 3 | 3 | 2 | 1 | 4 | 10 | 3 |
| b. Grease all wheel boxes | | 17 | 13 | 2 | 2 | 1 | 4 | 1 | 4 | 9 | 7 | 3 | 2 | 1 | | | | 8 | 3 | 4 |
| c. Adjust ball bearings | | 11 | 14 | 2 | 4 | 3 | 4 | 2 | 2 | 6 | 5 | | | | | | | 7 | 3 | 3 |
| d. Examine axle brackets and the collars securing axles to plow | | 12 | 13 | 2 | 3 | | 5 | 2 | 1 | 5 | 6 | | | | | | | 4 | 5 | 3 |
| e. Tighten set screws or pins used in collar | | 13 | 13 | | 3 | | 4 | 2 | 2 | 9 | 6 | | | | | | | 8 | 2 | 4 |

Mold Board Plows

Repair Jobs Cont'd

Yes No	Do you teach this job?	Reasons not taught	Years taught	Method of instruction								Time of in- struction																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																												
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11. Frame, Eveners and Tongue:																									
a. Repair or straighten any part of frame	14	13	2	2	1	6	1	2	7	6	1	2	3	4	3	1	2	8	3	2	3	7	6		
b. Check frame for broken or lost bolts	17	11	1	1	1	4	2	3	10	8	1	2	3				11	3	3	2	9	4			
c. Adjust tension of lift spring	14	14	2	2		4	2	3	9	6	3	2	1				9	4	3	2	7	5			
d. Replace old or broken lift	15	13	1	2		5	2	3	10	7	3	2	1				10	3	3	2	8	3			
e. Replace old or broken springs on levers	14	13	1	2		6	2	2	10	7	3	2	1				10	3	3	2	7	4			
f. Paint all parts except share, moldboard, coulter and jointer	17	12	3	1		5	1	4	12	6	1	2	3				12	2	2	2	10	3			
g. Splice plow handles	16	11	4	2		4		5	11	6				4	3	1	2	13	3	2	1	7	8		
h. Tighten or replace handle	18	8	1	2		3		5	14	8				4	3	2	1	16	3	3	2	10	5		
i. Replace plow handles. braces	22	6	1	2		2		5	14	10				4	3	2	1	16	3	3	2	9	6		
j. Repair eveners	27	3	1	1		1		9	18	12				4	3	2	1	18	3	3	2	10	6		
k. Replace worn clevis bolts	23	6	3	2		1		6	15	9				4	1	2	3	14	3	3	3	9	7		
12. Rigid Beam Tractor Plows:																									
a. Examine power lift clutch	8	18	6	4	1	4	2		5	6	3	2	1	4	3	1	2	4	5	2	2	4	5		
b. Replace worn parts	4	17	6	4	1	5	1		3	4								3	2	2	1	4	2		
c. Replace weak springs	4	17	5	4	1	5	1		3	4								3	2	2	1	4	2		
d. Clean clutch parts	4	17	5	4	1	5	1		3	4								3	2	2	1	3	2		
e. Lubricate well	5	16	5	4		4	1		3	5								2	3	2	1	3	2		
f. Replace worn pinscor bolts in draw bar	6	15	5	4		3	1		4	6								4	2	2	1	4	2		
g. Make supply of break pins	6	15	4	1		5	1		6	4	1	2	3					5	2	4	1	4	2		
h. Take apart release spring in draw bar, oil and replace	3	17	4	4		6	1		3	4	3	2	1					3	2	2	1	3	2		

The Disk Harrow
Information and Operative Jobs

13. General:																										
a. Name parts of disk harrow	18	12	5	1	1	3	1		14	8	3	2	1	4	3	1	2	1	14					8		
b. Purpose of tongue trucks	15	14	7	1	1	3	2		12	8									14				10			
c. Methods of oiling bearings	18	10	5	1		2	3	1	13	10								2	14	1	1	1	8			
d. Kind of paint to use	12	14	4	1	1	5	2		13	5								2	12			2	6			
e. Part disk plays in tillage	23	10	3			2	4	1	17	11								2	18		1	1	10			
f. Purpose and use of transport trucks	12	13	5	2		4	1	1	7	7									11	2	1		7			
g. Position of disks in rear gang where tandem is used	14	16	5	2	1	4	2		8	6								2	10	1			7			
14. Gangs:																										
a. Types of disks	1	1	5	1	1	4	2		9	5	3	2	1	4	3	1	2		12				7			
b. Size of disks	13	16	4	1	1	4	3		11	6									13	1	1		6			
c. Spacing of disks	15	13	5	1	1	5	3		10	6									12	1	1		6			
d. Material used in disks	14	15	6	2	1	4	2		7	4									10				6			
e. Purpose of bumper	10	18	6	2	2	5	2		5	3									8				5			
f. Purpose of spacing spoal	8	19	6	2	2	5	1		5	3									8				5			
g. Shape of arbor bolt	9	20	6	2	2	5	2		6	4									8	1	1		5			
h. Amount of concavity	8	17	6	2	2	6	2		5	4									7	1	1		4			
i. Kind of wood used in bearing	14	18	6	1	2	2	3		9	7							1		11	1	1		6			
j. Purpose of weight boxes	13	14	5	1	2	3	2		8	6							1		9	1	1		5			
k. Method of operating scrapers	10	14	6	2	2	4	2		6	5									8	1	1		5			
l. Purpose of spring on scraper bar	9	18	7	2	2	3	1		6	4									8	1	1		5			
15. Frame and Trucks:																										
a. Kind of material used in main frame	5	17	9	3	1	3	2		3	2	3	2	1	4	3	1	2		5				7			
b. Purpose of angling levers	10	21	7	1	1	4	2		5	6									8	1	1		7			
c. Purpose of pressure lever	11	13	7	1	1	4	2		7	7									9	1	1		7			
d. How frame attaches to gangs	8	13	10	2	1	3	2		5	4									7				6			
e. Size of wheels on truck	6	14	9	3	1	3	2		4	2									6				6			

The Disk Harrow
Repair Jobs

16. General																									
a. Paint all parts except disk	13	13	4	1		5	1	3	11	4	1	2	3	4	2	3	1	7	6	1		9	2		
b. Check and tighten all nuts	16	10	2	1		6	1	2	12	5								7	7	2	1	7	3		
c. Replace badly rusted, worn,	16	8	2	1		4	1	2	12	7								9	5	2	1	8	4		
17. Gangs:																									
a. Remove disk	18	13	3	1		6	1	3	14	8	1	2	3	4	2	3	1	12	4	5	3	8	3		
b. Polish rusted disk	13	15	4	2		7	1	2	11	5								11	4	2	2	6	3		
c. Sharpen disk	18	11	1	2		3	5	3	14	9								12	5	4	3	7	5		
d. Test disk bearings for wear	16	11	2	1		4	3	1	10	8								7	5	4	2	8	2		
e. Replace worn bushings	17	11	1	2		4	2	2	9	7								7	3	3	3	7	3		
f. Straighten arbor bolts	14	13	1	3		6	1	1	9	5								7	3	3	2	7	2		
g. Replace worn bearings	18	12	2	2		5	1	2	11	8								8	4	3	4	7	3		
h. Reassemble disk gangs	17	12	2	2		6	1	1	11	8								9	4	4	3	9	2		
i. Tighten gang bolt and lock with special washer	15	11	1	2		6	1	1	11	6								9	3	4	2	9	2		
j. Tighten bolts in disk gang frames	16	10	1	2		5	1	3	12	6								9	3	4	2	8	4		
k. Repair and adjust scrapers	17	10	1	3		4	1	2	12	8								9	2	4	2	7	4		
l. Replace missing grease cups	18	9	1	1		4	1	1	11	8								8	2	4	2	8	3		
m. Clean grease tubes	19	10	1	2		6	1	3	13	8								10	2	4	3	8	4		
n. Tighten bolts in weight pans	14	12	2	1		5	1	2	10	6								7	3	4	2	7	3		
o. Grease disk	18	10	1	1		4	1	3	12	7								9	4	4	3	8	4		

The Disk Harrow
Repair Jobs Cont'd

Yes :	: Do you teach this job?	Reasons not taught	Years taught	Method of instruction								Time of instruction								
				Rate				Rate												
				1	2	3	1	2	3	4										
No	:																			
Not practical	:																			
Repair job not taught																				
Lack of reference material																				
No demand																				
Lack of equipment																				
First																				
Second																				
Third																				
Individual																				
Group																				
Class																				
Exercise sheet																				
Job sheet																				
Study discussion																				
Student plan work																				
As boy has job																				
Time set by instructor																				
Home project supervision																				
Machine in shop																				
Yes :	Do you use this job for home																			
No :	practice:																			

18. Frame and Trucks:

a. Tighten bolts or rivets in stub	13	13	3	1	7	3	7	5	1	2	3	4	2	3	1	6	2	2	3	6	4
b. Repair and adjust levers. pole	13	15	4	1	6	3	8	6													
c. Check and repair tongue truck	14	15	3	2	5	3	9	7													
d. Replace weakened pressure spring	10	17	3	2	9	3	7	4													
e. Replace weakened or broken lever springs	9	17	3	2	8	3	7	4													
f. Clean truck wheel axle and grease	8	17	3	1	9	3	1	7	4												
g. Replace cast iron bearing sleeve	6	18	3	2	11	3	6	3													

Cultivators (Shovel, for row crops)

Information and Operative Jobs

19. General:

a. Types of shovel cultivators	27	7	1	1	2	1	7	20	11	3	2	1	3	2	1	4	2	17	2	3	3	11
b. Material used in shovels	19	14	5	1	4	2	7	11	8	3	2	1	3	2	1	4	2	17	2	3	3	11
c. Types of seats on riding cultivators	7	24	8	2	6	3	4	5	4	3	2	1	3	2	1	4	2	17	2	3	3	11
d. Purpose of balance frame	14	18	5	1	6	2	5	8	7	3	2	1	3	2	1	4	2	17	2	3	3	11
e. Purpose of pivot axle	14	16	5	1	6	2	5	10	8	3	2	1	3	2	1	4	2	17	2	3	3	11

20. Gangs:

a. Advantage of spring trip	21	12	3	1	4	2	8	14	7	3	2	1	3	2	1	4	3	13	2	2	1	11
b. Advantage of pin break	21	12	3	1	5	2	4	15	7	3	2	1	3	2	1	4	4	12	2	2	1	11
c. Types of shovels and sweeps	21	16	2	1	5	2	2	17	7	3	2	1	3	2	1	4	4	12	2	2	1	11
d. Types of fenders	16	13	4	1	6	2	2	12	8	3	2	1	3	2	1	4	2	12	2	1	1	11
e. Numbers of shovels per shank	20	15	3	1	5	2	2	13	8	3	2	1	3	2	1	4	2	12	2	2	1	11
f. Method of guiding shanks	15	17	5	2	5	2	2	13	7	3	2	1	3	2	1	4	2	12	2	2	1	11

21. Frame:

a. Purpose of master lever	12	15	3	1	3	2	1	11	7	3	2	1	3	2	1	4	1	12	4	2	2	9
b. Meaning of balance frame	12	15	4	3	2	2	1	10	7	3	2	1	3	2	1	4	1	11	2	1	2	8
c. Purpose of arch	13	14	4	2	3	2	1	10	7	3	2	1	3	2	1	4	1	11	2	1	2	8
d. Purpose of spacing lever	12	15	4	2	3	2	1	9	8	3	2	1	3	2	1	4	1	11	2	1	2	8
e. Purpose and use of depth lever	14	13	5	2	4	2	1	10	7	3	2	1	3	2	1	4	1	11	2	1	2	8
f. Method of adjusting width of frame	14	13	5	3	3	2	1	10	7	3	2	1	3	2	1	4	1	11	2	1	2	8
g. Method of adjusting balance	14	14	4	3	3	2	1	10	6	3	2	1	3	2	1	4	1	11	2	1	2	8

Cultivators (Shovel, for row crops)
Repair Jobs

22. General:

a. Paint cultivator	16	12	3	1	4	3	4	9	4	1	2	3	4	2	3	1	9	4	1	3	11	3
b. Oil all wearing parts	19	11	1	1	3	3	3	9	6	1	2	3	4	2	3	1	9	4	2	4	10	4
c. Inspect, tighten, and replace rusted and worn nuts and bolts	18	10	1	1	3	3	3	8	7	1	2	3	4	3	1	2	9	4	2	3	10	3
d. Clean and polish shovels	22	7			2	3	3	10	8	3	2	1	4	3	1	2	11	5	3	4	11	4
e. Grease shovels	21	7			2	3	5	10	7	1	2	3	4	3	1	2	11	4	3	4	10	4
f. Take up all lost motion and replace worn parts	19	8	1	1	1	3	3	9	7	1	2	3	4	2	3	1	10	5	3	3	11	3

23. Gangs:

a. Sharpen shovels	21	10	3	1	1	2	3	2	15	11	1	2	3	2	1	3	4	16	4	3	3	11	4
b. Give shovels proper vertical adjustment	16	10	2	1		1	2	1	13	9	1			4	3	1	2	11	3	4	2	8	3
c. Give shovels proper horizontal adjustment	17	12	2	1	1	1	3	1	13	9	1							10	3	4	2	8	3
d. Inspect and adjust spring trip	11	16	4	1	1	3	3	1	11	7	1							9	3	3	2	8	4
e. Inspect and adjust pin break	11	14	3	1	1	4	3	1	11	7								10	3	4	2	7	4
f. Adjust gang shanks	14	14	3	1	1	2	3	1	11	7								10	3	4	2	6	4
g. Adjust and tighten nuts holding shovel and shanks	14	13	3	1	1	2	3	1	12	8								11	3	4	2	7	3
h. Adjust fenders	11	15	4	1	1	3	3	1	10	6								8	3	4	2	6	3
i. Straighten gang for even distance	12	17	3	1	2	5	3		8	7								8	3	4	2	5	3
j. Adjust gangs for even distance from center of plow	11	16	3	1	2	5	3		8	7								9	3	4	2	5	3
k. Adjust foot guides	9	18	4	1	2	5	3		8	6								7	3	4	2	5	3

24. Frame:

a. Narrow or widen frame	10	18	3	1	1	7	2	6	7	3	2	1	3	2	1	4	6	3	3	3	4	5
b. Replace or repair bent or broken parts	13	11	1	1	1	4	1	9	5	1	2	3					8	1	5	4	6	3
c. Adjust foot guides	10	15	3	2	1	4	1	7	5	1	2	3					6	1	5	3	4	3
d. Adjust frame for balance	8	17	2	2	1	7	1	5	4	3	2	1					6	1	4	2	4	2
e. Adjust or replace chains	10	15	2	2	1	6	1	8	4	3	2	1					5	1	5	3	4	3
f. Align wheels	11	15	2	2	1	6	1	7	4	3	2	1					6	1	5	3	4	3
g. Adjust lifting springs	11	14	1	2	1	6	1	8	5	1	2	3					6	1	5	3	4	3

Harrow (Spike and Spring Tooth)
Information and Operative Jobs

25. General:

a. Name parts of harrow	17	10	2	2	1	2	2	2	14	6	3	2	1	3	2	1	4	14	1	1	9
b. Types of smoothing harrows	16	10	2	2	2	3	2	1	9	6								13	1	1	7
c. Types of bars used	10	15	4	2	2	4	2	1	6	5								9	1	1	6
d. Types of X bars used	5	19	4	2	3	4	2	1	1	2								5			4
e. Types of tooth fasteners	12	16	3	2	2	4	2	2	6	5								8	1	1	6
f. Spacing of teeth	14	14	2	2	1	4	2	2	7	5								9	1	1	7
g. Weight of harrow	8	18	4	2	3	4	2	1	3	4								7			4
h. Draft of harrow	12	15	1	2	3	4	2	2	6	5								10			1
i. Angle adjustment of teeth	16	11	1	2	2	4	2	2	7	8								2	9	1	1
j. Purpose of flexible bar	10	16	1	2	5	4	2	2	3	4								2	7		1
k. Purpose of runner teeth	12	16	3	2	4	4	2	1	5	6								9	1	1	1
l. Advantage of spring teeth over spike teeth	16	10		1	2	4	2	1	8	6								2	12		1

26. Tooth:

a. Size of teeth	9	14	4	2	4	3	2	4	5	3	2	1	3	2	1	4	8	1	1	4
b. Material used in teeth (kind)	8	15	4	2	5	3	2		3	5						7	1	1	5	
c. Length of teeth	8	15	4	2	3	3	2	1	4	4						7	1	1	5	
d. Purpose of notching teeth into bar	5	17	4	2	4	4	2	1	1	3						5			5	

Harrow (Spike and Spring Tooth)
Repair Jobs

27. General:

a. Paint harrow and draw bar	11	15	7	1	4	2	10	4	3	2	1	4	3	1	2	7	4	2	2	9	5
b. Straighten bent bars	22	4	1		1	2	15	11	1	2	3					15	4	2	4	12	5
c. Straighten bent lever bar	23	4	1		1	2	15	11								15	4	2	4	13	4
d. Replace rusted and broken bolts	21	5	1		2	2	14	11								16	4	2	4	12	4
e. Replace or repair broken bars	22	4	1		1	2	13	11								15	4	2	4	13	4
f. Replace or repair springs in adjustment lever	20	7	1	1	3	2	11	10								13	4	2	4	12	4
g. Replace or repair harrow draw bar	20	7		2	1	1	13	9								13	3	1	2	11	5
h. Tighten connections between tooth bars and guard rails	19	8		2	1	2	1	12	8							12	3	1	1	9	5
i. Replace drag links	18	8	2	2		1	2	12	9							12	3	1	3	9	5
j. Tighten eye bolts that connect eye bolts to eveners	19	5	1	1	1	2	2	13	9							15	3	2	4	12	4
<hr/>																					
k. Tighten eye bolts or rivets in draft hooks	18	6	1	1	1	2	1	12	9							14	3	2	3	11	4
l. Tighten eye bolts or rivets that fasten corner braces	18	6	1	1	1	2	1	12	9							13	3	2	3	11	3
m. Oil working parts	14	11	3	1	1	2	1	9	7							9	3	2	2	9	5
n. Secure rocker bars to rocker arms	14	11	2	2	1	3	1	9	5							10	2	2	1	7	4

3. The year in which this material will be offered will vary with the needs and ability of the boy. If a boy was taking crops for his first course in Vocational Agriculture, no doubt, he would have some farm machinery problems. However, it would seem that under ordinary circumstances the jobs would be offered in the second and third year of the course.

4. Class discussion brings the problems clearly before the entire group, it stimulates interest and provokes thought. Ideal learning conditions are brought out through the class discussion. From this point specific problems are carried to groups and to the individual.

5. General farm machinery jobs involving a number of skills and principles should be offered at a time set by the instructor. Skills associated with certain farm machines are taken up only when the boy has the machine in the shop.

6. After the skills have been worked out in the farm shop, they should be followed up as home practice work.

7. More repair jobs are reported being taught than information and operative jobs.

8. The farm machinery jobs taught in the farm shop should be progressive rather than repetitive.

9. A recent tendency in the field of vocational agriculture brought about, or at least hastened, by the

depression, is to do more repair work on farm machinery.

10. Most departments have sufficient equipment and reference material to teach the average farm shop job.

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