The Montana farm mechanics program in vocational agriculture
by William Joseph Welker

A THESIS Submitted to the Graduate Committee in partial fulfillment of the requirements for the degree of Master of Science in Agricultural Education
Montana State University
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Abstract:
No doubt the sponsors of the Federal legislation that made vocational agriculture possible Intended that the home farm mechanical activities were to be a part of the vocational agriculture supervised practice program* This study is concerned with the amount of carryover of the present farm shop instruction to the home farm* It also intends to note the type of farm shop course of study that gives the greatest carryover as well as to make other recommendations for improvement.

Data used in this study came from other studies, from 11 Montana vocational agriculture instructors, who were rated as being above average shop teachers and from 364 of these instructors' students' These data indicate the type of farm shop instruction deemed important by the instructors, the mechanical jobs the students performed in the school shop and at home, how the 112 juniors and seniors learned to do the jobs they do at home, and the home farm shop facilities available to vocational agriculture students.

The carryover of school shop instruction to the home farm is not great for 4 reasons. First, the type of farm shop work taught in the school is not the type used on farms. Second, the amount of home farm shop supervision that vocational agricultural students receive from their instructors is too small to be very effective. Third, instructors have not encouraged farm shop supervised practice, either as a part of the student's agricultural project or as a separate supervised practice. Fourth, there is no evidence to indicate that a home farm shop improvement program is one of the major objectives of farm mechanics instruction.

The home farms of vocational agriculture students do not have adequate farm shop buildings for the students to work in, but the students do have access to a fairly adequate supply of shop tools. Instructors recognize that they are not fully prepared to teach all of the desirable types of farm shop and that the farm shop supervised practice problem should receive more of their attention.

Means of improving the Montana farm mechanics program will undoubtedly, at first, be concerned with the reorganization of the course of study, more adequate teacher selection and preparation, and a definite attack on the problem of a farm mechanics supervised practice program. Other means of improvement will give consideration to the extension of the farm mechanics part-time and evening school program, refresher courses for instructors that are now in the field and an extension of the research program in Agricultural Education.

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A THESIS

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Master of Science in Agricultural Education

at

Montana State College

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FOREWORD

"Wisdom consists in knowing what to do.
Skill consists in knowing how to do it.
Virtue consists in doing it."

David Starr Jordan

THE MONTANA FARM MECHANICS PROGRAM IN VOCATIONAL AGRICULTURE

ABSTRACT

No doubt the sponsors of the Federal legislation that made vocational agriculture possible intended that the home farm mechanical activities were to be a part of the vocational agriculture supervised practice program. This study is concerned with the amount of carryover of the present farm shop instruction to the home farm. It also intends to note the type of farm shop course of study that gives the greatest carryover as well as to make other recommendations for improvement.

Data used in this study came from other studies, from 11 Montana vocational agriculture instructors, who were rated as being above average shop teachers and from 364 of these instructors' students. These data indicate the type of farm shop instruction deemed important by the instructors, the mechanical jobs the students performed in the school shop and at home, how the 112 juniors and seniors learned to do the jobs they do at home, and the home farm shop facilities available to vocational agriculture students.

The carryover of school shop instruction to the home farm is not great for 4 reasons. First, the type of farm shop work taught in the school is not the type used on farms. Second, the amount of home farm shop supervision that vocational agricultural students receive from their instructors is too small to be very effective. Third, instructors have not encouraged farm shop supervised practice, either as a part of the student's agricultural project or as a separate supervised practice. Fourth, there is no evidence to indicate that a home farm shop improvement program is one of the major objectives of farm mechanics instruction.

The home farms of vocational agriculture students do not have adequate farm shop buildings for the students to work in, but the students do have access to a fairly adequate supply of shop tools. Instructors recognize that they are not fully prepared to teach all of the desirable types of farm shop and that the farm shop supervised practice problem should receive more of their attention.

Means of improving the Montana farm mechanics program will undoubtedly, at first, be concerned with the reorganization of the course of study, more adequate teacher selection and preparation, and a definite attack on the problem of a farm mechanics supervised practice program. Other means of improvement will give consideration to the extension of the farm mechanics part-time and evening school program, refresher courses for instructors that are now in the field and an extension of the research program in Agricultural Education.

PART I. INTRODUCTION

General Statement

"Vocational education in agriculture has for its primary aim 'To train present and prospective farmers for proficiency in farming'." 1/ Proficiency in modern farming must include more than mere ordinary ability to work with tools and machine equipment. Today's farmer has a relatively heavy investment in tools and machine equipment as well as in farm buildings and farm improvements. Due to continued improvements in farm equipment, rapid extension of rural electrification, and greater use of engineering conservation practices 2/, the prospective farmer will, in all probability, have an investment in tools and machine equipment that is greater than the farmer of today. The high school vocational agriculture classes with the accompanying farm shop instruction were made possible by the Smith-Hughes Act of 1917 3/ and 1924 and later supporting acts. There are 308,325 of the nation's prospective farmers training for proficiency in farming by attending high school vocational agriculture classes. 4/

Section 10 of the Smith-Hughes Act clearly states that vocational agricultural education shall meet the needs of persons over 14 years of age who have entered upon or who are preparing to enter upon the work of the farm

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1/ Cook Scranton, and McColly, "Farm Mechanics Text and Handbook", The Interstate Printers and Publishers, Danville, Illinois, 1937, p. 5, Preface.

2/ "Technology on the Farm", a special report of an interbureau committee and the Bureau of Agricultural Economics of the U.S.D.A., U.S. Government Printing Office, Washington, D. C., 1940, pp. 42-43.

3/ Public. No. 347, Sixty-fourth Congress, S. 703.

4/ Statistical Release No. 5, Federal Security Agency, U. S. Office of Education, Washington, D. C., March 10, 1941.

or of the farm home. It further provides that schools which teach vocational agriculture shall provide for directed or supervised practice in agriculture either on a farm furnished by the school or other farm for at least six months per year. In Montana there are very few schools that are able to provide for the supervised practice needs of even a small number of their vocational agriculture students on school-owned or school-controlled farms. The Vocational agricultural supervised practice needs, therefore, must be taken care of on the student's home farm.

If it is essential that the vocational agriculture student put any of his classroom instruction to use as a supervised practice on his home farm, it is reasonable to expect that he will use all, or as much as possible, of this instruction at home. The writer is sure that much more progress has been made in carrying classroom instruction in agricultural production to the home farm as a supervised practice than has been made in the field of farm shop work.

Purpose of Study

It is the purpose of this investigation to attempt to determine the extent of the carryover 5/ of the classroom farm mechanics instruction to the home farm, to ascertain the nature of the farm mechanics instruction that appears to give the highest degree of carryover and to make recommendations as to improvement.

5/ The term "carryover" refers to the extent that students put to practical use on their home farms the instruction that they receive as a result of being enrolled in vocational agriculture classes.

In order to determine the extent of carryover and the type of instruction that appears to give the greatest carryover, it seemed necessary to seek the answers to at least a portion of the following questions relative to the present Montana farm shop program.

1. Are the farm shop jobs that vocational agriculture students complete in the school shop the type of farm shop jobs that are related to their agricultural projects?

2. To what extent do vocational agriculture students bring farm shop jobs from their home farm to the school shop for completion?

3. What type of farm shop jobs do vocational agriculture students do at home as they assist with the general farm work at their home farms?

4. What is the relation between the type of jobs completed at home and the type completed in the school shop?

5. Who teaches the students to do the jobs that they complete at home?

6. What is the number and type of home farm shops in which students might complete home shop jobs?

7. What does the home shop provide in tools and equipment with which the student may work?

8. How many farm shops do vocational agriculture students partially or wholly establish while they are in high school?

9. What efforts do vocational agriculture students make to maintain or improve home farm shop facilities while in high school?

Review of Literature

Many authors of books and bulletins covering the field of vocational agriculture farm shop have written, at considerable length, on farm shop course

organization, methods of teaching, and performance of the farm shop skills. Most of the authors have intended this type of material to be used as a basis for farm shop classroom instruction.

Only a few of the foremost authors recognized that directed and supervised farm practice as a part of the farm shop program was a most efficient means of teaching farm shop. In this connection, Schmidt 6/ states that "the directed and supervised farm practice work in which all boys studying vocational agriculture must engage is not only an important, but an essential part of the training in vocational agriculture. Many vocational educators have regarded it as the most important part of the training, both because of its own value and because it should be made the core of the classroom instruction. To be effective, this work must not only be considered an integral part of the instruction, but it must be carefully supervised.

"What has been said about the training given in agricultural projects and in supplementary farm practice work in agriculture, applies equally as well to training given in farm shop work and in other forms of farm mechanics. The training jobs in farm mechanics must be carried on in the same way, with the same tools and with the same machines as those in which and with which they are carried on by successful farmers in the community. Only so can the greatest carryover be attained and the time and energy spent in the school shop be used to the best advantage."

Schmidt, Ross, and Sharp 7/ and other more recent authors specifically

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6/ Schmidt, G. A., "Efficiency in Vocational Education in Agriculture", The Century Company, New York, 1928, pp. 278 and 162.

7/ Schmidt, G. A., Ross, W. A., and Sharp, M. A., "Teaching Farm Shop Work and Farm Mechanics", The Century Company, New York, 1937, pp. 205-207.

point out the necessity for the vocational agricultural student establishing a home farm shop. They believe every vocational agriculture instructor should feel himself responsible for the establishment of a farm shop on every farm represented by the boys under his charge. Other authors infer that some shop work might and should be done on the home farm as a directed practice. The subject is often dropped with this inference.

A few of the writers have, however, kept this subject foremost in their minds and have attempted to accomplish definite results.

Sutherland 8/ in 1933 reports, "about a year ago California agriculture teachers gave serious consideration to this question, 'if the home project is the valuable teaching device that it seems to be, why can't we use it in teaching farm mechanics?'" At the end of the year, he reports that many of the vocational agriculture students had farm shop supervised practice in which self labor averaged more than 100 hours per student per year. Sutherland, in referring to supervised practice, reports again in 1939 "that we are doing today what we talked about ten years ago". 9/

Palmer 10/ in writing of the farm mechanics home project outlines a simple, usable plan as a help to vocational agriculture instructors in getting more shop work completed on the home farm. He states that "farm mechanics home projects are not new - they have been carried out successfully in Montana

8/ Sutherland, S. S., "Home Projects in Farm Mechanics", Agricultural Education Magazine, Vol. VI, No. 4, October 1933, p. 61.

9/ Sutherland, S. S., "Supervised Farming Yesterday, Today, and Tomorrow", Agricultural Education Magazine, Vol. XI, No. 10, April 1939, p. 190.

10/ Palmer, R. H., "The Farm Mechanics Home Project", Department of Agricultural Education, Montana State College, a mimeographed circular, 1938.

and other states. . . . Probably we have not emphasized the farm mechanics home project as much as we should." There is some evidence that this program is workable but has not generally been put into effect because supervisors, teacher-trainers, and teachers have neglected to emphasize it.

It is worthy of note that Robinson 11/, an agriculture teacher at Kalispell, Montana, says "if we wish to accomplish our farm mechanics objectives in the fullest possible way we must develop in our shop program, first, a larger and better farm shop home project program and second, a repair attitude instead of the construction idea."

A New Jersey instructor 12/ of vocational agriculture also reports, "I have found that the project is a valuable help in keeping the boys working at top speed during the shop period and to me it has been a method of getting far more work done outside the school than was done inside."

In a study of 20 vocational agriculture departments in Iowa, Sweaney and Starrak 13/ found that 22 schools offered special units in animal husbandry supervised practice; 21 schools offered special units in farm crops supervised practice; 16 schools offered special units in farm management supervised practice; 13 schools offered special units in farm shop supervised practice. Even though farm shop supervised practice units are offered fewer times

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11/ Robinson, H. E., "A Farm Shop Program", Report of Twenty-Second Annual Conference of Vocational Agriculture Instructors of State of Montana, Office of Vocational Education, Montana State College, Bozeman, Montana, 1939, p. 25.

12/ Coan, Abraham, "Using the Project to Stimulate Farm Shop Work", Agric. Education Magazine, Vol. I, No. 3, March 1929, p. 8.

13/ Sweaney, H. P., and Starrak, J. A., "Supervised Practice in Vocational Agriculture in Iowa", Bulletin P29, Iowa State College, Ames, 1941.

than other forms of supervised practice, it is significant that 13 of 24 schools in one state are definitely attempting to encourage this form of instruction. In this connection it is interesting to note the following summary relative to the all-day program in vocational agriculture in Montana. 14/

Number of pupils enrolled	1600
Number of pupils starting supervised practice activities	1039
Number of pupils starting productive enterprise projects only	696
Number of pupils starting improvement projects only	6
Number of pupils starting supplementary farm practices only	5
Number of pupils starting productive enterprise projects and other supervised practice	320

It is noticeable that this summary does not specifically mention farm mechanics supervised practice. It does limit the possibility of more than the last 3 groups of students (331, or 20.6 per cent of the students enrolled) carrying on any specific farm mechanics supervised practice. It is this writer's belief that considerably less than 20.6 per cent of these students carry out specific farm mechanics supervised practices.

There seems to be no shortage of literature pertaining to the supervised practice program of a productive nature. There is much less literature regarding farm shop supervised practice. It may not follow that much less has been accomplished in this field, but the lack of recorded accomplishments would indicate it.

The writer found relatively few studies closely related to his field of investigation. Only the following quotations seemed pertinent to the purposes of this thesis.

14/ From statistics released by the Department of Agricultural Education, Bureau of Vocational Education, Washington, D. C.

Cook 15/ states, "surveys made in Minnesota, Tennessee, Colorado, Pennsylvania, California, Kansas and Iowa have clearly shown what type of work farmers want their boys to do in the farm mechanics course. These surveys indicate that the farm mechanics course should be built around the needs of the boy and the home farm."

When the returns from an Iowa survey made by M. A. Sharp 16/ were compiled, it showed that such projects as individual hog houses, hay racks, brooder houses, and farm gates were far in the majority.

A similar study made by Sutherland 17/ in Montana, parallels the findings of the Sharp study quite closely.

The studies made by Cheney, Graybeal, and Walker 18/ are somewhat more concerned with the organization of farm mechanics courses as applied to classroom instruction than the other studies that have been reviewed. Walker noted the similarity of opinions of farmers in Iowa, Montana, and Oregon concerning the relative importance of several phases of farm mechanics work.

15/ Cook, G. C., "Handbook in Teaching Vocational Agriculture", The Interstate Printing Company, Danville, Illinois, 1938, p. 308.

16/ Sharp, M. A., Sharp, W. M., "Principles of Farm Mechanics", John Wiley and Sons, New York, 1930, pp. 257-265.

17/ Sutherland, S. S., "Farm Mechanics Courses for Montana High Schools", A mimeographed pamphlet, Department of Agricultural Education, Montana State College, Bozeman, 1928.

18/ Cheney, Clark T., "A Study of the Vocational Farm Mechanics Courses in the High Schools of the United States", A thesis, Library, Iowa State College, Ames, 1930.

Graybeal, H. C., "Outlining The Course of Study in Agriculture By Means of the Farm Survey", Bulletin I, Department of Agricultural Education, University of Tennessee, Knoxville, 1925.

Walker, Clyde, "Determining the Content of Farm Mechanics Courses of Study for Smith-Hughes Agriculture Departments in High Schools", unpublished thesis, University of Nebraska, Lincoln, 1930.

No doubt Cheney refers to parts of Sharp's and Sutherland's conclusions when, in his own conclusions, he states, "it would appear from an examination of the studies previously made that what is being taught in many cases in farm mechanics courses is not what farmers believe is important and should be taught."

With the exception of these few quotations, it is believed by the writer that these and other studies are not applicable to any appreciable extent to the problem of this thesis.

State plans for vocational agricultural education in general are not very specific regarding supervised practice. Especially is this true when referring to farm shop supervised practice. In this connection, the Montana plan 19/, which is as specific as any plan studied, and at the same time is similar to other state plans, contains these statements: "although the farm should constitute a laboratory for much of the agricultural instruction, the school should own teaching equipment not readily available in the community.

"The instruction in vocational agriculture shall be built around the project and home farm program of the student, developing such knowledge, skills, and aptitudes as will be necessary for him to carry out an effective project and improvement program for his own home farm."

In general, the 8 states 20/ that made plans available to this investigator recommend that farm mechanics instruction be given as a separate course

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19/ "Vocational Education Manual for Montana", Department of Public Instruction, Helena, Montana, 1937-1942, pp. 29 and 31.

20/ State plans were requested from 21 states. Colorado, Iowa, Kansas, Montana, Nevada, North Dakota, Utah, and Wisconsin supplied state plans for vocational agricultural education.

of instruction during each of the 4 years of vocational agricultural instruction. (The Iowa plan 21/ advocated offering farm mechanics in the eleventh and twelfth grades.) The instruction during these 4 years is to be related to the students' home farming program. Basic shop skills and operations were generally a part of the first and second years of shop instruction. The last 2 years of instruction were to be devoted to larger construction projects and farm machinery and tractor repair.

The Colorado plan recommended that not less than 40 per cent of the vocational agriculture time be devoted to farm mechanics. From 40 per cent to 50 per cent seemed to be the generally recommended amount of vocational agriculture time that should be devoted to farm mechanics instruction.

Only the Iowa plan specifically mentioned that part-time and evening school instruction might involve farm mechanics. Other plans provided only in general for part-time and evening school instruction.

Hollenberg 22/ of California expresses the philosophy that vocational agriculture is a unit and farm shop is not a separate subject, when he states, "in our vocational agricultural teaching there should be no need for correlation of the two phases of agricultural science and the mechanical side of farming because they are one and the same thing."

21/ "Vocational Education for Iowa", State of Iowa, Board for Vocational Education, Des Moines, Iowa, May, 1938.

22/ Hollenberg, A. H., "The Correlation of Agricultural Science and Farm Mechanics Work", Report of the Twenty-First Annual Pacific Regional Conference, Misc. 2207, Office of Education, Vocational Division, U. S. Department of Interior, Washington, D. C., 1939.

PART II. PROCEDURE

Sources of Data

In an attempt to get secondary data that were related to this investigation, the following groups of publications were assembled and summarized: (a) other investigations, (b) state plans for vocational education from part of the western states, west central states, and north central states, (c) publications of professional authorities, (d) files of the Agricultural Education magazine 23/, (e) miscellaneous publications from state teacher-training departments 24/.

Primary data relating to the Montana farm shop program were secured from 364 students of vocational agriculture, 112 of whom were enrolled as third and fourth year agriculture students, and from the vocational agriculture instructors in the 11 departments studied.

Method of Gathering Data

Selecting departments for study.--The writer selected from all the vocational agricultural departments of Montana the 35 in which the instructors were in their fourth year or more of tenure. This meant that the present senior students began as freshmen under these instructors.

The state supervisor of vocational agriculture, the state teacher trainer, and the assistant state supervisor of vocational agriculture were requested 25/

23/ The Agricultural Education Magazine for the years 1929 through 1940.

24/ Publications were requested from 21 states. Useful publications were received from California, Colorado, Montana, and North Dakota.

25/ See Appendix, page 60, for copy of this request.

to make a general rating of the farm shop programs 26/ of the 35 schools.

Twenty-four of the high rating departments were re-rated by the state officials 27/ on 20 criteria 28/ set up by this investigator. The criteria covered courses of study, shop facilities, and the effectiveness of the instruction. As a result of the second rating the following 11 high scoring vocational agriculture departments were chosen for study: Belt, Big Timber, Bozeman, Chinook, Deer Lodge, Fort Benton, Harlowton, Kalispell, Laurel, Malta, and Missoula.

Means of getting data.--This investigator devised a series of questionnaires for the purpose of collecting primary data from instructors and students. Questionnaires I-1, I-2, and I-3 were filled out by this investigator during an interview with the vocational agricultural instructor. It is believed form I-1 29/ gives an indication of the type of farming in each school's patronage area. Form I-2 30/ when filled out is intended to show the relation of the project program to the type of agriculture in the school's patronage area. Form I-3 31/ shows the shop course of instruction provided for the students of this school as stated by the instructor.

26/ See Appendix page 60 for copy of rating form.

27/ See Appendix page 61 for copy of this request.

28/ See Appendix page 62 for copy of rating form.

29/ See Appendix page 63 for copy of form I-1.

30/ See Appendix page 64 for copy of form I-2.

31/ See Appendix page 65 for copy of form I-3.

The questionnaire with sheets S-4, S-5, S-6, and S-7 32/ is intended to present the scope of the student's farm shop activities in the school shop, on the home farm, and to indicate the channel through which he learned to perform these activities. This writer personally supervised the filling out of this questionnaire by vocational agriculture students in the departments studied. The exact procedure in filling out this questionnaire was as follows:

A. Freshmen

A uniform statement was made concerning the purpose of the study and how to fill in the first four questions.

1. The information desired and the method of marking columns I, II, and III were carefully explained.

2. A hypothetical job was presented to the class and the writer asked the class questions as to how the questionnaire should be filled out for this job.

3. It was carefully explained that it was not intended that the student should have completed all of the jobs on this questionnaire, nor was this list to include all of the jobs that they had completed. The students were requested to write in the names of the jobs they had completed that were not listed.

4. The freshmen were requested to mark in column I opposite the jobs they had completed the number of times that job had been done in the school shop this school year.

5. The class was then asked to mark column II separately in the same manner as column I was marked.

6. Column III was also marked separately by the freshmen. Column III included the jobs they had completed during the previous summer vacation and this school year.

B. Sophomores, juniors and seniors were given the same instructions for filling in this part of the questionnaire, except that these classes were allowed to fill in all three columns as they progressed down the page.

32/ See Appendix pages 66-69 for copies of forms S-4, S-5, S-6, S-7.

C. In order to determine the channels through which students learned to do the jobs they marked in column III, the following four questions were placed on the blackboard and fully explained to the juniors and seniors only:

1. What farm shop jobs do you do at home that you could not do before you took vocational agriculture?

2. What farm shop jobs has your instructor helped you with or given you supervision at home?

3. What farm shop jobs has your father taught you?

4. What farm shop jobs do you do at home that you learned to do without assistance from anyone?

The juniors and seniors were asked to place in the margin opposite the jobs they marked in column III the number (or numbers) of the question that came nearest to corresponding to the manner in which they learned to do these jobs.

As a means of determining the number and type of home farm shops in which vocational agriculture students could carry on home farm shop activities, this investigator prepared a rating sheet (form US-8) 33/ for the home farm shop. Only juniors and seniors were required to check this sheet. They were requested to place a check mark in the parentheses opposite the conditions that nearest fitted their home farm shop conditions.

The juniors and seniors also checked questionnaire US-9 34/ concerning the kinds of farm shop tools that were available at their homes, and the jobs they had done to improve or maintain the home farm shop facilities while they were enrolled in high school.

The juniors and seniors were asked to write yes or no to the question,

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33/ See Appendix page 70 for copy of form US-8.

34/ See Appendix page 71 for copy of form US-9.

'was your present home farm shop building being used as a farm shop when you entered high school?' In this same connection they were asked to make a brief general list of farm shop jobs they did during last summer's vacation and to make suggestions or comments relative to any phase of the vocational agriculture shop program in which they wished to express themselves.

Treatment of Data

The primary data gathered for this study fall into 3 groups. The data collected from the instructors relate to the type of agriculture found in each community, the type of agricultural project program, and the farm shop course of study. These 3 sub-groups of data have been arbitrarily summarized, placed in tabular form and may be found in tables I, II, and III, pages 22, 23, and 25.

The second group of data (from questionnaire with sheets S-4, S-5. S-6, and S-7) was collected from all of the vocational agriculture students in the schools studied. These data include the farm shop job experiences of vocational agriculture students during the 1940-41 school year in the school shop and on their home farms. A summary of the totals of the student job experiences in each major shop unit will be found in table IV, page 28. The complete tables will be found as tables X, XI, and XII of the appendix.

The last group of data was collected from 112 juniors and seniors. The first sub-group pertains to the type of home farm shop and the farm shop equipment to which vocational agriculture students have access. These data are in tabular form as tables XIII and XIV in the appendix. This sub-group also includes the efforts made by the students to improve and maintain their home farm shop facilities. The table that records these data

is found as table XI on page 43.

The last sub-group relates to the manner in which students learned to do the farm shop jobs they do at home. See table XII, page 45, for the tabular form of these data.

It is believed by this investigator that the data gathered for this thesis do not lend themselves to statistical treatment and computation of coefficients of correlation. It is, therefore, proposed that the interpretation of the data will be by deduction and comparison.

PART III. INTERPRETATION OF DATA

Type of Farming, Supervised Practice, and Farm Shop Course of Study

If a program of agricultural education is to be fully justifiable, it must include a study of the important farm enterprises in the area it serves and the instruction must be made to fit the needs of the area.

The vocational agriculture instructors believe the farm enterprises of Montana rank in order of importance as shown in table I. One might conclude that the agricultural supervised practice program (a major portion of this program is the agricultural project program) would naturally center around the more important farm enterprises. This is not quite the case in the departments studied. The instructors rank the hog enterprises as eighth (table I) while it is first by a substantial margin (table II) in the agricultural project program. Poultry only ranks sixth in the enterprise table while it ranks second in the project table. The instructors believe wheat is the second and dairy the seventh farm enterprise, while in the project program these two enterprises are sixth and fourth, respectively.

This writer believes these discrepancies may be accounted for as follows: (a) Hogs and poultry as vocational agricultural projects both lend themselves admirably to supervised practice programs. The initial investment is small, returns come quickly, and they present a challenge to both the student and the instructor if well carried out. (b) One, and perhaps 2, of the schools have large numbers of hog and poultry projects. These large numbers tend to make the ranking of these projects higher than they would otherwise be. (c) Seven of the 11 departments studied are located in irrigated or partially irrigated areas. These areas permit the instructors to encourage their

TABLE I. ORDER OF IMPORTANCE OF FARM ENTERPRISES AS RANKED BY 11 VOCATIONAL AGRICULTURE INSTRUCTORS
1940-41 School Year

Ranking	Enterprises
1	Beef cattle
2	Wheat
3	Sheep
4	Hay
5	Grain feed crops
6	Poultry
7	Dairying
8	Hogs
9	Sugar beets
10	Potatoes
11	Gardening
12	Horses
13	Fruit crops
14	Canning crops
15	Bees

TABLE II. NUMBER OF AGRICULTURAL PROJECTS CARRIED IN EACH FARM ENTERPRISE IN 11 MONTANA VOCATIONAL AGRICULTURE DEPARTMENTS
1940-41 School Year

Projects in order of importance	Projects By Schools											
	School No. 1	School No. 2	School No. 3	School No. 4	School No. 5	School No. 6	School No. 7	School No. 8	School No. 9	School No. 10	School No. 11	TOTAL
1. Hogs	4	3	15	5	5	5	5	63	10	15	6	136
2. Poultry	1	3	2	2	19	9	10	33	3	23	7	112
3. Beef	1	9	15	6	11	9	3	10	7	6	5	82
4. Dairying		5	3		3		2	38	3	7	7	68
5. Sheep	4	12	9		8		5	6	7	6	1	58
6. Wheat	10		1	5	4	13	1	2		16	1	53
7. Potatoes	11	3	5	4	7	4	1		4	11	1	51
8. Gardening	1	1	5	7	4	9	6	4	1		10	48
9. Grain feed crops	1		2	2		1			2	13		21
10. Sugar beets							1			10		11
11. Hay			2		2	1				3	1	9
12. Horses		2			4							6
13. Bees				1			2		2			5
14. Rabbits					2							2
15. Crested Wheat						1						1
16. Canning Crops												0
17. Fruit Crops												0
TOTAL	33	38	59	32	69	52	36	156	39	110	39	663

students to become rapidly established in livestock.

Inasmuch as the first 5 high ranking projects are livestock projects and the sixth a small grain project, this writer believes that these projects alone form an excellent base around which to build a diversified home farm shop program, both in the school shop and on the home farm.

It is not claimed that the summary of the course of study (table III) as stated by the agriculture instructors is any more than a very arbitrary and general summarization. The courses of study varied so greatly that tabulation was very difficult.

Very few of the instructors had written courses of study. Very few of the instructors were able to refer to a written record regarding student shop accomplishments. The writer believes that the data given by the instructors relative to their courses of study are reasonably reliable insofar as it was supplied from memory. It is probable that the instructors made more errors of omission than errors of overstatement.

Five instructors reported that they either did not have a senior class or did not teach shop in the senior year, while one instructor reported he did not teach shop in the junior and senior years due to schedule difficulties. This partially accounts for the small number of units reported as taught in the junior and senior years, as shown in table III.

Most of the instructors seemed to have the freshman shop course reasonably well organized in their minds. The second year course in some respects was not so well organized. In schools where the sophomores and juniors were combined in shop classes, a few of the instructors made efforts to give the

TABLE III. NUMBER OF INSTRUCTORS REPORTING SHOP UNITS TAUGHT

Percent of Vo-Ag Time Devoted to Farm Shop	44.5	44.5	42.5	42.5
	Number of Times Reported			
Shop Units	Freshmen	Sophomores	Juniors	Seniors
Belt Lacing				
Exercise	1			
Babbitting				
Miscellaneous	1		1	
Cold Metal				
Minor building	1	5	2	2
Major building	1	4	2	3
Concrete				
Minor	1	1		1
Major		2	1	2
Drawing				
Exercises	5			
Other	3			
Electric Welding				
Miscellaneous				1
Farm Machinery				
Small Repair	1	2	1	
Overhaul	1	3	3	
Electric Wiring				
Miscellaneous		1		
Forging				
Exercises	2	5	3	
Minor Jobs	3	7	7	3
Major Jobs	1	6	5	3
Gas Engines & Tractors				
Minor				
Major	1	3	3	3
Glazing				
Exercises	5			
Other-	2			
Harness & Leather				
Miscellaneous	3		1	
Rope				
Exercises	7			
Other	7			
Soldering				
Exercises	9	4	1	
Other	8	4	2	
Surveying				
Ditches				1
Tool Sharpening				
Small shop tools	10	3	2	
Other tools	9	2	2	1
Woodworking				
Exercises	6			
Minor building	11	11	10	5
Major building	5	9	7	5

juniors more advanced work than the sophomores received. It was not uncommon to note that all members of the combined classes did the same work. One instructor reported that his present sophomore class would do the same type of work as a junior class with the exception that as sophomores they would overhaul a mowing machine and as juniors they would overhaul a binder.

It was not uncommon for the instructor to state that the second, third, and fourth years, and sometimes the first year, students all worked on the same jobs. This seemed necessary to complete the large number of shop jobs that were furnished by the school patrons. This writer particularly noted 4 schools in which all classes were working on some of the same jobs, and that there were many more jobs to be done in these 4 shops than in other shops. One of these shops contained the following jobs in various stages of completion: 12 saddles being repaired, one wagon box being built, 2 large sheep feeders under construction with native lumber, 3 completed stock gates constructed of native poles, 2 window frames, one tool box, and miscellaneous small wood shop projects.

Another one of the 4 shops contained 3 old wagon running gears, less wheels and skeins, and 3 pairs of old, heavy car axles and wheels. Out of these old parts would come 3 serviceable rubber tired farm wagons. Juniors and seniors appeared to be working on these wagons.

From table III and the writer's observation one may conclude the following relative to the shop course of study:

a. In general most instructors have a formal shop course of study for freshmen even though there is no written record of the course.

b. The exercises, small projects, and sometimes elementary larger projects that are a part of the freshman and sophomore courses are intended to develop

basic shop skills.

c. Beyond the first year the course is in general less formal. Especially is this true in the junior and senior years of farm shop.

d. Either by coincidence or design the patrons of some of the vocational agriculture departments supply many more shop jobs than are supplied to other vocational agriculture departments. In these 4 departments it was quite noticeable that the student interest, industry, discipline and quality and quantity of work are all that can be expected.

e. The instructors emphasized the following types of farm shop work in about the following order; i.e., carpentry and woodworking, forging, tool sharpening, soldering and cold metal work. This conclusion is borne out by noting the student job experiences in these units in table IV.

Farm Shop Experiences of All Students

Vocational agriculture students are encouraged to bring problems that arise concerning their agricultural projects to the classroom for solution. Does this not suggest that farm shop problems and farm shop jobs could also be brought from home for solution and completion in the school shop? This is certainly in keeping with the basic principles of vocational education which state that the instruction functions on the job; that the training jobs are the same as real jobs in the occupation, and training jobs are the jobs of the occupation.

Table IV clearly indicates that many of the farm shop experiences of Montana vocational agriculture students are not acquired as vocationally as they should be. As an answer to the question, 'to what extent do vocational agriculture students bring farm shop jobs from their home farms

TABLE IV. NUMBER OF STUDENT EXPERIENCES IN VARIOUS FARM SHOP UNITS IN 11 MONTANA VOCATIONAL AGRICULTURE DEPARTMENTS, 1940-41 School Year*

Farm Shop Units	I	II	III
	Number of Experience		
	In School Shop		
	Not From Home	From Home	At Home
Carpentry and Woodwork	791	239	1400
Concrete and Masonry	127	10	426
Drawing & Bills of Materials	357	87	146
Electric Wiring	43	17	342
Farm Machinery Repair	141	42	1308
Forging	577	249	369
Gas Engines & Tractors	142	162	1008
Glazing	296	34	617
Harness & Leather	100	76	671
Plumbing	103	26	358
Rope	543	69	407
Soldering & Cold Metal	534	142	414
Tool Sharpening	754	492	1429
General Improvement Jobs	102	30	835
TOTAL	4610	1675	9730

*Taken from tables X, XI, and XII in the appendix.

to the school shop for completion', it is worth noting that of 6285 student job experiences all students acquire in the school shop, 73.3 per cent (4610) were acquired on jobs that did not come from the students' home farms (see table IV).

It might be expected that there would be fewer jobs brought from home than jobs furnished by the instructor. Transporting the jobs from the home farm sometimes presents a problem that is often easily but unwisely solved by the instructor supplying the jobs himself. It might also be expected that the farm shop jobs brought from home would be smaller in number due to the time element in getting large freshman classes accustomed to bringing jobs from home. Table V indicates that sophomores and juniors do bring more jobs from home per student than do the freshmen. However, the seniors bring the fewest jobs per student. The average experiences per student for the 3 upper classes with jobs from home is .329 compared to .315 for the freshmen. This difference is not significant.

The large percentage of jobs supplied by the instructors and the small percentage supplied by the students (see columns I and II, table IV) is significant. Besides detracting from true vocational teaching it is an indication that the school farm shop facilities are not being employed in a program of improving the student's home farm. In this connection this writer noted that a part of the jobs completed in the school shop are of the nature of shop exercises. One class of 23 freshmen were, one at a time, cutting glass to size and installing it in a small practice window sash. The glazing activities of this one class account for approximately 40 per

TABLE V. NUMBER OF EXPERIENCES PER CLASS IN THE SCHOOL SHOP ON JOBS THAT CAME FROM HOME FARMS OF MONTANA VOCATIONAL AGRICULTURE STUDENTS - 1940-41 School Year*

Number of Students Studied	160		92		60		52		364	
	Number of Experiences									
Farm Shop Units	Freshmen		Sophomores		Juniors		Seniors		All	
	No.	No. Per Stu.	No.	No. Per Stu.	No.	No. Per Stu.	No.	No. Per Stu.	No.	No. Per Stu.
Carpentry & Woodwork	121	.75	73	.79	37	.61	18	.35	239	.79
Concrete & Masonry	2	.01	0	.00	4	.06	4	.08	10	.02
Drawing & Bills of Matls.	47	.29	28	.30	8	.13	4	.08	87	.24
Electric Wiring	10	.06	5	.05	1	.01	1	.02	17	.04
Farm Machinery Repair	20	.12	10	.10	11	.18	1	.02	42	.11
Forging	74	.46	70	.76	73	1.20	32	.62	249	.68
Gas Engines & Tractors	24	.15	76	.83	45	.70	17	.33	162	.44
Glazing	13	.08	10	.10	6	.10	5	.10	34	.09
Harness & Leather Work	25	.17	20	.20	27	.45	4	.08	76	.21
Plumbing	12	.07	4	.04	5	.08	5	.10	26	.07
Rope	46	.28	15	.16	3	.05	5	.10	69	.19
Soldering & Cold Metal	52	.32	42	.45	36	.60	12	.14	142	.39
Tool Sharpening	252	1.57	101	1.20	92	1.50	47	.92	492	1.35
General Improvement Jobs	15	.09	5	.05	4	.07	6	.12	30	.08
AVERAGE		.315		.359		.410		.218		.335

*Taken from Table XI of the appendix.

cent of all of the glazing activities 35/ in all schools studied. Another instructor required each member of his freshman carpentry class to complete 16 wood working exercises before the student could start any kind of a real carpentry job. Quite a few of the forging jobs completed in the school shop are of the nature of exercises. Gate hooks, staples and, in a few cases, chisels and punches were being made that were too small to be of use on a farm. Exercises in belt lacing, babbitting, electric wiring, preparing waxed ends that are not used, pipe cutting and threading exercises, soldering exercises and much of the rope work are taught in a manner that is not truly vocational.

Tables VI and VII 36/ are significant in answering questions that relate to the type and amount of farm shop work that vocational agriculture students do at home and how this compares with the type and amount completed in the school shop. As might be expected, students encounter more jobs at home from which they gain farm shop experience than are encountered in the school shop. Students are seldom in farm shop classes more than 5 hours per week but the amount of time at home that may be devoted to farm shop averages more than this.

It may be assumed from table VI that the farm shop experiences that vocational agriculture students have at home are acquired on jobs that are essential to home farm operations; otherwise these jobs would not be attempted. It may be assumed that the most important phases of home farm

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35/ See glazing, table X, pages 72-76 of the appendix.

36/ See tables X, XI, and XII, pages 72-86 of the appendix.

TABLE VI. THE RELATIVE IMPORTANCE OF 14 PHASES OF FARM MECHANICS WORK BASED ON THE HOME FARM MECHANICS EXPERIENCES OF 344 MONTANA VOCATIONAL AGRICULTURE STUDENTS 1940-41 School Year*

Type of Farm Shop Work	Student Job Experiences
1. Tool sharpening	1429
2. Carpentry and woodwork	1400
3. Farm machinery repair	1308
4. Gas engines and tractors	1008
5. General improvement jobs	835
6. Harness and leather work	671
7. Glazing	617
8. Concrete and masonry	426
9. Soldering and cold metal	414
10. Rope	407
11. Forging	369
12. Plumbing	358
13. Electric wiring	342
14. Drawing and bills of materials	146
TOTAL	9730

*Taken from table XII of the appendix.

TABLE VII. THE RELATIVE IMPORTANCE OF 14 PHASES OF FARM MECHANICS WORK BASED ON THE SCHOOL SHOP FARM MECHANICS EXPERIENCES OF 364 MONTANA VOCATIONAL AGRICULTURE STUDENTS 1940-41 School Year*

Type of Farm Shop Work	Student Job Experiences
1. Tool sharpening	1246
2. Carpentry and woodwork	1030
3. Forging	826
4. Soldering and cold metal	676
5. Rope	612
6. Drawing and bills of materials	444
7. Glazing	330
8. Gas engines and tractor repair	304
9. Farm machinery repair	183
10. Harness and leather work	176
11. Concrete and masonry	137
12. General improvement jobs	132
13. Plumbing	129
14. Electric wiring	60
TOTAL	6285

*Taken from tables X and XI of the appendix.

mechanics are those in which the students are allowed by their fathers to participate to the greatest extent. The data in tables VI and VII reveal that there is a difference in the type of farm shop work that vocational agriculture students do at home and what they do in the school shop.

Even though tool sharpening does actually rank first in both tables VI and VII the similarity ceases with the ranking. The tool sharpening as carried on in the school shop consists largely of sharpening carpentry and woodworking tools, plus axes and hatchets. On the home farms the students do not sharpen so many tools of this type, but they do get many other kinds of tool sharpening experiences. Sharpening carpentry tools in the school shop provided 855 student job experiences. Only 316 similar experiences were encountered at home (see upper portion of table VIII). Sharpening other farm tools in the school shop provided 381 experiences, while at home the similar sharpening experiences were almost three times (113) as many (see lower portion of table VIII).

Carpentry and woodworking rank second in both tables VI and VII. Beyond this there is no important degree of similarity between the farm shop work done by vocational agriculture students in the school shop and at home. Table VI shows that farm boys do get many experiences at home in farm machinery repair and gas engine and tractor repair. Table VII clearly shows that this type of instruction in the school shop is very limited.

It is worthy of note that general improvement jobs and harness and leather work rank fifth and sixth respectively as jobs that are done on the farm. The same jobs rank only tenth and eleventh in importance in the school

TABLE VIII. NUMBER OF EXPERIENCES OF VOCATIONAL AGRICULTURE STUDENTS IN SHARPENING A SELECTED LIST OF FARM TOOLS 1940-41 School Year*

Number of Students Studied	364		344	
Tools Sharpened	Number of Experiences			
	In School Shop		At Home	
	Number	Per Cent	Number	Per Cent
1. Wood chisels	234	64.3	56	16.30
2. Cold chisels	190	52.2	96	27.91
3. Plane bits	167	45.9	47	13.66
4. Auger bits	60	16.7	43	12.50
5. Hand saws	204	56.0	74	21.53
Total	855		316	
6. Circle saws	12	3.3	19	5.5
7. Butcher knives	116	31.8	164	47.6
8. Scythe	5	1.4	88	25.8
9. Mower sickle	2	.5	161	46.8
10. Hoe	5	1.4	201	58.5
11. Cultivator shovel	5	1.4	50	14.5
12. Harrow teeth	23	6.3	17	4.9
13. Disc harrow blade	0	0.0	4	1.2
14. Plow share	1	.2	33	9.6
15. Axe	102	28.1	223	64.8
16. Hatchet	69	18.9	148	43.1
17. Miscellaneous	41	11.2	5	1.45
Total	381		1113	

*Taken from tool sharpening, tables X, XI, and XII in the appendix.

shop. Apparently farmers and their sons do not do as much forging, soldering, rope work and drawing of plans on the home farm as the sons do in the school shop. These activities rank much lower in table VI than in table VII.

In 1928, Sutherland 37/ reported that 290 farmers thought gas engines, auto and tractor repairing, and overhauling of farm machinery were the most important types of instruction that should be given to vocational agriculture students in the school shop. The types of instruction following in importance were farm building repair, tool sharpening, and blacksmithing repair projects. A careful study of table IX reveals that there is quite a degree of similarity between the home farm shop activities of vocational agriculture students in 1940-41 and what the 290 farmers thought should be taught. The phases of tool sharpening, carpentry and woodwork, farm machinery repairing, and gas engine and tractor repairing rank among the first 4 of the 1940-41 and the 1928 activities. The low ranking of home farm forging activities in 1940-41 may be accounted for by the fact that less than 40 per cent of the students studied have forges on their home farms. 38/ Belt lacing, which ranks seventh in the 1928 list of activities has been included as a part of farm machinery repair in the 1940-41 list. Repairing fences and gates makes up approximately 60 per cent of the 1940-41 general improvement activities. The ranking of harness repair as twelfth in 1928 and sixth in 1940-41 is somewhat difficult to account for. The higher rank of 1940-41 may be due to a "forced use" of old and discarded equipment during the depressed

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37/ Ibid, footnote 17, page 12.

38/ Item No. 3, table XIV of the appendix.

TABLE IX. RELATIVE IMPORTANCE OF TYPES OF HOME FARM SHOP ACTIVITIES ENGAGED IN BY 344 VOCATIONAL AGRICULTURE STUDENTS IN 1940-41 AND THE RELATIVE IMPORTANCE OF TYPES OF FARM SHOP ACTIVITIES THAT 290 FARMERS THOUGHT SHOULD BE TAUGHT TO VOCATIONAL AGRICULTURE STUDENTS IN 1938

Home Farm Shop Activities of 1940-41*		Farmers Recommended Be Taught in 1928**	
Rank	Type of Activity	Rank	Type of Activity
1.	Tool Sharpening	1.	Gas engine, auto and tractor repair
2.	Carpentry and woodwork	2.	Overhauling farm machinery
3.	Farm machinery repair	3.	Farm building repair
4.	Gas engines and tractor repair	4.	Tool sharpening - including saw filing
5.	General improvement jobs	5.	Repair projects in forge work
6.	Harness and leather work	6.	Setting up new farm machinery
7.	Glazing	7.	Belt lacing
8.	Concrete and Masonry	8.	Repairing fences and gates
9.	Soldering and cold metal	9.	Rope work
10.	Rope	10.	Babbitting
11.	Forging	11.	Farm building construction
12.	Plumbing	12.	Harness repair
13.	Electric wiring	13.	Electric wiring
14.	Drawing and bills of materials		

*Taken from table VI, page 32 of this thesis.
**Taken from table IV, page 25, of the Sutherland study.

agricultural conditions of the last decade.

As a means of discovering whether the farm mechanics course of study had undergone change during the last decade, a part of the data from table IV of the Sutherland study 39/ was rearranged. These data concern farm shop projects that were being taught at the time the Sutherland study was made. Sutherland divided the projects into 26 different phases of farm shop activity, while this writer condensed them into the 14 phases being studied in this thesis. These were then compared in table X with the types of experience that students received in the school shop during 1940-41.

Sutherland concluded that the type of farm shop work being given in 1928 was not the type farmers believed should be taught. Since this time the emphasis placed upon the various types of farm shop instruction by the vocational agriculture instructors has changed in only a few respects. In 1928 carpentry and woodwork, tool sharpening and forging ranked as the 3 highest based upon the number of student job experiences in the school shop. It may be noted that the carpentry course is no longer a course in furniture making, repairing, and refinishing. The carpentry course of today includes some furniture work but it also includes many other building and repair projects that are useful on the farm. There was essentially no change in emphasis on soldering, rope and glazing, which ranked fourth, fifth, and seventh in 1940-41 while they ranked seventh, sixth, and fifth, respectively, in 1928.

It is especially significant to note from tables IX and X that:

a. Gas engine and tractor repairs and farm machinery repair rank eighth

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39/ Ibid, footnote 17, page 12, and footnote 37, page 36.

TABLE X. RELATIVE IMPORTANCE OF 14 TYPES OF FARM MECHANICS WORK IN SCHOOL SHOP IN MONTANA BASED ON STUDENT JOB EXPERIENCES IN 1940-41 AND PROJECTS TAUGHT IN 1927-28

1940-41 School Year*		1927-28 School Year**	
Types of Farm Shop Work	Student Experiences	Types of Farm Shop Work	Projects Taught
1. Tool sharpening	1246	1. Carpentry & woodwork	1726
2. Carpentry & woodwork	1030	2. Tool sharpening	1162
3. Forging	826	3. Forging	470
4. Soldering & cold metal	676	4. Harness & leather work	244
5. Rope	612	5. Glazing	177
6. Drawing & bills of materials	444	6. Rope	140
7. Glazing	330	7. Soldering and cold metal	95
8. Gas engine and tractor repair	304	8. Gas engine and tractor repair	51
9. Farm machinery repair	183	9. Farm machinery repair	46
10. Harness and leather work	176	10. Plumbing	44
11. Concrete and masonry	137	11. Concrete and masonry	18
12. General improve. jobs	132	12. General improvements	1
13. Plumbing	129	13. Electric wiring	1
14. Electric wiring	60	14. Drawing and bills of materials	(Unreported)

*Taken from tab le VII, page 33 of this thesis.
**Taken from table IV, page 25 of the Sutherland study.

and ninth at both dates.

b. These are the two units that 290 farmers ranked as being the most desirable types of farm shop instruction to be given.

c. Gas engine and tractor repairing and farm machinery repairing rank third and fourth today as home farm shop activities.

With the exception of harness and leather work the emphasis on the remainder of the units taught in 1940-41 and 1927-28 is much the same.

In drawing a conclusion relative to the extent of change in the Montana farm shop course of study, it may be said that the farm shop units are being taught more vocationally today. Only a small amount of change has been made in the emphasis placed upon the various units of the farm shop course of instruction. The conclusion made by Sutherland still stands much as it did in 1928.

Home Farm Shop Facilities

It might be expected that vocational agriculture students would have reasonably adequate shop facilities at home in view of the large number of home farm shop jobs that they do. The true answer to this is revealed by making a study of table XIII, page 88 of the appendix. Seventeen and nine-tenths per cent of the vocational agriculture students studied do not have access to a shop. This is in part accounted for by 14.3 per cent of town boys that are in the vocational agriculture classes. Another 26.4 per cent of the students have access to a farm shop with less than 100 sq. ft. of floor space. This writer believes that a farm shop that is smaller than 14 feet by 16 feet or approximately 200 square feet of floor space is inadequate to take care of the shop needs of most farms. A larger amount of floor space

is preferable.

Only 45 per cent of the students reported a home farm shop with a door large enough for a car, tractor, or truck to be taken into the shop. A total of 78.6 per cent of the shops are unheated and unsuitable for use in severe weather. According to vocational agriculture students, 40 per cent of the home farm shops are inadequately lighted for use during the day time.

It is surprising that vocational agriculture students are able to do as many jobs at home as they do. The problem of size, lack of large doors for getting equipment into the shop, lack of heating facilities, and inadequate light, present a worthwhile challenge for those who are charged with the responsibility of improving the home farm shop program.

The data in table XIII pertaining to storage of tools, lumber, iron, nails, bolts, etc., are not in themselves conclusive evidence that these supplies are not well stored. The writer has at other times observed farm shops in which tools were not put away. He has also observed piles of lumber and iron that were stored on various parts of the farmstead. These piles are, in reality, junk and have little value as such. These data and observations lead this writer to believe that there is much room for improvement in the storage of farm shop tools and supplies. The writer believes this is especially true in respect to used supplies such as lumber, iron, bolts, leather, and other miscellaneous materials.

Although home farm shop building facilities are inadequate, the farm shop tool situation seems to be more adequate. Quite a large percentage of vocational agriculture students have an adequate assortment of farm shop tools on their home farms. 40/ There are, however, a few essential tools

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40/ See table XIV, page 89 of the appendix.

that are not in as many farm shops as they should be. Shop vises are a part of the equipment of 67.8 per cent of the farm shops. This seems a relatively high percentage, but this writer believes that this percentage should be even higher. Only 39.3 per cent of the shops have forges. This is an indication that there are fewer forges than there should be. It seems that more than 38.8 per cent of the farm shops should have post drills. Farm repair work often necessitates drilling holes in iron. The low rating of twist drills is, of course, accounted for by the low rating of post drills. Only 36.3 per cent of the farm shops have stocks and dies for threading bolts. With the few exceptions noted, it may be stated that vocational agriculture students do not lack home farm shop tools with which to work.

It has been shown that there is room for improvement in the home farm shop facilities. Paralleling this we may note table XI indicating that an adequate home farm shop improvement program has not been successfully undertaken. An improvement program must certainly center around improved farm shop buildings. Even the planning of these buildings is an activity that has been participated in by only 15.2 per cent of the students studied. Improvement jobs such as building farm forges, or installing a shop stove had only 6.3 per cent and 7.1 per cent participation. This is equipment that only a few farm shops have. The writer knows of forges and shop stoves that have been built of used and waste material from the farm scrap pile. Other jobs listed in table XI may not be as easily and cheaply completed as these jobs mentioned but an ingenious vocational agriculture student encouraged by an "improvement minded" vocational agriculture instructor could accomplish more than is now being done.

TABLE XI. NUMBER OF VOCATIONAL AGRICULTURE STUDENTS THAT HAVE MADE IMPROVEMENTS IN THEIR HOME FARM SHOP WHILE ENROLLED IN HIGH SCHOOL*

Improvement Job	Number of Students Completing Jobs	Pct. of Students Completing Jobs
1. Plan a home farm shop	17	15.2
2. Construct or prepare a building for shop	17	15.2
3. Provide storage space for tools	54	48.2
4. Provide storage space for screws, nails, bolts, etc.	57	50.9
5. Construct a work bench	26	23.1
6. Install a shop vise	21	18.8
7. Construct anvil of heavy iron	10	8.9
8. Construct anvil base	14	12.5
9. Construct or install forge	7	6.3
10. Construct or install shop stove	8	7.1
11. Provide storage space for lumber and iron	25	22.2
12. Install emery wheel or grindstone	26	23.1
13. Improve shop floor	18	16.1
14. Clean the shop once per month	44	39.3

*This study included 112 junior and senior vocational agriculture students.

How Students Learned To Do Farm Shop Jobs

In examining table XII we can learn how vocational agriculture students say they learned to do the farm shop jobs which they do at home. It is quite significant to note that father is still the most important single teacher. The boys claim that their fathers taught them to do 42 per cent of the jobs they now do (question III, table XII). When the boys indicated more than one factor had been influential in their learning to do jobs, the father's influence was often noted as one of the factors. One may be inclined to believe that the 16 per cent of the jobs taught by the instructor (question I) is much smaller than it should be. This writer shares the belief that the percentage is somewhat smaller than it should be. However, it must be reiterated that students are at home much more of the time than they are in school. In defense of the instructors, it should also be stated that they have many other phases of vocational agriculture to teach besides farm shop. These factors may in part account for the seemingly low percentage.

The very low percentage (6 per cent) of home farm shop jobs supervised by the instructors (question II, table XII) is supported by statements made by the instructors themselves. In referring to the amount of home supervision several of the instructors remarked, "You won't find much of that here". This low percentage is relatively significant as a point from which to initiate a home farm shop improvement program.

Summary

Conclusions Relating To Carryover

1. Vocational agriculture students receive only a small amount of home farm shop supervision from their vocational agriculture instructors.

TABLE XII. METHOD BY WHICH 112 MONTANA JUNIOR AND SENIOR VOCATIONAL AGRICULTURE STUDENTS INDICATED THEY LEARNED TO DO 3354 FARM SHOP JOBS THEY DID AT HOME - 1940-41
School Year

Sources of help or supervision on jobs	Farm Shop Jobs Completed At Home	
	No. of Jobs	Pct. of Jobs
Question I What farm shop jobs do you at home that you could not do before you took vocational agriculture?	537	16
Question II What farm shop jobs has your instructor helped you with or given you supervision at your home?	201	6
Question III What farm shop jobs has your father taught you?	1415	42
Question IV What farm shop jobs do you do at home that you learned to do without assistance from anyone?	606	18
Combinations of markings in which markings of question two appeared. (Jobs in which the instructor gave partial supervision or help.)	265	8
Other combination markings. (Jobs in which student had partial help from various sources.)	330	10

2. The lack of supervision is an indication that carryover has not been emphasized at a point in the farm shop program where results might be expected.

3. Vocational agriculture students bring relatively few farm shop jobs from home to the school shop for completion. Hence carryover may be expected to be small in this respect.

4. With a few exceptions, the types of farm shop work that vocational agriculture students do at home are not the types of work that are emphasized in the school shop. This is especially applicable to such types of shop work as gas engine and tractor repairing, farm machinery repairing, and general farm tool sharpening. It is also applicable, but to a lesser extent, to concrete work, harness and leather work, glazing and general improvement jobs.

5. Carpentry and tool sharpening are two important exceptions referred to in conclusion 4. These 2 farm shop units receive major student attention in school and at home. It may be reasoned that inasmuch as vocational agriculture students do other types of home farm shop jobs with only a small amount of school instruction, carpentry and tool sharpening jobs would also be done at home if school instruction were lacking. It would then follow that carryover was small for these units. The writer believes that the jobs would be done in these units even if school instruction were lacking. While the carryover may not be all that is desired in these units, this writer believes that more and better quality of workmanship are the results of the school instruction.

6. The carryover to the home farm is small in drawing and computing bills of materials, forging and rope work. Students do not do as many of

these jobs at home as they do in the school.

7. The data of this study do not give an indication of the extent of transfer of training received on one type of farm shop work to another type of work. It is conceivable that instruction in forging, even though not used as forging, might give some transfer in the use and handling of tools in farm machinery repair. The same might be said of cold metal work and farm machinery repair, or of small carpentry projects and building a farm trailer.

8. Vocational agriculture students get many more farm shop experiences at home than they get in the school shop. This is not only true of the various phases of farm shop, but also of the experiences within each phase. It seems correct to assume that the standards of workmanship in the school are acceptable. The data in this study do not give an indication of how well vocational agriculture students do the many farm shop jobs they do at home. This writer's experience in observing many farmers and their sons doing farm shop repair jobs, causes him to believe that there is room for improvement in the methods of doing the jobs and in standards of workmanship.

9. The foregoing conclusions lead to this final conclusion; i.e. the carryover of school farm shop instruction to the home farm is not great because:

a. The type of farm shop work taught in the school shop is not the type used on farms.

b. No definite effort has been made by instructors to carry on farm shop supervised practice, either as a part of the agricultural project program or as a separate supervised practice.

c. The amount of home farm shop supervision that vocational agriculture students receive from their instructors is too small to be very effective.

General Conclusions

1. Montana vocational agriculture farm shop objectives are not well defined. The course of study is not well outlined. This is especially true of the courses for the upper classes. The shop course often includes whatever farm shop jobs happen to be on hand. It may be said that emphasis has been placed upon developing farm shop skills with small thought to their subsequent use.

2. Vocational agriculture farm shops are often a place where school patrons may get free work done. This type of farm shop is helpful to the school patrons, and helpful to the vocational agriculture department in establishing a type of prestige in the community. It does not develop student responsibility in supplying shop projects or in initiating a farm mechanics supervised practice program.

3. The agricultural project program of Montana vocational agriculture departments follows the general pattern of the major farm enterprises of the state.

4. The data of this study do not indicate the number of students that have completed farm shop projects relating to their agricultural projects.

5. Six of the eleven departments studied do not give farm shop instruction to senior vocational agriculture students.

6. A fairly high proportion of vocational agriculture students have access to an adequate supply of home farm shop tools.

7. Buildings used for home farm shop activities appear to be inadequate to care for the shop needs of most farms. A further study of this topic would permit more definite conclusions.

8. The general pattern of the vocational agriculture shop program has undergone only a few changes during the last decade. The major changes involve less furniture making in favor of more practical farm construction. The kind of shop work done still fails to conform to the needs of the students.

9. Vocational agriculture instructors in general recognize that farm shop supervised practice and a home farm mechanics improvement program have not received the same degree of emphasis that has been given to the agricultural project program.

PART IV. RECOMMENDATIONS FOR IMPROVING THE MONTANA FARM SHOP PROGRAM

Vocational education has been defined as that part of the experiences of an individual that enables him to learn to carry on a gainful occupation 41/. It was the major objective of this thesis to attempt to determine to what extent the farm shop experiences that vocational agriculture students receive in the high school shop classes will be helpful to them in the occupation of farming. The application of class instruction to home farm jobs is termed carryover. The foregoing conclusions of this thesis indicate that carryover is not great.

The farm shop course of study, the home shop practice program, teacher preparation and farm shop research program are important factors leading to improvement. These factors are not receiving enough attention at the present time. This part of the study will give attention to these factors as recommendations that will lead to improvement in the Montana farm shop program.

Shop Course of Study

Since the present farm shop course of study does not meet the needs of vocational agriculture students, it should be reorganized. It will still be necessary to emphasize carpentry and woodworking and tool sharpening. Gas engine and tractor repairing, farm machinery repairing, and general improvement jobs should receive almost the same emphasis as carpentry and tool sharpening.

41/ Prosser and Allen, "Vocational Education in a Democracy", The Century Company, New York, 1925, p. 4.

It may still be necessary to use a few shop exercises to develop some of the desirable skills. It is, of course, much more economical to risk spoiling a practice saw blade than a good saw. The same may be said of some other types of shop work. However, it seems that many of the desirable skills may be developed on practical jobs. Drawing of iron in blacksmithing may be taught by reshaping harrow teeth. Bending of iron may be taught by making end gate rods and hitches for farm trailers. Lumber may have to be ordered overlength to allow beginners to have some practice in sawing as they lay the floor in a new trailer box.

In view of the writer's experience as a vocational agriculture instructor and his observations in this study, he believes that no time should be lost in starting first year students in the farm shop. Time may not permit freshmen to participate in all types of farm shop work. Even then no effort should be spared in making this year's experiences as wide and varied as possible. Freshmen may not work as fast or as well as upperclassmen in making a farm trailer or overhauling a grain drill, but they will be interested in this kind of work. The first year students are doing these and similar jobs on their home farms without instruction. Good vocational teaching implies that the student be taught to do good quality work on a practical job at the time there is a need for the job to be done.

Far too little time is being spent in the school shop by upperclassmen. It would seem advisable to devote from 40 to 50 per cent of the total vocational agriculture time of all classes to shop instruction. More efficient results may be attained if all of the vocational time for 2 weeks or even

a month be devoted to shop instruction. This same amount of time could then be devoted to strictly agricultural subjects.

As a further means of improving the farm mechanics of the local community, this writer would like to suggest that more attention be given to organized shop instruction for out-of-school rural groups. At no point in the whole Smith-Hughes farmer training program is the opportunity so great for farm mechanics training to be effective. These young men have entered farming or are nearer to entering farming than are high school students. Their maturity, need for instruction, and immediate use of instruction warrant the consideration of all educators.

Home Practice Program

Farm shop training will be much more effective if a vitalized home farm shop practice program is instituted. Such a program will necessitate more careful attention to and supervision of the home farm mechanical needs of vocational agriculture students. Instructors should become acquainted with the student, his parents, and his farm shop supervised practice needs (and other supervised practice needs also) before the student enrolls for his first year of vocational agriculture. Survey data gathered during summer visits to the farms of prospective and other students should be made the basis of the farm shop course of study. If the survey revealed a number of home farm mechanical jobs relating to the student's agricultural project or other supervised practice activities, a home farm mechanics project should be organized. Under careful direction and supervision of the parents and the instructor, credit toward graduation from high school may be granted

for such a project. The home farm mechanics project should very early take the form of a long-time plan of carrying on and improving the mechanical activities of the home farm. It certainly should include the home farm shop facilities.

Students should be encouraged to accept the responsibility of supplying their own school shop projects. If transporting the projects to and from the school shop becomes a problem the school may have access to transportation facilities of ample capacity for moving such projects.

Teacher Qualifications

Vocational agriculture instructors recognize that they are not fully prepared to teach all of the types of farm shop that should be taught. This is especially true in regard to gas engine, tractor and farm machinery repairing. In discussing this with the writer they quite often stated, "Who is going to teach this work? We have very little training in these fields."

There are several answers to this question. These instructors might do the preliminary work of organizing a class of their all-day students or an out-of-school group. An itinerant specialist employed by the State Department of Vocational Education could then give the instruction. If a state specialist were not available, a well qualified local man could be employed under the supervision of the agriculture instructor. Either of these methods will not only train vocational agriculture students but will go a long way toward giving the local vocational agriculture instructor the training he lacks.

Vocational agriculture instructors should not overlook advanced and

intense specialized shop courses made available by the State Department of Vocational Education. It follows that the state departments should provide worthwhile courses and then encourage the instructors to enroll periodically in these courses.

A very vital point in making long-time plans for improvement in the vocational agriculture shop program has to do with the selection of future vocational agriculture teachers at the college level.

The plan of selection should provide for elimination of trainees that do not have at least average scholastic records. Those that have less than average mechanical aptitude should not be encouraged to enter the field of agricultural education. Prospective trainees that do not have an adequate mechanical background should be expected to enhance this background before becoming trainees. Such a program of selection will allow the teacher training institutions to turn out vocational agriculture instructors that are capable of executing a worthwhile farm shop program.

Definite efforts should be made by institutions that are training present and future vocational agriculture instructors to re-orient their farm shop training objectives. Few, indeed, are the vocational agriculture instructors who will be called upon to design a barn, a farm machine, or make a brake horsepower test of a tractor. It is much more important that they know how to select and how to teach the selection of the right barn or poultry house and the right farm equipment for a particular farm. It is just as important that the instructor know how to lay out a foundation, how to cut the framing members, etc., for the barn, and how to repair and care for farm machinery.

Until the farm mechanics training courses include this type of training, the newly graduated vocational agriculture instructors will be inadequately equipped to execute a farm shop program that meets the needs of the community they will be asked to serve.

Research Program

The somewhat low status of the Montana farm mechanics program may in part be accounted for by the fact that the research program is not receiving the attention it merits.

This study is only a step in finding the existing conditions and making recommendations for improvement. Much is still to be done.

This and other studies have not said the last word relative to the exact status of the home farm shop facilities. It is generally conceded that there is room for improvement. Only a definite study of this problem will answer this question and make possible appropriate recommendations for improvement.

Relatively few data were available indicating just how closely vocational agriculture students parallel their farm shop activities with their productive project activities.

While efforts are being made to study the problem of teacher selection and preparation, most teacher training institutions graduate all students who wish to enroll in agricultural education and who can complete the minimum scholastic requirements. Appropriate studies in this field might deal with minimum standards of mechanical aptitude and experience necessary to indicate success as a farm shop teacher.

If and when the farm shop course of study is changed to meet the needs of the vocational agriculture students, another need will at once arise for teaching aids and devices to handle effectively the new type of instruction.

The importance of teaching management and selection practices relative to farm machinery and equipment has been pointed out. Very little has been done in developing teaching techniques and situations in this field.

No doubt many small bits of data have been collected by vocational agriculture instructors relating to some of the problems that are encountered in their own communities. The collection and summarization of these data would be a contribution to the whole program.

SUMMARY

The results of this study indicate that carryover of farm mechanics instruction to the home farm is not only lacking in Montana but in other states also. No other studies were noted that were concerned with carryover. Relatively few authors have dealt with farm shop supervised practice programs. Even the state plans for vocational agricultural education are not specific in this respect.

The lack of carryover in Montana seems to be due to the following factors:

1. Lack of definite course planning that will attain carryover.

2. A meager home farm shop supervised practice program.

3. The types of farm shop work that vocational agricultural students do at home are not the types of work emphasized in the school shop.

4. Students bring relatively few jobs from home for completion in the school shop.

5. The small amount of home farm shop supervision that students receive from their instructors.

In summarizing the results of the carryover study, a number of other conclusions were noted.

1. Very few instructors have written courses of study.

2. Farm shop students complete much free work for school patrons. This does not encourage students to bring farm shop jobs from home.

3. The Montana agricultural project program parallels the pattern of the major farm enterprises of the state.

4. Farm shop instruction is given to less than 50 per cent of senior

vocational agriculture students.

5. Vocational agriculture students have access to an adequate supply of shop tools on their home farms. The home farm shop buildings are inadequate.

6. The Montana vocational agriculture shop program still fails to confirm to the needs of the students.

7. Vocational agriculture instructors recognize that farm shop supervised practice programs have not been emphasized.

8. The instructors recognize that their college training did not adequately prepare them to teach farm shop.

On the basis of the foregoing conclusions the following recommendations for improvement of farm mechanics instruction seem appropriate.

1. The community survey is desirable as a starting point in planning a farm shop course of study that will meet the needs of vocational agriculture students.

2. The present farm shop instructional needs of Montana vocational agriculture students should center around carpentry, tool sharpening, farm machinery repairing and general improvement jobs.

3. A vitalized and well supervised farm mechanics home practice program should be a definite part of the course of study of all vocational agriculture departments.

4. Well planned farm mechanics instruction for out-of-school groups may well receive more attention.

5. More careful teacher selection at the college level will improve the farm mechanics program.

6. Advanced, specialized farm shop courses should be made available

to instructors that are in service.

7. Farm shop training objectives of teacher training institutions are in need of revision.

8. Extension of research will be helpful if it includes:

a. Further study of home farm shop facilities.

b. Relation of farm shop and agricultural project activities.

c. Means of teacher selection at college level.

d. Development of course materials for home practice programs, part-time and evening school programs, and the management and selection phases of farm mechanics activities.

APPENDIX

TABLE I. INSTRUCTIONS AND SCHEDULE FOR RATING VOCATIONAL AGRICULTURE SHOP PROGRAMS OF MONTANA BY STATE OFFICIALS

January 10, 1941

Dear Sir:

I should be pleased to have you place the names of the attached list of Montana vocational agriculture departments in three groups, according to your judgment of the value of each farm shop program.

Please use the following rating scale. Place a letter before each department name, in the column on the left of the names.

U = Farm shop program is rated as being in the upper one-third of this group.

M = Farm shop program is rated as being in the middle one-third of this group.

L = Farm shop program is rated as being in the lower one-third of this group.

Thank you.

(signed) W. J. Welker

Rating	Post Office	Name of School	County	Vo-Ag Instr.
	No. 1			
	No. 2			
	No. 3			
	No. 4, etc.			
	-			
	-			
	-			
	No. 35*			

*Post office addresses, names of schools, names of counties, and names of vocational agriculture instructors purposely omitted.

TABLE II. INSTRUCTIONS FOR SCORING SELECTED VOCATIONAL AGRICULTURE DEPARTMENT SHOP PROGRAMS OF MONTANA

January 18, 1941

Dear Sir:

I should be pleased to have you score the Montana Vocational Agriculture shop programs that are listed on the attached form.

You may use a scale of one-to five for scoring. The low numbers, that is, one, two, and three will indicate a low to medium score for the factor being scored in relation to the same factor for other departments that are being scored. The higher numbers, that is, three, four, and five will indicate a medium to high score for the factor being scored in relation to the same factor for other departments that are being scored.

Will you please score all factors for all departments listed? You need not compute subtotals and totals.

Thank you.

(Signed) W. J. Welker

TABLE III. FORM FOR SCORING VOCATIONAL AGRICULTURE SHOP PROGRAMS

FActors To Be Scored	Selected Mont. Vo-Ag Departments								
	No. 1	No. 2	No. 3	No. 4	No. 5	No. 6	Etc.	No. 23	No. 24
TOTAL									
INSTRUCTOR									
Farm shop minded									
Skilled farm mechanics worker									
In school instruction is effective									
Large capacity for accomplishment									
Quantity of work finished by students									
Quality of shop work done by students									
Respected by community									
COURSE OF STUDY									
Fits needs of community									
Provides opportunity for student development in many lines of farm shop work									
Includes practical, real life, farm shop projects									
Provides opportunity for projects that relate to student's proj. prog.									
Provides opportunity for other home projects to be built in school shop									
SHOP FACILITIES									
Adequate size									
Adequate tools, supplies, equipment									
Adequate references									
Ample means of getting large shop projects in and out of shop									
SHOP ORGANIZATION									
Shop discipline									
Shop housekeeping ability									
Student Industry									
Arrangement of and method of handling tools, equipment, and supplies									

TABLE IV. FORM USED IN DETERMINING IMPORTANT ENTERPRISES OF COMMUNITY

I - 1

I. Department _____

II. Present Instructor _____

III. Tenure of Present Instructor _____

IV. Important Farm Enterprises of Community

Classified as Follows	Order of Importance
1. Beef cattle	
2. Bees	
3. Canning crops	
4. Dairying	
5. Grain feed crops	
6. Fruit crops	
7. Gardening	
8. Hay	
9. Hogs	
10. Horses	
11. Poultry	
12. Potatoes	
13. Sugar beets	
14. Sheep	
15. Wheat	

TABLE V. FORM USED IN TABULATING KIND AND NUMBER OF AGRICULTURE PROJECTS BY CLASSES

I - 2

I. Department _____

II. Present Instructor _____

III. Tenure of Present Instructor _____

IV. Agricultural Projects by Class

A. Freshmen

1. Kind	Number
a. _____	_____
b. _____	_____
c. _____	_____
d. _____	_____
e. _____	_____
f. _____	_____
g. _____	_____
h. _____	_____

B. Sophomores

1. Kind	Number
a. _____	_____
b. _____	_____
c. _____	_____
d. _____	_____
e. _____	_____
f. _____	_____
g. _____	_____
h. _____	_____

C. Juniors

1. Kind	Number
a. _____	_____
b. _____	_____
c. _____	_____
d. _____	_____
e. _____	_____
f. _____	_____
g. _____	_____
h. _____	_____

D. Seniors

1. Kind	Number
a. _____	_____
b. _____	_____
c. _____	_____
d. _____	_____
e. _____	_____
f. _____	_____
g. _____	_____
h. _____	_____

TABLE VI. FORM USED IN TABULATING FARM SHOP COURSES OF STUDY

I - 3

I. Department _____

II. Instructor _____

III. Tenure of Present Instructor _____

IV. Course of study for farm shop _____ Class _____

A. Unit _____

1. Jobs	No.
a.	
b.	
c.	
d.	
e.	
f.	
g.	
h.	

	No.

TABLE VII. FORM USED BY STUDENTS FOR TABULATING FARM SHOP EXPERIENCES

I. Department _____

II. Present Instructor _____

III. Name of Student _____ Class _____

IV. Farm Student Lives On is ( ) owned, ( ) rented, ( ) other.

V. Will you please place in the proper column opposite the shop job the number of times you have completed that job this year.

Farm Shop Jobs	NUMBER OF FARM SHOP JOBS COMPLETED		
	Jobs Completed In School Shop		Jobs Completed At Home
	I Not From Home	II From Home	III
A. Carpentry and Wood Work			
1. Nail box			
2. Bench hook			
3. Saw horse			
4. Piece of Furniture			
5. Work bench			
6. Hog house			
7. Poultry feeder			
8. Hay rack			
9. Trailer or truck box			
10. Loading chute			
11. Hen nests			
12. Poultry house			
13. Cut and set studding			
14. Cut and nail rafters			
15. Nail on sheathing			
16. Nail on siding			
17. Nail on shingles			
18. Frame a window			
19. Frame and hang a door			
20. Stain furniture			
21. Paint wood project			
22.			
B. Concrete and Masonry			
1. Lay out forms			
2. Mix and pour concrete			
3. Make water trough			
4. Concrete sidewalk			
5. Concrete steps			
6. Concrete fence posts			
7. Concrete floor			
8. Lay rock foundation			
9. Lay rock walk			
10. Concrete septic tank			
11.			
C. Drawing and Bills of Materials			
1. Small project to scale			
2. Small building to scale			
3. Compute bill of materials			
4. Buy materials			
5.			

TABLE VII (Continued)

Farm Shop Jobs	NUMBER OF FARM SHOP JOBS COMPLETED		
	Jobs Completed In School Shop		Jobs Completed at Home
	I. Not From Home	II From Home	III
D. Electric Wiring			
1. Install door bell			
2. Install convenience outlet			
3. Install electric switch			
4. Install light fixture			
5. Wire a building			
6. Read an electric meter			
7.			
E. Farm Machinery Repair			
1. Repair mower sickle			
2. Repair binder sickle			
3. Replace ledger plates			
4. Install new gears			
5. Install new bushings			
6. Install new sprockets			
7. Repair steel chain			
8. Align sprockets			
9. Pour babbit bearings			
10. Remove pulley			
11. Lace belt			
12. Repaint old machine			
13. Order new part			
14. Set up new machinery			
15. Compute sizes of pulleys			
16. Overhaul a farm machine			
17.			
18.			
19.			
F. Forging			
1. Build forge fire			
2. Make staple			
3. Make gate hook			
4. Make bolt			
5. Make punch and chisels			
6. Repair old punches and chisels			
7. Make clevis			
8. Repair chain			
9. Make wrecking bar			
10. Make butcher knife			
11. Make forge weld			
12.			
G. Gas Engines and Tractors			
1. Adjust spark plugs			
2. Adjust breaker points			
3. Time ignition			
4. Time valves			
5. Grind valves			
6. Adjust tappets			
7. Clean carburetor			
8. Adjust carburetor			
9. Adjust babbit bearings			
10. Adjust taper roller bearings			
11. Repair water pump			
12. Install sleeves and pistons			
13. Fit piston rings			

TABLE VII (Continued).

Farm Shop Jobs	NUMBER OF FARM SHOP JOBS COMPLETED		
	Jobs Completed in School Shop		Jobs Completed at Home
	I Not From Home	II From Home	III
H. Glazing			
1. Remove old putty from sash			
2. Remove old glass from sash			
3. Prepare putty			
4. Cut glass to size			
5. Install glass in sash			
6. Sharpen glass cutters			
I. Harness and Leather Work			
1. Prepare wax end			
2. Cut strap from cow hide			
3. Prepare joints for splice			
4. Make stitched splice			
5. Make rivet splice			
6. Clean harness			
7. Replace worn parts			
8. Oil harness			
9. Repair saddle			
10. Tan leather			
11			
J. Plumbing			
1. Cutting pipe to length			
2. Threading pipe			
3. Install kitchen sink			
4. Repair faucet			
5. Install shower bath			
6. Repair water pump			
7. Install electric pump			
8.			
K. Rope			
1. Tie six knots			
2. Make short splice			
3. Make long splice			
4. Make end splice			
5. Make halter			
6.			
L. Soldering and Cold Metal			
1. Soldering exercise			
2. Make funnel			
3. Make gallon measure			
4. Prepare soldering flux			
5. Other soldering projects			
6. Rivet iron together			
7. Recondition old bolts			
8. Thread bolts			
9. Remove broken stud bolt			
10.			
M. Tool sharpening			
1. Wood chisels			
2. Cold chisels			
3. Plane bits			
4. Auger bits			
5. Hand saws			
6. Circle saws			
7. Butcher knife			

TABLE VII (Continued). S - 7

Farm Shop Jobs	NUMBER OF FARM SHOP JOBS COMPLETED		
	Jobs Completed in School Shop		Jobs Completed At Home
	I Not From Home	II From Home	III
Tool Sharpening (Continued)			
8. Scythe			
9. Mower sickle			
10. Hoe			
11. Cultivator shovel			
12. Harrow tooth			
13. Disc harrow blade			
14. Plow share			
15. Axe			
16. Hatchet			
17.			
N. General Improvement Jobs			
1. Build fence			
2. Repair gates			
3. Repair screen door			
4. Fit storm windows			
5. Build farm trailer			
6.			
7.			
8.			

TABLE VIII. RATING SHEET FOR HOME FARM SHOP US - 8

RATING SHEET FOR HOME FARM SHOP

Department _____ Instructor _____

Student _____ Class _____

I. Size (floor space)
( ) A. 400 sq. ft. and over
( ) B. 399 sq. ft. to 250 sq. ft.
( ) C. 249 sq. ft. to 100 sq. ft.
( ) D. Less than 100 sq. ft.
( ) E. No shop

II. Location
( ) A. Separate building or separate space with tractor and truck driveway into shop.
( ) B. Shop space used partly by garage or other use. Has a tractor and truck door.
( ) C. Separate building or separate space. Has small door.
( ) D. Shop space used for other purposes. Has small door.
( ) E. No shop.

III. Heat
( ) A. Heated by stove; suitable for use in severe weather.
( ) B. Unsuitable for use in severe weather.

IV. Light
( ) A. Artificial light plus glass windows.
( ) B. Shop adequately lighted by glass windows only.
( ) C. Shop inadequately lighted. Work bench adequately lighted.
( ) D. No artificial light. No windows.

V. Floor
( ) A. Concrete and wood
( ) B. Concrete only
( ) C. Wood
( ) D. Dirt

VI. Tool Storage
( ) A. Tools are stored in cabinet.
( ) B. Tools hang in open on a wall.
( ) C. Tools lay on bench or shelf.
( ) D. Are kept in more than one place on farm.
( ) E. Not stored.

VII. Lumber and Iron Storage Facilities
( ) A. Stored on wall rack
( ) B. Stored on ceiling joists or in corner
( ) C. Stored on floor
( ) D. Stored in piles outside shop
( ) E. Not stored

VIII. Storage facilities for nails, bolts, screws
( ) A. Bins or can for common sizes of each
( ) B. All sizes of each in one bin or can
( ) C. Not stored

TABLE IX. FORM USED IN DETERMINING THE NUMBER OF FARM SHOP TOOLS ON HOME FARM AND NUMBER OF HOME FARM SHOP IMPROVEMENTS CARRIED OUT ON HOME FARMS OF MONT. VO-AG STUDENTS US - 9

I. Department _____

II. Instructor _____

III. Student _____ Class _____

IV. Please check ( ) the farm shop tools that you have at home.

( ) 1. Shop bench
( ) 2. Shop vise
( ) 3. Forge
( ) 4. Anvil
( ) 5. Hand emery wheel
( ) 6. Power emery wheel
( ) 7. Grind stone
( ) 8. Oil stone
( ) 9. Post drill
( )10. Rip saw
( )11. Hand saw
( )12. Saw set
( )13. Claw hammer
( )14. Metal hammer
( )15. Sledge hammer
( )16. Steel square
( )17. Tee bevel
( )18. Carpenter's level
( )19. Automatic drill
( )20. Draw knife
( )21. Carpenter's brace
( )22. Expansive bit
( )23. Auger bits (minimum of five)
( )24. Twist drills (minimum of five)
( )25. Plane
( )26. Screw driver
( )27. Wrecking bar
( ) 28. Flat file
( ) 29. Triangular file
( ) 30. Glass cutter
( ) 31. Putty knife
( ) 32. Cold chisel
( ) 33. Punch
( ) 34. Stocks and dies for bolts
( ) 35. Chain drill
( ) 36. Hack saw
( ) 37. Pliers
( ) 38. Pipe wrench
( ) 39. Tin snips
( ) 40. Blacksmith tongs (minimum of two)
( ) 41. Harness needles
( ) 42. Harness awls
( ) 43. Harness riveting machine
( ) 44. Shovel or spade
( ) 45. Trowel
( ) 46. Center punch
( ) 47. Crescent adjustable wrench
( ) 48. Open end wrenches (minimum of four
( ) 49. Box end wrenches (minimum of four)
( ) 50. Socket wrenches (minimum of five)
( ) 51. Valve lifter
( ) 52. Carpenter's dividers
( ) 53. Blow torch
( ) 54. Soldering copper

V. Please check ( ) the jobs that you have done to improve or maintain your home farm shop facilities during the time you have been enrolled in high school.

( ) 1. Plan a home farm shop
( ) 2. Construct or prepare a building for shop
( ) 3. Provide storage space for tools
( ) 4. Provide storage space for screws, nails, bolts, etc.
( ) 5. Construct a work bench
( ) 6. Install shop vise
( ) 7. Construct anvil of heavy iron
( ) 8. Construct anvil base
( ) 9. Construct or install forge
( )10. Construct or install shop stove
( )11. Provide storage space for lumber and iron
( )12. Install emery wheel or grindstone
( )13. Improve shop floor
( )14. Clean the shop once per month

TABLE X. MONTANA VOCATIONAL AGRICULTURE STUDENTS RECEIVING FARM SHOP EXPERIENCE IN SCHOOL SHOP ON JOBS THAT DID NOT COME FROM THE STUDENT'S HOME FARM - 1940-41 School Year

Number of Students Studied	160	92	60	52	364	
Farm Shop Jobs	Number Receiving Experiences					
					All Students	
	Fresh.	Sophs.	Juniors	Seniors	Number	Per Cent
A. Carpentry and Wood Work	252	255	157	120	791	
1. Nail box	11	3	5	6	25	5.5
2. Bench hook	1	3	3	0	7	1.9
3. Saw horse	4	15	8	9	36	9.9
4. Piece of furniture	44	40	8	10	102	24.7
5. Work bench	3	4	2	1	10	2.7
6. Hog house	6	1	0	0	7	1.7
7. Poultry feeder	2	4	2	0	8	2.2
8. Hay rack	1	0	0	0	1	0.27
9. Trailer or truck box	18	19	13	4	54	14.8
10. Loading chute	0	1	2	4	7	1.9
11. Hen nests	2	2	2	6	12	3.3
12. Poultry house	4	7	7	6	24	6.6
13. Cut and set studding	7	2	3	7	19	5.2
14. Cut and nail rafters	9	10	12	10	41	11.2
15. Nail on sheathing	14	13	12	5	44	12.1
16. Nail on siding	5	9	8	9	31	8.5
17. Nail on shingles	21	10	11	13	55	15.1
18. Frame a window	18	3	6	6	33	9.1
19. Frame and hang a door	1	4	5	2	12	3.3
20. Stain furniture	36	24	13	11	84	23.1
21. Paint wood project	6	32	18	13	69	18.8
22. Miscellaneous	39	47	17	4	107	29.4
B. Concrete and Masonry	26	36	11	54	125	
1. Lay out forms	4	4	2	14	24	6.6
2. Mix and pour concrete	20	13	6	14	53	14.5
3. Make water trough	1	6	0	3	10	2.7
4. Concrete sidewalk	0	5	0	5	10	2.7
5. Concrete steps	0	2	1	6	9	2.4
6. Concrete fence posts	0	0	0	2	2	0.5
7. Concrete floor	0	6	0	9	15	4.1
8. Lay rock foundation	0	0	1	1	2	0.54
9. Lay rock walk	0	0	0	0	0	0.0
10. Concrete septic tank	0	0	0	0	0	0.0
11. Miscellaneous	1	0	1	0	2	0.54
C. Drawing and Bills of Mat'ls.	174	95	50	38	357	
1. Small project to scale	63	22	8	10	103	28.3
2. Small building to scale	32	7	4	3	46	12.6
3. Compute bill of materials	45	26	13	11	95	26.1
4. Buy materials	34	40	25	14	113	31.0

TABLE X (Continued). MONTANA VOCATIONAL AGRICULTURE STUDENTS RECEIVING FARM SHOP EXPERIENCE IN SCHOOL SHOP ON JOBS THAT DID NOT COME FROM THE STUDENT'S HOME FARM - 1940-41 School Year

Number of Students Studied	160	92	60	52	364	
Farm Shop Jobs	Number Receiving Experiences					
					All Students	
	Fresh.	Sophs.	Juniors	Seniors	Number	Per Cent
D. Electric Wiring	15	14	12	2	43	
1. Install door bell	0	0	0	0	0	0.00
2. Install convenience outlet	2	4	0	0	6	1.64
3. Install electric switch	4	5	5	1	15	4.12
4. Install light fixture	2	2	5	1	10	2.7
5. Wire a building	0	2	1	0	3	0.81
6. Read elect. meter	6	1	1	0	8	2.2
7. Miscellaneous	1	0	0	0	1	0.27
E. Farm Machinery Repair	68	33	28	12	141	
1. Repair mower sickle	0	0	0	0	0	0.00
2. Repair binder sickle	0	0	0	0	0	0.00
3. Replace ledges plates	0	0	0	0	0	0.00
4. Install new gears	0	0	0	1	1	0.27
5. Install new bushings	1	0	0	1	2	0.54
6. Inst. new sprockets	0	0	0	0	0	0.00
7. Repair steel chain	2	2	0	0	4	1.1
8. Align sprockets	0	0	0	0	0	0.00
9. Pour babbitt bearings	15	3	2	0	20	5.5
10. Remove pulley	4	2	2	2	10	2.7
11. Lace belt	19	1	1	2	23	6.3
12. Repaint old machine	6	6	7	0	19	5.7
13. Order new part	1	5	0	1	7	1.9
14. Set up new mach.	0	2	3	0	5	1.4
15. Compute sizes of pulleys	1	2	7	1	11	3.0
16. Overhaul a farm machine	16	9	6	4	35	9.5
17. Miscellaneous	3	1	0	0	4	1.1
F. Forging	215	146	103	113	577	
1. Build forge fire	75	55	33	28	191	52.4
2. Make staple	21	4	4	13	42	11.5
3. Make gate hook	27	8	9	11	55	15.3
4. Make bolt	10	21	9	7	47	12.9
5. Make punch and chisels	17	14	18	19	68	18.6
6. Repair old punches and chisels	26	20	9	15	70	19.2

TABLE X (Continued). MONTANA VOCATIONAL AGRICULTURE STUDENTS RECEIVING FARM SHOP EXPERIENCE IN SCHOOL SHOP ON JOBS THAT DID NOT COME FROM THE STUDENT'S HOME FARM - 1940-41 School Year

Number of Students Studied	160	92	60	52	364	
Farm Shop Jobs	Number Receiving Experiences				All Students	
	Fresh.	Sophs.	Juniors	Seniors	Number	Per Cent
F. (Continued)						
7. Make clevis	9	4	5	5	23	6.3
8. Repair chain	0	4	2	0	6	1.6
9. Make wrecking bar	2	2	3	3	10	2.7
10. Make butcher knife	7	6	2	0	15	4.1
11. Make forge weld	5	1	5	10	21	5.8
12. Miscellaneous	16	7	4	2	29	8.0
G. Gas Engines and Tractors	18	30	60	34	142	
1. Adjust spark plugs	2	7	3	4	16	4.39
2. Adjust breaker pts.	0	1	4	3	8	2.2
3. Time ignition	0	2	5	2	9	2.5
4. Time valves	0	1	4	3	8	2.2
5. Grind valves	2	3	6	5	16	4.4
6. Adjust tappets	2	5	5	3	15	4.1
7. Clean carburetor	6	3	8	3	20	5.5
8. Adjust carburetor	2	0	5	2	9	2.5
9. Adjust babbitt bearings	2	0	3	2	7	1.9
10. Adj. taper roller "	0	0	2	0	2	0.5
11. Repair water pump	1	2	4	2	9	2.5
12. Install sleeves and pistons	0	2	4	2	8	2.2
13. Fit piston rings	0	3	7	3	13	3.5
14. Miscellaneous	1	1	0	0	2	0.5
H. Glazing	178	54	39	25	296	
1. Remove old putty from sash	34	7	7	4	52	14.3
2. Remove old glass from sash	28	13	6	5	52	14.3
3. Prepare putty	52	13	10	4	79	21.6
4. Cut glass to size	33	8	9	7	57	15.6
5. Install glass in sash	29	13	6	5	53	14.5
6. Sharpen glass cutters	2	0	1	0	3	0.8
I. Harness and Leather Work	34	32	13	21	100	
1. Prepare wax end	10	6	2	7	25	6.8
2. Cut strap from cow hide	1	3	0	0	4	1.1
3. Prepare joints for splice	5	0	2	1	8	2.2

TABLE X (CONTINUED). MONTANA VOCATIONAL AGRICULTURE STUDENTS RECEIVING FARM SHOP EXPERIENCE IN SCHOOL SHOP ON JOBS THAT DID NOT COME FROM THE STUDENT'S HOME FARM - 1940-41 School Year

Number of Students Studied	160	93	60	52	364	
Farm Shop Jobs	Number Receiving Experience					
					All Students	
	Fresh.	Sophs.	Juniors	Seniors	Number	Per Cent
I. (Continued)						
4. Make stitched splice	2	4	1	2	9	2.5
5. Make rivet splice	2	3	2	3	10	2.8
6. Clean harness	4	3	0	1	8	2.2
7. Replace worn parts	2	4	2	1	9	2.5
8. Oil harness	4	2	0	0	6	1.7
9. Repair saddle	4	7	2	6	19	5.2
10. Tan leather	0	0	0	0	0	0.0
11. Miscellaneous	0	0	2	0	2	0.5
J. Plumbing	24	45	20	14	103	
1. Cutting pipe to length	11	18	10	6	45	12.4
2. Threading pipe	13	26	9	5	53	14.6
3. Install kitchen sink	0	0	0	0	0	0.0
4. Repair faucet	0	1	0	1	3	0.5
5. Install shower bath	0	0	0	1	1	0.3
6. Repair water pump	0	0	0	0	0	0.0
7. Install electric pump	0	0	0	0	0	0.0
8. Miscellaneous	0	0	1	1	2	0.5
K. Rope	382	100	32	29	543	
1. Tie six knots	81	21	6	5	113	31.0
2. Make short splice	84	26	8	7	125	34.2
3. Make long splice	86	19	7	8	120	32.9
4. Make end splice	90	18	8	7	123	33.7
5. Make halter	39	16	3	2	60	16.4
6. Miscellaneous	2	0	0	0	2	0.6
L. Soldering & Cold Metal	274	132	68	60	534	
1. Soldering exercise	89	30	12	8	139	38.0
2. Make funnel	27	6	4	3	40	10.9
3. Make gallon measure	3	0	3	1	7	1.9
4. Prepare soldering flux	46	11	4	7	68	18.6
5. Other soldering proj.	43	12	3	8	66	18.1
6. Rivet iron together	12	8	5	3	28	7.7
7. Recondition old bolts	6	12	8	7	33	9.1
8. Thread bolts	34	34	23	21	112	36.6
9. Remove broken stud bolt	11	14	6	2	33	9.1
10. Miscellaneous	3	5	0	0	8	2.2

TABLE X (Continued). MONTANA VOCATIONAL AGRICULTURE STUDENTS RECEIVING FARM SHOP EXPERIENCE IN SCHOOL SHOP ON JOBS THAT DID NOT COME FROM THE STUDENT'S HOME FARM - 1940-41 School Year

Number of Students Studied	160	93	60	52	364	
Farm Shop Jobs	Number Receiving Experience					
					All Students	
	Fresh.	Sophs.	Juniors	Seniors	Number	Per Cent
M. Tool Sharpening	344	187	139	84	754	
1. Wood chisels	92	45	25	18	180	49.4
2. Cold chisels	50	28	22	18	118	32.4
3. Plane bits	37	35	28	17	117	32.1
4. Auger bits	8	10	9	11	38	10.8
5. Hand saws	79	25	19	7	130	35.8
6. Circle saws	3	1	2	1	7	1.9
7. Butcher knife	18	18	8	3	47	12.7
8. Scythe	0	4	0	0	4	1.1
9. Mower sickle	0	1	0	0	1	0.3
10. Hoe	0	0	2	0	2	0.5
11. Cultivator shovel	0	0	1	1	2	0.5
12. Harrow tooth	3	3	8	4	18	4.9
13. Disc harrow blade	0	0	0	0	0	0.0
14. Plow share	0	0	0	0	0	0.0
15. Axe	21	7	8	0	36	9.9
16. Hatchet	13	6	5	2	26	7.2
17. Miscellaneous	20	4	2	2	28	7.7
N. General Improvement Jobs	33	43	23	13	102	
1. Build fence	4	6	6	3	19	6.2
2. Repair gates	2	5	1	1	9	2.5
3. Repair screen door	1	1	2	0	4	1.1
4. Fit storm windows	0	0	2	0	2	0.5
5. Build farm trailer	10	14	7	4	35	9.5
6. Replace tool handles	6	1	0	0	7	1.9
7. Miscellaneous	0	16	5	5	26	7.1

TABLE XI. MONTANA VOCATIONAL AGRICULTURE STUDENTS RECEIVING FARM SHOP EXPERIENCE IN SCHOOL SHOP ON JOBS THAT DID COME FROM THE STUDENT'S HOME FARM - 1940-41 School Year

Number of Students Studied	160	92	60	52	364	
Farm Shop Jobs	Fresh.	Sophs.	Juniors	Seniors	All Students Number	Per Cent
A. Carpentry & Woodwork	121	73	37	18	239	
1. Nail box	3	2	1	1	7	1.7
2. Bench hook	0	0	0	0	0	.0
3. Saw horse	2	1	1	1	5	1.4
4. Piece of furniture	31	17	8	5	61	16.8
5. Work bench	0	1	0	0	1	.3
6. Hog house	1	1	0	0	2	.5
7. Poultry feeder	11	8	4	3	26	7.1
8. Hay rack	4	1	0	0	5	1.4
9. Trailer or truck box	5	3	0	0	8	2.2
10. Loading chute	0	0	0	1	1	.3
11. Hen nests	0	2	1	0	3	.8
12. Poultry house	2	0	0	0	2	.5
13. Cut & set studding	1	1	0	0	2	.5
14. Cut & nail rafters	0	1	1	0	2	.5
15. Nail on sheathing	4	0	0	0	4	1.1
16. Nail on siding	1	0	0	0	1	.3
17. Nail on shingles	4	2	0	0	6	1.7
18. Frame a window	1	1	0	0	2	.5
19. Frame and hang a door	0	0	0	0	0	.0
20. Stain furniture	17	10	5	3	35	9.6
21. Paint wood project	19	5	7	4	35	9.6
22. Miscellaneous	15	7	9	0	31	8.5
B. Concrete and Masonry	2	4	0	4	10	
1. Lay out forms	0	1	0	1	2	.5
2. Mix and pour concrete	0	0	0	1	1	.3
3. Make water trough	2	1	0	1	4	1.1
4. Concrete sidewalk	0	0	0	0	0	.0
5. Concrete steps	0	0	0	0	0	.0
6. Concrete fence posts	0	0	0	0	0	.0
7. Concrete floor	0	0	0	1	1	.3
8. Lay rock foundation	0	1	0	0	1	.3
9. Lay rock walk	0	1	0	0	1	.3
10. Concrete septic tank	0	0	0	0	0	.0
11. Miscellaneous	0	0	0	0	0	.0
C. Drawing & Bills of Matls.	47	28	8	4	87	
1. Small project to scale	11	7	1	2	21	5.7
2. Small building to scale	2	1	0	0	3	.8
3. Compute bill of matls.	9	6	2	0	17	4.7
4. Buy materials	25	14	5	2	46	12.6
5. Miscellaneous	0	0	0	0	0	.0

TABLE XI (Continued). MONTANA VOCATIONAL AGRICULTURE STUDENTS RECEIVING FARM SHOP EXPERIENCE IN SCHOOL SHOP ON JOBS THAT DID COME FROM THE STUDENT'S HOME FARM - 1940-41 School Year

Number of Students Studied	160	92	60	52	364	
Farm Shop Jobs	Number Receiving Experiences				All Students	
	Fresh.	Sophs.	Juniors	Seniors	Number	Per Cent
D. Electric Wiring	10	5	1	1	17	
1. Install door bell	1	1	0	0	2	.5
2. Install convenience outlet	2	0	0	0	2	.5
3. Install electric switch	2	1	1	1	5	1.4
4. Install light fixture	2	1	0	0	3	.8
5. Wire a building	1	0	0	0	1	.3
6. Read an electric meter	2	1	0	0	3	.8
7. Miscellaneous	0	1	0	0	1	.3
E. Farm Machinery Repair	20	10	11	1	42	
1. Repair mower sickle	1	0	0	0	1	.3
2. Repair binder sickle	1	0	0	0	1	.3
3. Replace ledger plates	1	0	0	0	1	.3
4. Install new gears	1	1	1	0	3	.8
5. Install new bushings	2	0	1	0	3	.8
6. Install new sprockets	0	0	1	0	1	.3
7. Repair steel chain	1	1	0	0	2	.6
8. Align sprockets	0	0	0	0	0	.0
9. Pour babbit bearings	2	0	0	0	2	.6
10. Remove pulley	0	0	2	0	2	.6
11. Lace belt	0	0	2	0	2	.6
12. Repaint old machine	3	2	2	0	7	2.0
13. Order new part	3	4	1	0	8	2.2
14. Set up new machinery	1	0	0	0	1	.3
15. Compute sizes of pulleys	1	0	0	0	1	.3
16. Overhaul a farm machine	1	0	1	1	3	.8
17. Miscellaneous	2	2	0	0	4	1.1
F. Forging	74	70	73	32	249	
1. Build forge fire	6	10	7	5	28	7.7
2. Make staple	4	5	5	4	78	21.4
3. Make gate hook	2	7	7	4	20	5.5
4. Make bolt	4	7	10	3	24	6.6
5. Make punch and chisels	4	9	9	7	29	8.0
6. Repair old punches and chisels	28	14	11	6	59	16.2

TABLE XI (Continued). MONTANA VOCATIONAL AGRICULTURE STUDENTS RECEIVING FARM SHOP EXPERIENCE IN SCHOOL SHOP ON JOBS THAT DID COME FROM THE STUDENT'S HOME FARM- 1940-41 School Year

Number of Students Studied	160	92	60	52	364	
Farm Shop Jobs	Number Receiving Experiences					
					All Students	
	Fresh.	Sophs.	Juniors	Seniors	Number	Per Cent
F. (Continued)						
7. Make clevis	10	2	7	0	19	5.2
8. Repair chain	0	3	1	0	4	1.1
9. Make wrecking bar	3	3	3	3	12	3.3
10. Make butcher knife	10	5	3	0	18	4.9
11. Make forge weld	0	3	9	0	12	3.3
12. Miscellaneous	3	2	1	0	6	1.6
G. Gas Engines & Tractors	24	76	45	17	162	
1. Adjust spark plugs	5	14	5	2	26	7.1
2. Adjust breaker points	0	7	2	2	11	3.0
3. Time ignition	0	8	3	1	12	3.3
4. Time valves	0	4	3	1	8	2.2
5. Grind valves	3	5	6	1	15	4.1
6. Adjust tappets	1	4	5	1	11	3.0
7. Clean carburetor	4	13	4	1	22	6.0
8. Adjust carburetor	3	7	4	2	16	4.4
9. Adjust babbit bearings	3	0	3	1	7	1.9
10. Adjust taper roller bearings	0	2	3	1	6	1.6
11. Repair water pump	1	2	2	2	7	1.9
12. Install sleeves and pistons	1	2	2	1	6	1.6
13. Fit piston rings	2	5	3	1	11	3.0
14. Miscellaneous	1	3	0	0	4	1.1
H. Glazing	13	10	6	5	34	
1. Remove old putty from sash	2	2	2	0	6	1.6
2. Remove old glass from sash	3	1	1	0	5	1.4
3. Prepare putty	2	3	1	0	6	1.6
4. Cut glass to size	5	2	2	5	14	3.8
5. Install glass in sash	1	2	0	0	3	.8
6. Sharpen glass cutters	0	0	0	0	0	.0
I. Harness & Leather Work	25	20	27	4	76	
1. Prepare wax end	7	2	7	1	17	4.7
2. Cut strap from cow hide	2	4	6	0	12	3.3
3. Prepare joints for splice	4	4	5	0	13	3.6

TABLE XI (Continued). MONTANA VOCATIONAL AGRICULTURE STUDENTS RECEIVING FARM SHOP EXPERIENCE IN SCHOOP SHOP ON JOBS THAT DID COME FROM THE STUDENT'S HOME FARM - 1940-41 School Year

Number of Students Studied	160	92	60	52	364	
Farm Shop Jobs	Number Receiving Experiences					
					All Students	
	Fresh.	Sophs.	Juniors	Seniors	Number	Per Cent
I. (Continued)						
4. Make stitched splice	4	3	4	0	11	3.2
5. Make rivet splice	4	3	3	1	11	3.2
6. Clean harness	0	0	0	1	1	.3
7. Replace worn parts	0	0	1	0	1	.3
8. Oil harness	0	0	0	1	1	.3
9. Repair saddle	3	1	1	0	5	1.4
10. Tan leather	0	0	0	0	0	.0
11. Miscellaneous	1	3	0	0	4	1.1
J. Plumbing	12	4	5	5	26	
1. Cutting pipe to length	3	1	1	2	7	1.9
2. Threading pipe	3	2	2	1	8	2.2
3. Install kitchen sink	1	0	1	0	2	.5
4. Repair faucet	2	0	0	1	3	.8
5. Install electric pump	0	0	0	0	0	.0
6. Repair water pump	2	0	1	1	4	1.1
7. Install shower bath	0	1	0	0	1	.3
8. Miscellaneous	1	0	0	0	1	.3
K. Rope	46	15	3	5	69	
1. Tie six knots	7	1	1	2	11	3.2
2. Make short splice	8	2	0	0	10	2.8
3. Make long splice	6	2	0	1	9	2.5
4. Make end splice	7	3	0	1	11	3.2
5. Make halter	17	7	2	1	27	7.4
6. Miscellaneous	1	0	0	0	1	.3
L. Soldering & Cold Metal	52	42	36	12	142	
1. Soldering exercise	10	8	5	2	25	6.9
2. Make funnel	10	3	2	1	16	4.4
3. Make gallon measure	0	1	1	1	3	.8
4. Prepare soldering flux	5	3	1	0	9	2.4
5. Other soldering proj.	15	4	2	2	23	6.3
6. Rivet iron together	1	3	4	1	9	2.4
7. Recondition old bolts	1	5	2	1	9	2.4
8. Thread bolts	5	10	9	4	28	7.7
9. Remove broken stud bolt	1	1	2	0	4	1.1
10. Miscellaneous	4	4	8	0	16	4.4

TABLE XI (Continued). MONTANA VOCATIONAL AGRICULTURE STUDENTS RECEIVING FARM SHOP EXPERIENCE IN SCHOOL SHOP ON JOBS THAT DID COME FROM THE STUDENT'S HOME FARM - 1940-41 School Year

Number of Students Studied	160	92	60	52	364	
Farm Shop Jobs	Number Receiving Experiences					
					All Students	
	Fresh.	Sophs.	Juniors	Seniors	Number	Per Cent
M. Tool sharpening	252	101	92	47	492	
1. Wood chisels	32	8	8	6	54	14.6
2. Cold chisels	32	14	17	5	72	19.7
3. Plane bits	23	13	11	3	50	13.7
4. Auger bits	21	4	4	3	32	8.8
5. Hand saws	42	13	11	8	74	20.2
6. Circle saws	2	1	1	1	5	1.4
7. Butcher knife	28	21	13	7	69	19.0
8. Scythe	1	0	0	0	1	.3
9. Mower sickle	0	0	0	1	1	.3
10. Hoe	1	0	2	0	3	.8
11. Cultivator shovel	1	0	0	2	3	.8
12. Harrow tooth	0	4	0	1	5	1.4
13. Disc harrow blade	0	0	0	0	0	.0
14. Plow share	0	1	0	0	1	.3
15. Axe	34	14	13	5	66	18.1
16. Hatchet	22	6	11	4	43	11.7
17. Miscellaneous	9	2	1	1	13	3.6
N. General Improvement Jobs	15	5	4	6	30	
1. Build fence	0	1	1	0	2	.6
2. Repair gates	0	0	2	0	2	.6
3. Repair screen door	1	0	0	1	2	.6
4. Fit storm windows	0	1	0	0	1	.3
5. Build farm trailer	1	2	0	1	5	1.4
6. Replace tool handles	12	0	1	3	16	4.4
7. Miscellaneous	1	1	0	1	3	.8

TABLE XII. MONTANA VOCATIONAL AGRICULTURE STUDENT'S FARM SHOP EXPERIENCE AT HOME - 1940-41 School Year

Number of Students Studied	149	83	60	52	344	
Farm Shop Jobs	Number Receiving Experiences					
					All Students	
	Fresh.	Sophs.	Juniors	Seniors	Number	Per Cent
A. Carpentry & Wood Work	607	328	245	226	1400	
1. Nail box	19	4	4	8	35	10.2
2. Bench hook	7	1	3	3	14	4.1
3. Saw horse	33	5	10	8	56	16.3
4. Piece of furniture	38	11	14	14	77	22.4
5. Work bench	16	15	7	4	42	12.2
6. Hog house	14	17	7	9	41	13.7
7. Poultry feeder	30	13	15	13	71	20.6
8. Hay rack	32	19	19	12	82	23.8
9. Trailer or truck box	25	13	7	5	50	14.5
10. Loading chute	15	11	6	10	42	12.2
11. Hen nests	57	28	22	12	119	34.6
12. Poultry house	17	10	8	4	39	11.6
13. Cut & set studding	17	12	8	12	49	14.2
14. Cut & nail rafters	27	21	8	16	72	20.9
15. Nail on sheathing	16	8	5	10	39	14.3
16. Nail on siding	40	19	10	18	87	25.6
17. Nail on shingles	52	36	21	18	127	36.9
18. Frame a window	22	13	12	12	59	17.1
19. Frame & hang a door	30	12	18	14	74	21.5
20. Stain furniture	41	18	11	10	80	23.2
21. Paint wood project	48	27	19	13	107	31.1
22. Miscellaneous	11	10	11	1	133	9.6
B. Concrete and Masonry	172	102	93	59	426	
1. Lay out forms	26	19	18	12	75	21.8
2. Mix & pour concrete	44	24	23	15	106	30.8
3. Make water trough	19	5	6	3	33	9.6
4. Concrete sidewalk	11	6	5	7	29	8.4
5. Concrete steps	10	10	5	2	27	7.8
6. Concrete fence posts	8	0	0	2	10	2.9
7. Concrete floor	17	16	11	5	49	14.2
8. Lay rock foundation	15	10	14	5	44	12.8
9. Lay rock walk	21	5	5	7	38	11.0
10. Concrete septic tank	1	2	3	1	7	2.0
11. Miscellaneous	0	5	3	0	8	2.3
C. Drawing & Bills of Materials	51	40	29	26	146	
1. Small project to scale	0	4	2	6	12	3.5
2. Small building to scale	7	0	3	3	13	3.8
3. Compute bill of matls.	7	16	7	5	35	10.8
4. Buy materials	37	20	17	12	86	25.0
5. Miscellaneous	0	0	0	0	0	0.0

TABLE XII. (Continued). MONTANA VOCATIONAL AGRICULTURE STUDENT'S FARM SHOP EXPERIENCE AT HOME - 1940-41 School year

Number of Students Studied	149	83	60	52	344	
Farm Shop Jobs	Number Receiving Experiences					
					All Students	
	Fresh.	Sophs.	Juniors	Seniors	Number	Per Cent
D. Electric Wiring	136	86	74	46	342	
1. Install door bell	5	2	2	0	9	2.6
2. Install convenience outlet	11	10	7	2	30	8.7
3. Install electric switch	31	18	20	15	84	21.4
4. Install light fixture	36	21	25	12	94	27.2
5. Wire a building	12	14	10	8	44	12.8
6. Read electric meter	40	18	10	7	75	21.8
7. Miscellaneous	1	3	0	2	6	1.7
E. Farm Machinery Repair	519	317	253	219	1308	
1. Repair mower sickle	68	37	32	32	169	49.1
2. Repair binder sickle	33	22	14	16	85	24.6
3. Replace ledger plates	32	17	18	15	82	23.8
4. Install new gears	38	23	18	15	94	27.2
5. Install new bushings	24	19	16	12	71	20.6
6. Install new sprockets	25	14	10	8	57	16.6
7. Repair steel chain	37	25	16	14	92	26.7
8. Align sprockets	5	7	6	4	19	5.5
9. Pour babbitt bearings	8	5	7	5	25	7.3
10. Remove pulley	43	21	20	15	99	28.7
11. Lace belt	32	22	18	17	89	25.8
12. Repaint old machine	36	18	17	9	80	23.2
13. Order new part	35	31	17	18	101	28.3
14. Set up new machinery	35	24	12	14	85	24.7
15. Compute sizes of pulleys	11	6	2	6	25	7.3
16. Overhaul a farm mach.	55	26	29	19	129	35.4
17. Miscellaneous	2	3	1	0	6	1.7
F. Forging	128	90	76	74	369	
1. Build forge fire	0	22	19	19	60	17.5
2. Make staple	9	4	6	4	23	6.7
3. Make gate hook	19	13	8	7	47	13.6
4. Make bolt	11	5	4	8	28	8.1
5. Make punch & chisels	13	8	7	4	32	9.4
6. Repair old punches & chisels	23	14	13	12	62	18.0

TABLE XII. (Continued). MONTANA VOCATIONAL AGRICULTURE STUDENT'S FARM SHOP EXPERIENCE AT HOME - 1940-41 School Year

Number of Students Studied	149	83	60	52	344	
Farm Shop Jobs	Number Receiving Experiences					
					All Students	
	Fresh.	Sophs.	Juniors	Seniors	Number	Per Cent
F. (Continued)						
7. Make clevis	5	5	6	5	21	6.1
8. Repair chain	27	14	4	10	55	15.9
9. Make wrecking bar	1	1	1	2	5	1.4
10. Make butcher knife	15	4	1	0	20	5.5
11. Make forge weld	5	1	7	3	16	4.6
12. Miscellaneous	0	0	0	0	0	0.0
G. Gas Engines & Tractors	387	267	185	179	1008	
1. Adjust spark plugs	65	36	31	29	161	46.6
2. Adjust breaker points	26	25	13	14	78	22.6
3. Time ignition	22	17	12	14	65	18.3
4. Time valves	9	10	6	8	33	9.6
5. Grind valves	32	15	15	10	72	20.9
6. Adjust tappets	26	21	13	12	72	20.9
7. Clean carburetor	63	45	35	26	169	49.1
8. Adjust carburetor	40	26	17	19	102	29.7
9. Adjust babbitt bearings	9	7	1	7	24	7.0
10. Adjust taper roller bearings	6	6	1	3	16	4.6
11. Repair water pump	34	31	22	14	101	29.3
12. Install sleeves and pistons	16	12	5	5	38	11.0
13. Fit piston rings	32	16	14	8	70	20.2
14. Miscellaneous	7	0	0	0	7	2.0
H. Glazing	224	173	131	89	617	
1. Remove old putty from sash	56	41	30	20	147	40.7
2. Remove old glass from sash	44	36	24	18	122	35.2
3. Prepare putty	52	36	28	15	131	37.9
4. Cut glass to size	40	31	24	16	111	33.2
5. Install glass in sash	31	28	24	20	103	29.3
6. Sharpen glass cutters	1	1	1	0	3	0.9
I. Harness & Leather Work	295	154	128	94	671	
1. Prepare wax end	11	3	6	7	27	7.8
2. Cut strap from cow hide	31	19	12	7	69	20.1
3. Prepare joints for splice	15	10	12	7	44	12.8

TABLE XII. (Continued). MONTANA VOCATIONAL AGRICULTURE STUDENT'S FARM SHOP EXPERIENCE AT HOME - 1940-41 School Year

Number of Students Studied	149	83	60	52	344	
Farm Shop Jobs	Number Receiving Experiences					
					All Students	
	Fresh.	Sophs.	Juniors	Seniors	Number	Per Cent
I. (Continued)						
4. Make stitched splice	14	4	13	3	34	9.9
5. Make rivet splice	52	29	28	16	125	36.4
6. Clean harness	32	20	10	10	72	20.9
7. Replace worn parts	46	21	18	22	107	31.4
8. Oil harness	40	18	11	10	79	22.9
9. Repair saddle	51	24	16	12	103	30.0
10. Tan leather	3	5	0	0	8	2.3
11. Miscellaneous	0	1	2	0	3	0.3
J. Plumbing	148	100	64	46	358	
1. Cutting pipe to length	35	21	14	10	80	23.2
2. Threading pipe	25	16	11	10	62	18.1
3. Install kitchen sink	19	12	7	6	44	12.7
4. Repair faucet	16	21	10	9	56	16.3
5. Install shower bath	10	5	2	1	18	5.2
6. Repair water pump	32	19	12	9	72	20.9
7. Install electric pump	9	6	6	1	22	6.4
8. Miscellaneous	2	0	2	0	4	1.2
K. Rope	156	95	75	81	407	
1. Tie six knots	44	30	26	23	123	35.7
2. Make short splice	21	16	12	16	62	18.0
3. Make long splice	27	13	12	13	68	19.7
4. Make end splice	19	15	14	15	63	18.3
5. Make halter	45	21	9	14	89	25.8
6. Miscellaneous	0	0	2	0	2	5.8
L. Soldering & Cold Metal	156	107	92	59	414	
1. Soldering exercise	14	9	13	6	42	12.2
2. Make funnel	3	0	0	2	5	1.4
3. Make gallon measure	2	0	2	1	5	1.4
4. Prepare soldering flux	5	7	10	0	22	6.4
5. Other soldering projects	22	13	15	10	60	17.4
6. Rivet iron together	30	13	9	8	60	17.4
7. Recondition old bolts	3	18	14	8	43	12.5
8. Thread bolts	40	30	15	15	100	29.1
9. Remove broken stud bolt	34	15	11	9	69	20.3
10. Miscellaneous	3	2	3	0	8	2.4

TABLE XII. (Continued). MONTANA VOCATIONAL AGRICULTURE STUDENT'S FARM SHOP EXPERIENCE AT HOME - 1940-41 School Year

Number of Students Studied	149	83	60	52	344	
Farm Shop Jobs	Number Receiving Experiences					
					All Students	
	Fresh.	Sophs.	Juniors	Seniors	Number	Per Cent
M. Tool Sharpening	587	343	271	228	1429	
1. Wood chisels	26	14	2	14	56	16.3
2. Cold chisels	40	21	21	14	96	27.9
3. Plane bits	15	13	10	9	47	13.7
4. Auger bits	15	11	9	8	43	12.5
5. Hand saws	26	15	19	14	74	21.5
6. Circle saws	6	8	3	2	19	5.5
7. Butcher knife	79	38	29	18	164	47.6
8. Scythe	32	22	18	16	88	25.8
9. Mower sickle	69	32	29	31	161	46.8
10. Hoe	79	54	39	29	201	58.4
11. Cultivator shovel	23	11	9	7	50	14.5
12. Harrow teeth	7	6	3	1	17	4.9
13. Disc harrow blade	3	1	0	0	4	1.2
14. Plow share	22	5	3	3	33	9.6
15. Axe	87	53	45	38	223	64.8
16. Hatchet	58	39	31	20	148	43.1
17. Miscellaneous	0	0	1	4	5	1.4
N. General Improvement Jobs	373	207	142	113	835	
1. Build fence	118	61	46	40	265	77.1
2. Repair gates	103	56	43	33	235	68.2
3. Repair screen door	82	45	29	17	173	50.3
4. Fit storm windows	43	26	11	15	95	27.4
5. Build farm trailer	18	11	7	5	41	11.9
6. Replace tool handles	2	0	0	0	2	0.6
7. Miscellaneous	7	8	6	3	24	7.0

TABLE XIII. THE HOME FARM SHOP FACILITIES AVAILABLE TO 112 JUNIOR AND SENIOR VO-AG STUDENTS OF MONTANA - 1940-41 School Year

Shop Factors	No. of Students Rating Factors	Pct. of Students Rating Factors
I. Size (floor space)		
A. 400 sq. ft. and over	14	13.2
B. 399 sq. ft. to 250 sq. ft.	15	14.2
C. 249 sq. ft. to 100 sq. ft.	30	28.3
D. Less than 100 sq. ft.	28	26.4
E. No shop	19	17.9
II. Location		
A. Separate building or separate space with tractor and truck driveway into shop.	9	8.6
B. Shop space used partly by garage or other use. Has a tractor and truck door.	39	36.7
C. Separate building or separate space. Has small door.	22	20.7
D. Shop space used for other purposes. Has small door.	19	17.9
E. No shop.	17	16.1
III. Heat		
A. Heated by stove; suitable for use in severe weather.	19	21.4
B. Unsuitable for use in severe weather.	70	78.6
IV. Light		
A. Artificial light plus glass windows	22	23.6
B. Shop adequately lighted by glass windows only.	35	37.6
C. Shop inadequately lighted; work bench adequately lighted.	22	23.6
D. No artificial light; no windows	14	15.2
V. Floor		
A. Concrete and wood	6	6.6
B. Concrete only	9	9.9
C. Wood	34	37.3
D. Dirt	39	42.5
E. Combination of two of above	3	3.1

TABLE XIII (Continued). THE HOME FARM SHOP FACILITIES AVAILABLE TO 112 JUNIOR AND SENIOR VO-AG STUDENTS OF MONTANA - 1940-41 School Year

Shop Factors	No. of Students Rating Factors	Pct. of Students Rating Factors
VI. Tool Storage		
A. Tools restored in cabinet	6	6.6
B. Tools hang in open on wall	21	22.4
C. Tools lay on bench or shelf	12	12.8
D. Tools are kept in more than one place on farm	23	13.8
E. Tools are not stored	4	4.3
F. Combination of two of above	30	31.9
G. Combination of three of above	7	7.4
VII. Lumber and Iron Storage Facilities		
A. Stored on wall rack	3	3.1
B. Stored on ceiling joists or in corner	20	20.4
C. Stored on floor	13	13.3
D. Stored in piles outside shop	34.	34.7
E. Not stored	18	18.3
F. Combination of two of above	10	10.1
G. Combination of three of above	4	4.3
VIII. Storage Facilities for Nails, Bolts, Screws		
A. Bins or cans for common sizes of each	59	58.4
B. All sizes of each in one bin or can	28	27.8
C. Not stored	14	18.8
D. Combinations of two of above	1	1.0

TABLE XIV. NUMBER OF STUDENTS WITH TOOLS AVAILABLE AND AVERAGE NUMBER OF FARM SHOP TOOLS ON HOME FARMS OF THESE STUDENTS*

Farm Shop Tools	No. of Students With Tools Available	Pct. of Students With Tools Available
1. Shop bench	83	74.2
2. Shop vise	76	67.8
3. Forge	44	39.3
4. Anvil	75	67.0
5. Hand emery wheel	54	48.2
6. Power emery wheel	15	13.4
7. Grind stone	65	58.1
8. Oil stone	80	71.5
9. Post drill	43	38.4
10. Rip saw	93	83.1
11. Hand saw	107	95.5
12. Saw set	55	49.1
13. Claw hammer	108	96.4
14. Metal hammer	72	64.3
15. Sledge hammer	95	84.9
16. Steel square	102	91.1
17. Tee bevel	36	32.1
18. Carpenter's level	94	83.9
19. Automatic drill	18	16.1
20. Draw knife	93	83.1
21. Carpenter's brace	95	84.9
22. Expansive bit	45	40.2
23. Auger bits (min. of five)	94	83.9
24. Twist drills (min. of five)	55	49.1
25. Plane	95	84.9
26. Screw driver	110	98.2
27. Wrecking bar	101	90.2
28. Flat file	107	95.5
29. Triangular file	91	81.3
30. Glass cutter	77	68.8
31. Putty knife	85	75.9
32. Cold chisel	106	94.6
33. Punch	106	94.6
34. Stocks and dies for bolts	41	36.3
35. Chain drill	9	8.0

*This study included 112 junior and senior vocational agriculture students of Montana, 1940-41 school year.

TABLE XIV (Continued). NUMBER OF STUDENTS WITH TOOLS AVAILABLE AND AVERAGE NUMBER OF FARM SHOP TOOLS ON HOME FARMS OF THESE STUDENTS*

Farm Shop Tools	No. of Students With Tools Available	Pct. of Students With Tools Available
36. Hack saw	97	86.6
37. Pliers	106	94.6
38. Pipe wrench	100	89.3
39. Tin snips	86	76.8
40. Blacksmith Tongs (minimum of two)	47	42.0
41. Harness needles	40	35.4
42. Harness Awls	55	49.1
43. Harness riveting machine	47	42.0
44. Shovel or spade	110	98.2
45. Trowel	70	62.5
46. Center punch	90	80.2
47. Crescent adjustable wrench	101	90.2
48. Open end wrenches (minimum of four)	100	89.3
49. Box end wrenches (minimum of four)	64	57.2
50. Socket wrenches (min. of five)	69	61.6
51. Valve lifter	26	23.1
52. Carpenter's dividers	28	25.0
53. Blow torch	51	45.6
54. Soldering copper	71	63.4

*This study included 112 junior and senior vocational agriculture students of Montana, 1940-41 school year.

VITA

William Joseph Welker was born near Weatherby, Missouri, February 2, 1899. His elementary and secondary education was secured in the public schools of Coffeyville, Kansas, from 1906 to 1918. He entered Kansas State College, Manhattan, Kansas, in 1920. The Degree of Bachelor of Science in Agricultural Engineering was received in June, 1924. The school year of 1935-36 was spent at Montana State College, Bozeman, Montana, in preparing to teach Smith-Hughes vocational agriculture. As a result of graduate study during summer school terms, and the school year of 1940-41, the Degree of Master of Science was awarded in June, 1941.

W. J. Welker's early experience was that of the average farm boy that might go to city schools and spend his evenings, week-ends, and summer holidays with his parents. The period of 1918-1920 was spent as an enlisted man in the United States Army as a first class carpenter worker and as an oil field worker. From 1924 to 1927 he acted as a farm mechanics instructor and a school fair organizer, supervisor and judge for the Province of Alberta at the Agricultural School at Claresholm, Alberta, Canada. In 1927 he purchased a farm implement business. This business venture entailed duties in farm implement sales, credits, collections, general service, and repair work and supervision of employees. He sold the farm implement business in 1935 in order to return to the United States to make his home.

During the years of 1936 to 1940 he was employed as a vocational agriculture instructor at Fergus County High School, Lewistown, Montana. During this time he served as assistant vocational agriculture teacher critic and as teacher critic for Montana State College. During the 1939 and 1940 Montana State College summer school sessions, he gave graduate farm mechanics instruction to classes of vocational agriculture instructors. During the 1940-41 school year he was employed one-third time as an agricultural engineering instructor and Supervisor of National Defense Training courses.

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W. J. Welker

June, 1941

LITERATURE CITED AND CONSULTED

1. Agricultural Education Magazine, Volumes January 1929 through April 1941.

2. Cheney, Clark T., A Study of The Vocational Farm Mechanics Courses in the High Schools of the United States, unpublished thesis, Iowa State College Library, Ames, Iowa, 1930.

3. Coan, Abraham, Using the Project to Stimulate Farm Shop Work, Agricultural Education Magazine, Volume I, Number 3, March, 1929, p. 8.

4. Cook, G. C., A Handbook on Teaching Vocational Agriculture, The Interstate Printers and Publishers, Danville, Illinois, 1938.

5. Cook, G. C., Scranton, L. L., and McColly, H. F., Farm Mechanics Text and Handbook, The Interstate Printers and Publishers, Danville, Illinois, 1937, Preface.

6. Cook, G. C., and Walker, Practical Methods in Teaching Farm Mechanics, The Interstate Printers and Publishers, Danville, Illinois, 1936.

7. Farm Shop Work, Bulletin 261, The State Board of Control for Vocational Education, Lansing, Michigan, 1940.

8. Graybeal, H. C., Outlining the Course of Study in Agriculture by Means of the Farm Survey, Bulletin I, Department of Agricultural Education, University of Tennessee, Knoxville, Tennessee, 1925.

9. Hollenberg, A. H., The Correlation of Agricultural Science and Farm Mechanics Work, Report of 21st Annual Pacific Regional Conference, Misc. 2207, Office of Education, U. S. Department of Interior, Washington, D. C., 1939.

10. Lattig, H. E., Practical Methods in Teaching Vocational Agriculture, McGraw-Hill Book Company, Inc., New York, 1931.

11. Lee, Edwin A., Objectives and Problems of Vocational Education, McGraw-Hill Book Company, Inc., New York, 1938.

12. Miscellaneous publications from agricultural teacher training departments of California, Colorado, Montana, and North Dakota.

13. Palmer, R. H., The Farm Mechanics Home Project, a mimeographed circular, Department of Agricultural Education, Montana State College, Bozeman, Montana, 1938.

14. Prosser and Allen, Vocational Education in a Democracy, The Century Co., New York, 1925.

15. Publication No. 347, Sixty-fourth Congress, S. 703.

16. Robinson, H. E., A Farm Shop Program, Report of 22nd Annual Conference of Vocational Agriculture Instructors, Office of State Director of Vocational Education, Montana State College, Bozeman, Montana, 1939, p. 25.

17. Roehl, L. M., Farmers Shop Book, The Bruce Publishing Company, Milwaukee, Wisconsin, 1939.

18. Schmidt, G. A., Efficiency in Vocational Education in Agriculture, The Century Company, New York, 1928.

19. Schmidt, G. A., Ross, W. A., and Sharp, M. A., Teaching Farm Shop Work and Farm Mechanics, The Century Company, New York, 1927.

20. Sharp, M. A., Sharp W. M., Principles of Farm Mechanics, John Wiley and Sons, New York, 1930.

21. State Plans for Vocational Education from Colorado, Iowa, Kansas, Montana.

22. Statistical Release No. 5, Federal Security Agency, U. S. Office of Education, Washington, D. C., March 10, 1941.

23. Supervised Farm Practice Planning, Bulletin 163, U. S. Office of Education, Washington, D. C., June, 1932.

24. Supervised Practice in Agriculture Including Home Projects, Bulletin 112, U. S. Office of Education, Washington, D. C., April 1930.

25. Sutherland, S. S., Farm Mechanics Courses for Montana High Schools, a mimeographed pamphlet, Department of Agricultural Education, Montana State College, Bozeman, Montana, 1928.

26. Sutherland, S. S., Home Projects in Farm Mechanics, Agricultural Education Magazine, Volume VI, No. 4, October, 1933, p. 61.

27. Sutherland, S. S., Supervised Farming Yesterday, Today, and Tomorrow, Agricultural Education Magazine, Volume XI, No. 10, April, 1939, p. 190.

28. Sweany, H. P. and Starrak, J. A., Supervised Practice in Vocational Agriculture in Iowa, Bulletin P29, Iowa State College, Ames, Iowa, 1941.

29. Technology on the Farm, a special report by an Interbureau committee and the Bureau of Agricultural Economics of the U.S.D.A., U. S. Government Printing Office, Washington, D. C., 1940.

30. Vocational Education Manual for Montana, Department of Public Instruction, Helena, Montana, 1937-1942.

31. Vocational Education, U. S. Government Printing Office, Washington, D. C., 1938.

32. "Vocational Education for Iowa, State of Iowa, Board for Vocational Education, Des Moines, Iowa, May, 1938.

33. Walker, Clyde, Determining the Content of Farm Mechanics Courses of Study for Smith-Hughes Agriculture Departments in High Schools, unpublished thesis, University of Nebraska Library, Lincoln, Nebraska, 1930.

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