A FARM MECHANICS TRAINING PROGRAM IN VOCATIONAL AGRICULTURE

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IN VOCATIONAL AGRICULTURE

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CHAPTER I

INTRODUCTION

The Bond County Community Unit No. 2 School District has two high school attendance centers at the present time; one, located at Greenville and the other at Pocahontas in south southwestern Illinois. At the present time one new high school is being constructed and when completed the two high schools will be consolidated into one unit. Plans are for the two vocational agriculture departments to be combined having two instructors. The farm mechanics program will then be expanded, this calls for reorganization of plans to better meet the needs of the students. The physical plant and equipment are adequate to serve an enlarged program of farm mechanics activities which can be planned to better fit the needs of students and farmers in Bond County. With the increased use of tractors, trucks, farm machinery, and electricity and electrical equipment the need for a more organized farm mechanics course has likewise increased.

A course that includes electricity, farm plumbing and water systems, concrete and masonry, farm carpentry, painting, welding, and farm machinery maintenance and repair must be developed to better meet the needs of farmers in the area. It is recognized that farmers themselves constitute one of the better sources of information for planning an instructional program.

In a survey conducted as part of the study, twenty-five farmers from the Greenville attendance center and twenty-five farmers from the Pochontas attendance center were interviewed. The farmers were considered representative in both of the attendance centers; providing a cross section both as to type of farming and size of business in both areas. The information obtained should provide a sound basis for organizing the course content of the farm mechanics program.

Definition. The term "farm mechanics" is used in this report to include all unspecialized mechanical skills needed on the farm and in the home.

Cook, Scranton, and McColly had the following comment to make on the subject:

> The term "mechanics" is commonly used to indicate some mechanical work such as auto mechanics or blacksmithing; but as used in the vocational field it has a much broader meaning. The term "farm shop work" and "farm mechanics" are often used interchangeably in connection with the program in vocational agriculture. Farm mechanics instruction, however, is much broader in scope than is farm shop work. Farm mechanics instruction includes all the unspecialized mechanical activities needed on the farm and in the home.[1]

Purpose. The purpose is to secure information from which to develop a farm mechanics training program in vocational agriculture, based upon the needs of farmers in the community.

Need for the study. Before success can be achieved in a farm mechanics training program a systematic plan must be formulated so farm skills are not over looked or over emphasized. In a department with two teachers a definite plan must be adopted so each teacher will know what farm mechanics skills he will teach each year. At the

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[1]Cook, Scranton, McColly, Farm Mechanics Text and Handbook, p31

present time only minor and inadequate organization has been given the development of units of instruction in farm mechanics.

Procedure. To attempt to solve the problem a study was designed and completed. Investigation involved collecting and analyzing data and subsequent development of a farm mechanics training program for the local school. Procedure followed in the study included the following steps:

1. A review of pertinent literature on the subject was made.
2. Fifty farmers in the Bond County Community Unit No. 2 School District were interviewed to secure information needed for the study.
   (a) Twenty-five farmers in the Pocahontas area were interviewed.
   (b) Twenty-five farmers in the Greenville area were interviewed.
3. Results of the survey were tabulated and analyzed.
4. A farm mechanics training program in vocational agriculture for the Bond County Community Unit High School was formulated, based upon the needs of the farmers as analyzed from the findings.

The types of information secured included: (1) size of farms; (2) kind of animal and crop enterprises; (3) kind of equipment found on farms in the area; (4) home conveniences; (5) abilities of farmers to do farm skills; (6) abilities farmers thought students should learn to do in a farm mechanics course; (7) welding projects made or needed; (8) type of tools and equipment needed on farms in the area.

Review of similar studies. With the rapid expansion of farm mechanization, which has occured within the past two decades, it is quite natural that considerable time and study have been given by workers in vocational agriculture in organizing farm mechanics courses to better meet the needs of farmers and students. Ingram,[2] makes the following summary statement regarding a study completed in farm mechanics:

> The study showed that the farms of the county had shown a great increase in the use of tractors, trucks, farm machinery and electricity and electrical equipment.

Phipps and Deyoe[3] in a study designed to determine the proper contents for a farm mechanics course report the following conclusions:

> The most important phase of farm mechanics instruction for farmers is the maintenance, repair, and adjustment of machinery including tractors.
>
> Since some interest was indicated in all five of the areas of farm mechanics, farm shop work, farm power and machinery, farm building and conveniences, soil and water management, and rural electrification, a teacher might check to see that the important content in each of these areas is included in his courses.

Price[4] in a study of young farmer instructional programs had the following comment regarding farm mechanics programs for young adult farmer programs:

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[2]Fred C. Ingram, "Planning the Farm Shop Building and Equipment for the Department of Vocational Agriculture in Winder High School," (unpub. Non-thesis study, University of Georgia, 1953) Summaries of Studies in Agricultural Education, Vocational Division Bul. 256 (Washington, 1955), p. 46

[3]Lloyd J. Phipps and George P. Deyoe, "Determining Farm Mechanics Content--What Farmers Consider Important," (unpub. Non-thesis study, University of Illinois, 1952), as reported in Summaries of Studies in Agricultural Education, Vocational Division Bul. 253 (Washington 1954) p. 19

[4]Robert R. Price, "Factors Associated With the Occurrence of Local Young Adult Farmer Instructional Programs in Vocational Agriculture in the States of Pennsylvania and Oklahoma" (unpub. Doctor's dissertation, Pennsylvania State University, State College, 1956 pp. 131-132.

Conversely, the evidence secured by treatment of data included in this study definitely would indicate that the occurance of organized instructional programs for young adult farmers is associated with substantial inventory of superior farm mechanics facilities and equipment.

Roy W. Dugger[5] in a study of mechanical competencies needed by vocational agriculture teachers in Oklahoma pointed out:

> The planning of effective educational programs in agriculture which are adapted to the needs of farmers requires that attention be given to the practices which are being used by successful farmers. To plan adequate instructional programs in farm mechanics involves ascertaining the farm mechanics practices which are being used by successful farmers.

In the study conducted Dugger interviewed forty selected vocational agriculture teachers, forty selected young farmers, and forty selected adult farmers in an attempt to secure opinions regarding the degree of understanding needed by farmers in certain mechanical competencies. In a summary of findings the following are reported: All the interviewees expressed the opinion that farmers need an extensive and personal understanding in the following mechanical competencies; (1) Selecting farm tractors, (2) Lubricating engines and farm machinery, (3) Selecting farm machinery, (4) Servicing farm machinery, (5) Building with concrete, lumber, and metal, (6) Planning, building, and repairing livestock and poultry equipment, (7) Planning and repairing farm fences, (8) Selecting, using, and conditioning hand and power shop tools, (9) Using nails, bolts, keys, and pins, (10) Using a framing square.

Many other farm mechanic competencies were considered, and a majority of the interviewees expressed the opinion that farmers needed

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[5]Roy W. Dugger, "Mechanical Competencies Needed by Vocational Agriculture Teachers in Oklahoma" (unpub. Doctor's dissertation, Oklahoma Agricultural and Mechanical College, Stillwater, 1956), p.105

extensive and personal understanding. These included: (1) The more elementary competencies involved in maintaining and servicing electrical systems and appliances, (2) Selecting, installing, and servicing water systems for the farmstead, (3) Servicing irrigation pumps, pipe lines, and power units as well as many others.

Pruitt[6] in a study made for the purpose of securing pertinent data and developing a local farm mechanics program in vocational agriculture recommends the following:

1. That machinery maintenance and repair should be an important phase of the farm mechanics program.
2. That in the majority of local departments more equipment needs to be purchased to fulfill the above need.
3. That in general more training in farm carpentry is needed.
4. That skill in fence construction and repair and using the electric drill needs to be developed.
5. That more emphasis needs to be placed on ropework, plumbing and eletricity.

A review of the available literature indicates that more emphasis should be placed on the farm mechanics course to meet the ever increasing demands of farmers to learn to cope with the every day needs of farm mechanics skills on the farm and in the home.

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[6]Walter E. Pruitt, "A Four Year Farm Mechanics Program in Vocational Agriculture for the Marshall High School Based Upon a Community Survey," (unpub. Master's thesis, Oklahoma Agricultural and Mechanical College, Stillwater, 1954), pp. 64-65.

CHAPTER II

PRESENTATION OF DATA

Data presented in this chapter were obtained through individual interviews with twenty-five selected farmers in the Greenville attendance area and twenty-five selected farmers residing in the Pocahontas attendance area. Each of the interviewees was asked to give opinions concerning farm mechanics skills which farmers should be able to do in their farming operations and also also asked for an opinion as to farm mechanics skills students should learn to do in their farm mechanics instruction in vocational agriculture. Information concerning the extent of the mechanization of farms, size of farms, farm enterprises prevalent, equipment owned, and tools needed were also secured at the time of the interview and subsequently tabulated and analyzed.

The farm mechanics skills about which farmers were asked to express opinions were divided into the following groups: (1) electricity; (2) farm plumbing and water system installation; (3) farm concrete and masonry; (4) farm carpentry; (5) farm painting; (6) farm welding; (7) farm machinery maintenance and repair; and (8) miscellaneous farm operations. Part of this chapter is devoted to the farm mechanics skills farmers indicated they believed were important for them to know as farm operators and those which they felt students should learn in their farm mechanics training program. Also found in this chapter is an analysis of pertinent data regarding the

nature and extent of farming operations and the equipment found on farms.

TABLE I

STATUS OF FIFTY FARM OPERATORS IN THE GREENVILLE-POCAHONTAS SCHOOL ATTENDANCE AREA WITH REGARD TO OWNERSHIP OF LAND OPERATED

Number Acres	Land rented, only: Per cent reporting	Land owned, only: Per cent reporting	Combination: Per cent reporting
0 to 59	0	0	0
60 to 119	2	8	4
120 to 179	6	6	8
180 to 239	10	4	18
240 to 299	6	2	10
300 and over	0	2	14
Total	24	22	54

The median size of all farms surveyed was 210 acres, with the largest farm consisting of 560 acres and the smallest 80 acres. Sixty-six per cent of the farms surveyed ranged in size from 80 acres to 239 acres, with thirty-four per cent totaling 240 acres or more. The size of farms reported appears as sufficient to justify the more extensive mechanization found throughout the area.

It is interesting to note that the combination of "owner and renter" was a pattern peculiar to the farming of larger acreages. Seventy-eight per cent of the farmers rented some or all of the land they farmed, while only twenty-four per cent rented all the land farmed. This would indicate a high degree of stability for the farmers, and is quite likely a factor of importance in the extensive

increase of home conveniences, farm improvements, and other farm mechanization.

TABLE II

STATUS OF FIFTY FARM OPERATORS IN THE GREENVILLE-POCAHONTAS SCHOOL ATTENDANCE AREA WITH REGARD TO DISTANCE OF RESIDENCE FROM SCHOOL CENTER

Distance	Farm operators: Per cent reporting	Distance, miles	Farm operators: Per cent reporting
0 to 1	4	14 to 15	14
2 to 3	6	16 to 17	10
4 to 5	4	18 to 19	0
6 to 7	12	20 to 21	2
8 to 9	6	22 to 23	0
10 to 11	26	24 to 25	2
12 to 13	14		

The distance farmers and students live from the attendance center naturally regulates to a certain extent the amount of machinery repaired, reconditioned, and painted in the farm shop. This is an important factor in organizing a farm mechanics course that will meet needs for instruction for both high school students and adult farmers.

The median miles farmers live from school is 10.88 miles, with the greatest distance reported as being twenty-five miles and the nearest being only three-eighths of a mile. While ninety-six per cent of the farmers interviewed lived within 17.5 miles of the new attendance center, only ten per cent lived within a 3.5 mile radius. This information would indicate that the distance farmers live from the attendance center is definitely a factor of importance to consider in planning for an effective program in farm mechanics.

TABLE III

OPINIONS EXPRESSED BY FIFTY FARM OPERATORS RESIDING IN THE GREENVILLE-POCAHONTAS SCHOOL ATTENDANCE AREA REGARDING THE IMPORTANCE OF ANIMAL ENTERPRISES

Enterprise	Farmers rating: First, per cent	Farmers rating: Second, per cent	Farmers rating: Third, per cent
Dairy	52	22	8
Swine	38	44	12
Beef	10	8	8
Poultry	0	16	54
Sheep	0	4	0
Horses	0	0	2

Farmers were of the opinion that dairying is the most important animal enterprise of the community. Table III shows that 52 per cent of the farmers ranked dairying first with 22 per cent ranking it as second in importance. The swine enterprise was ranked second by 44 per cent while 38 per cent ranked it first. These rankings make it appear that swine is the second most important enterprise to the farmers surveyed. Fifty-four per cent of the farmers surveyed ranked poultry as third in importance. Of the fifty farmers in the survey forty-five checked either dairy or swine as the most important enterprise found on their farms. From these finds it would seem that a farm mechanics program might well result in considerable time devoted to construction and maintenance of equipment for the dairy and swine enterprises.

TABLE IV

OPINIONS EXPRESSED BY FIFTY FARM OPERATORS RESIDING IN THE GREENVILLE-POCAHONTAS SCHOOL ATTENDANCE AREA REGARDING THE IMPORTANCE OF PLANT ENTERPRISES

Crop	Farmers rating: First, per cent	Farmers rating: Second, per cent	Farmers rating: Third, per cent
Soybeans	4	48	30
Wheat	4	30	46
Hay	4	0	4
Alfalfa	0	8	2
Pasture	0	4	2
Oats	0	2	6
Clover	0	2	0
Cane	0	0	2

Corn is by farm the most important crop enterprise in the community. Table IV shows that 88 per cent of the farmers ranked corn as the most important enterprise. Forty-eight per cent of the farmers ranked soybeans as second in importance while 30 per cent ranked the enterprise as third. The third most commonly grown crop is wheat, being ranked second in importance by 30 per cent and third by 46 per cent of the farmers surveyed.

It is apparent, therefore, that farm mechanics course for this community should emphasize farm mechanics jobs particularly related to the three enterprises; corn, soybeans, and wheat. Considerably less attention would be given to farm mechanics activities involved in the growing of hay, alfalfa, pastures, oats, clover, and cane. Such a variety of crops will require several different types of equipment.

TABLE V

FARMING EQUIPMENT REPORTED BY FIFTY FARM OPERATORS RESIDING IN THE GREENVILLE-POCAHONTAS SCHOOL ATTENDANCE AREA

Kind of equipment	Farm operators, Per cent reporting
Wagon	100
Cultivators	100
Corn planter	98
Tractor (distillate)	98
Moldboard plow	96
Automobile	92
Mowing machine	92
Electric motors	88
Disk harrow	86
Manure spreader	84
Spike-tooth harrow	84
Implement shed	82
Combine (pull type)	80
Feed grinder	66
Side delivery rake	58
Elevator	56
Rotary hoe	52
Grain drill (standard)	52
Farm shop building or room	50
Gasoline motors	50
Corn picker (pull type)	48
Pickup	48
Grain drill (fertilizer attachment)	48
Spring tooth harrow	42
Corn picker (mounted)	40
Hay baler	36
Milking machine	34
Truck	32
Lime and fertilizer spreader	30
Sprayer	30
Manure loader	24
Trailer	18

TABLE V (CONTINUED)

Kind of Equipment	Farm operators, Per cent reporting
Forge	10
Silage cutter	8
Electric welder	8
Disc plow	8
Silage blower	8
Roller	8
Tractor (diesel)	6
Combine (self propelled)	6
Seeder	6
Oxy-acetylene	4
Tractor (propane-butane)	0

Equipment reported on the fifty farms surveyed. The skills taught in a farm mechanics course should be based, to a large extent, upon the equipment used on farms of the community. The more common kinds of equipment found included wagons, cultivators and tractors; these being reported on all farms. It is interesting to note that no farmers reported tractors using propane-butane fuel and only six per cent reported using deisel powered tractors. The small percentage of diesel powered tractors may be related to some extent to the median farm size, which is 210 acres. The complete lack of no propane-butane type tractors is possibly also related to the type of fuel farmers use in heating their homes. Coal is cheap in this community and propane-butane heating systems are not used extensively, thus the storage facilities for fuel would all be charged to the tractor making fuel costs higher than where propane-butane heating systems are used.

Corn planters, mildboard plows, automobiles and mowing machines were reported on over 91 per cent of the farms surveyed. Pull-type combines were reported on eighty per cent of the farms. It is interesting to note the high per cent of implement sheds and farm shop building or rooms, which were reported on 82 per cent and 50 per cent, respectively, of the fifty farms surveyed.

TABLE VI

HOME CONVENIENCES ON FARMS AS REPORTED BY FIFTY FARM OPERATORS RESIDING IN THE GREENVILLE-POCAHONTAS SCHOOL ATTENDANCE AREA

Home conveniences	Farm operators, Per cent reporting
Electricity	100
Pressure water system	94
Hot water heater	82
Bathroom	78
Septic tank	64
Automatic stoker	20

Table VI indicates that an unusually high number of farm home conveniences are found on farms in this area. All of the farm homes have electricity. It is surprising to note that ninety-four per cent of the farm homes have a pressure water system and seventy-eight per cent reported having bathrooms with sixty-four per cent reporting septic tank installation. Only twenty per cent of the farm operators interviewed indicated they had an automatic stoker; however, since this question was not specifically asked on the schedule but was volunteered by the interviewees, the actual rate of occurrence may be higher.

TABLE VII

SKILLS IN THE AREA OF ELECTRICITY INDICATED AS OF IMPORTANCE BY FIFTY FARM OPERATORS

Skills considered	Farmers indicating importance of: Skill for farmers Per cent	Skill for students Per cent
Replacing fuses	98	84
Repairing electric cords	92	86
Doing simple electric wiring	88	90
Basic principles of electricity	82	90
Splicing electric wires	80	80
Soldering	74	66
Maintenance of electric motors	68	82
Basic principles of electric motors	60	80
Reversing electric motors	60	78

Table VII indicates that farmers believe they should be able to perform several electrical skills in their farming operations and that students should be taught those skills. Eighty-eight per cent thought they should be able to do simple wiring, while 90 per cent thought this should be taught to high school students. Over 90 per cent were of the opinion that farm operators should be able to replace fuses and electric cords with a slightly less number feeling that such skills should be taught to high school students.

It is interesting to note that more farmers thought high school students should be taught to understand the basic principles of electric motors, reversing electric motors, and how to clean, lubricate,

and maintain electric motors than felt these were skills particularly needed by farm operators.

TABLE VIII

SKILLS IN THE AREA OF FARM PLUMBING AND INSTALLATION OF WATER SYSTEMS INDICATED AS OF IMPORTANCE BY FIFTY FARMERS

Skills considered	Farmers indicating importance of: Skill for farmers Per cent	Skill for students Per cent
Repairing leaky valves and faucets	88	76
Upkeep and repair of pumps	82	72
Pipe cutting, threading, and fitting	82	78
Laying sewage tile	80	62
Installing plumbing fixtures	62	64
Cleaning septic tanks	46	38

Table VIII indicates that repairing leaky valves and faucets was listed as the most important skill by 88 per cent of the farmers. With the exception of installing plumbing fixtures and cleaning septic tanks, eighty per cent or more of the farmers indicated they should be able to do all of the skills listed in Table VIII.

It is interesting to note that with the exception of installing plumbing fixtures, all of the farmers indicates that those skills should be taught less in a farm mechanics course than they should be able to do. Pipe cutting, threading, and fitting was reported by 78 per cent of the farmers as being an important skill to teach vocational agriculture students. Cleaning septic tanks was only reported by 38 per cent of the farmers as a worthwhile skill in which high school

students should become proficient.

TABLE IX

SKILLS IN THE AREA OF FARM MASONRY INDICATED AS OF IMPORTANCE BY FIFTY FARMERS

Skills considered	Farmers indicating importance of: Skill for farmers Per cent	Skill for students Per cent
Selecting and preparing concrete mixtures	92	82
Rough concrete work	90	78
Layout and level foundation	82	76
Finished concrete work	78	62
Laying bricks, tile and concrete blocks	74	78
Estimating quantities of brick, tile, and concrete blocks needed	68	76

Ninety per cent or more of the farmers indicated a farm operator should be able to do rough concrete work and select and prepare concrete mixtures. With the exception of 'estimating quantities of brick, tile and concrete blocks needed,' three-fourths of the farmers indicated they should be able to do all masonry skills listed.

Selecting and preparing concrete mixtures, as a skill which should be taught to high school students was so identified by 82 per cent of the farmers, while 78 per cent were of a like opinion regarding the skills of rough concrete work and laying brick, tile and concrete blocks. Seventy-six per cent reported 'layout and level up a foundation' and 'estimating quantities of brick, tile and concrete blocks needed' as important skills for seconday school pupils. Ability to

complete finished concrete work was indicated by a somewhat fewer number of farmers as a skill needed by farmers.

TABLE X

SKILLS IN THE AREA OF FARM CARPENTRY INDICATED AS OF IMPORTANCE BY FIFTY FARMERS

Skills considered	Farmers indicating importance of: Skill for farmers Per cent	Skill for students Per cent
Construction of hog houses, feeders, etc.	94	92
Roofing	88	78
Framing small buildings	88	80
Building farm buildings	82	72
Figuring bill of materials	78	82
Sharpening metal bits	78	72
Cutting common rafters	78	90

Over seventy-seven per cent of the farmers asked indicated that they felt farm operators should be able to do all skills listed in Table X, with 94 per cent reporting construction of hog houses, feeders, etc. as important skills for farmers to have. Approximately the same high percentage, 92 per cent, reported attainment of these skills as important for high school students.

It is interesting to note that ninety per cent of the farmers surveyed indicated cutting common rafters an important skill and only 78 per cent reported it as an important skill for farmers.

TABLE XI

SKILLS IN THE AREA OF FARM PAINTING INDICATED AS OF IMPORTANCE BY FIFTY FARMERS

Skills considered	Farmers indicating importance of: Skills for farmers Per cent	Skill for students Per cent
Applying exterior paint	92	82
Painting metal surfaces	92	84
Cleaning and care of brushes	92	82
Painting farm implements	88	94
Selecting paint	80	74
Mixing paint	76	62

Table XI indicates that all farmers interviewed reported they felt farm operators should be able to do all skills more than should be taught in a farm mechanics course with the exception of painting farm implements. Ninety-two per cent reported farm operators should be able to perform the skills of applying exterior paint, painting metal surfaces, and cleaning and care of brushes in their farming operations. All skills listed in Table XI were reported by 75 per cent or over of the farmers surveyed.

Ninety-four per cent indicated students in high school should be taught painting farm implements in their farm mechanics program. Only 62 per cent and 74 per cent reported mixing paint and selecting paint, respectively, were important skills to teach. Applying exterior paint, painting metal surfaces, cleaning and care of brushes were indicated as important to vocational agriculture students by

eighty-two per cent or over of all farm operators interviewed.

TABLE XII

SKILLS IN THE AREA OF FARM WELDING INDICATED AS OF IMPORTANCE BY FIFTY FARMERS

Skills considered	Farmers indicating importance of: Skill for farmers Per cent	Skill for students Per cent
Cutting metal	58	68
Arc welding	48	68
Brazing	38	56
Steel fabrication	34	50
Oxy-acetylene welding	30	54
Hardsurfacing	28	52

Forty-eight per cent of the farmers in the survey reported they felt farm operators should be able to perform arc welding. This proved interesting in view of the fact that only eighty per cent have arc welders. However, some of the farm operators interviewed have completed farm shop training in the Veterans-on-the-Farm Training Program, which may account for the percentage of opinion arc welding as a desirable skill for adult farmers. Even so, the per cent of farm operators reporting welding skills as important was less than in any of the other areas of farm mechanics skills.

The percentage of skills farmers thought important for students was higher than skills indicated as important for farmers on all welding skills on the survey, indicating that farm operators believe the need for farm welding will become even more important in the

future than it is at the present time. With the exception of steel fabrication the per cent of skill important for students were ranked in the same order of importance as skills important for farmers.

TABLE XIII

SKILLS IN THE AREA OF FARM MACHINERY INDICATED AS OF IMPORTANCE BY FIFTY FARMERS

Skills considered	Farmers indicating importance of: Skill for farmers Per cent	Skill for students Per cent
Minor farm implement repairs	96	88
Machine adjustments	96	86
Tractor maintenance and repair	94	80
Combine maintenance and repair	92	80
Corn picker maintenance and repair	90	78
Minor gasoline engine adjustments	88	76

The skills considered most important in the area of farm machinery maintenance and repair were 'minor repairs on farm implements' and 'adjustment of machines.' Of all the mechanical skills in the total survey schedule, 'minor repairs on farm implements,' was indicated as the most important skill which should be taught to vocational agriculture students.

Over 75 per cent of all farm operators interviewed indicated all skills listed in Table XIII were important enough to be included in the farm mechanics program.

More than ninety per cent of all farm operators indicated they felt farm operators should be able to do all of the skills in the

survey except minor adjustments of gasoline engines and 88 per cent reported farm operators should be able to do that skill.

TABLE XIV

SKILLS IN THE AREA OF MISCELLANEOUS FARM OPERATIONS INDICATED AS OF IMPORTANCE BY FIFTY FARMERS

Skills considered	Farmers indicating importance of: Skill for farmers Per cent	Skill for students Per cent
Using electric drill	94	88
Grinding sickle	94	80
Using and conditioning hand tools	94	80
Fence construction and repair	92	80
Threading nuts and bolts	86	76
Riveting	86	78
Reading blueprints	62	74
Forge work	60	72
Farm drawing	56	72

'Using the electric drill,' 'using and conditioning hand tools,' and 'grinding sickles' were indicated as important skills for farmers by ninety-four pre cent of the farm operators surveyed. Ninety-two per cent indicated fence construction and repair as an important farm skill for operators. The more detailed skills of reading blueprints and farm drawing were indicated by only 62 per cent and 56 per cent respectively of the farm operators interviewed as important skills for farm operators.

On the average the farm operators interviewed considered all skills as less important to students than to farmers. However, farm operators considered the skills of 'farm drawing' and 'reading blueprints' as more important skills for students than for farmers.

TABLE XV

REPORTS GIVEN BY FIFTY FARMERS REGARDING THE USE OF THE ELECTRIC WELDER

Project	Per cent of farmers that have built	Per cent of farmers that would build
Hog feeder or waterer	12	44
Loading chute	6	34
Trailer	6	38
Clothesline post	6	40
Machinery trailer	6	30
Post hole digger	4	32
Gates	4	56
Cattle guard	2	24
Fuel oil rack	2	44
Barn floor scraper	2	24
Cattle feeder	0	22
Manure loader	0	8
Hay loader	0	4
Weed sprayer	0	18

Reports Given by Fifty Farmers Regarding the Use of the Electric Welder.

The use of electric welders by farmers is a practice which has greatly increased during recent years. The teaching of farm welding has consequently also received great emphasis in many farm mechanics courses in local schools. For those reasons farm welding was included in the interview schedule in order to discover equipment farmers have constructed and would construct if they owned an electric welder.

It is interesting to note that only eight per cetn of the farmers interviewed reported owning electric welders while twelve per cent report having made hog feeders or waterers. This indicates some farmers who do not own electric welders do have access to them. Six per cent reported they had made a loading chute, trailer, machinery trailer, or clothesline posts while none reported making a cattle feeder, manure loader, hay loader, or weed sprayer.

The percentage of farmers who would build gates if they owned electric welders was fifty-six per cent of the farm operators surveyed. Forty-four per cent reported they would build hog waterers or feeders or fuel oil racks. Only eight per cent and four per cent reported they would build a manure loader or hay loader if they had an electric welder.

Seventy per cent of the farm operators interviewed felt farm operators needed an electric welder while only thirty per cent felt an oxy-acetylene welder as needed in farm operations in this area. Less than fifty-seven per cent of the farm operators felt pipe cutters, and a pipe-bolt die set important.

TABLE XVI

OPINIONS EXPRESSED BY FIFTY FARM OPERATORS RESIDING IN THE GREENVILLE-POCAHONTAS SCHOOL ATTENDANCE AREA REGARDING TOOLS NEEDED BY FARM OPERATORS IN THE AREA

Tools	Tools farmers need Per cent indicated
Carpenter's square	100
Claw hammer	100
Set of open-end wrenches	100
Pliers	100
Pipe wrench 10"-12"	100
Grease gun	100
Rule	98
Carpenter's level	98
Assortment of screwdrivers	98
Tin snips	98
Brace-set of bits	96
Hacksaw	96
Vice grip pliers	96
Assortment of chisels	94
Set of box-end wrenches	94
Socket set	94
Table vice	94
Ball pien hammer	90
Cross-cut hand saw	90
Rip saw	90
Trouble light	90
Power grinder	88
One-half inch electric drill	88
Draw knife	86
Crescent wrenches 10"-12"	86
Key hole saw	84
Blow torch	82
Crescent wrenches 6"-8"	80
Bolt cutters	80
Trowel	76
Jack plane	74
Glass cutter	72

TABLE XVI (CONTINUED)

Tools	Tools farmers need Per cent indicated
Electric welder	70
Air compressor	70
Try-square	64
Blacksmith's hammer	62
Timber saw	62
Chain hoist	60
Forge	58
Paint sprayer	58
Miter box	56
Diagonal cutting pliers	56
Pipe cutters	56
Pipe-bolt die set	52
Drill press	50
One-forth inch drill	50
Plumb bob	46
Coping saw	42
Miter saw	40
Calipers	36
Oxy-acetylene	30
Band saw	30
Micrometer	28
Belt sander	24
Electric saw	8
Chain saw	4

Table XVI indicates farm operators consider tools needed for farm carpentry and 'machine maintenance and repair' are needed most in this area. One-hundred per cent indicated farm operators needed a carpenter's square and a claw hammer, and ninety-eight per cent felt a rule, and carpenter's level would be needed in their farm operations. A set of open-end wrenches, pliers, pipe wrench 10"-12", and grease gun were reported important tools by one-hundred per cent and

ninety-eight per cent felt an assortment of screw drivers, as tools needed by the fifty farm operators surveyed.

CHAPTER III

SUMMARY AND CONCLUSIONS

Twenty-five farm operators in the Pocahontas school attendance area and twenty-five farm operators in the Greenville school attendance school area were included in the survey as representative of farming units of the two attendance areas, not only in geographical location but social and economic status as well. All types of farming activities in which farm operators engage in are adequately represented. The farm operator interviewees were evenly distributed over the total future attendance area.

The fifty farm operators interviewed in this study certainly constitute a large enough cross section of farming activities to enable definite conclusions to be reached, which, in turn, provides a sound basis for planning a farm mechanics training program in vocational agriculture.

The median size of farm was 210 acres. Sixty-six per cent of the operators farm from 80 to 239 acres, while seventy-eight per cent of the operators rent all or part of the land farmed. The median distance farmers live from the new attendance center is 10.88 miles, with the farthest living a distance of twenty-five miles and the nearest only three-eights of a mile.

Dairying is the most important livestock enterprise in the community in terms of income farmers receive, followed closely by swine. Due to the large number of farms with poultry flocks, this enterprise was ranked as third in importance. Corn is definitely the most important crop enterprise with soybeans and wheat ranking second and third, respectively, in importance.

All of the farm operators had an automobile, truck, or pickup on their farms and also wagons and cultivators. Ninety-eight per cent of the farm operators reported gasoline tractors. Mowing machines and moldboard plows were reported on over ninety per cent of the farms and slightly in excess of eighty per cent had pull type combines, implement sheds, spike tooth harrows, manure spreaders, disk harrows, and electric motors. Fifty per cent reported having a farm shop building or room.

An unusually high number of farm conveniences are found on the farm surveyed. All of the farms have electricity and ninety-four per cent have a pressure water system with seventy-eight per cent reporting hot water heaters.

The farmers believed that as farm operators they should have a large number of skills in the area of electricity and also are of the opinion that students should acquire a large number of electrical skills. Over seventy-seven per cent of all of the electrical skills were rated as important skills for students to acquire. Other areas of farm skills in which three-fourths or over of the interviewees felt the skill was important to students were: (1) repairing leaky valves and faucets; (2) pipe cutting, threading, and fitting; (3) selecting and preparing concrete mixtures, rough concrete work; (4) lay out and

level foundation; (5) laying brick, tile and concrete blocks; (6) estimating quantities of brick, tile, and concrete blocks needed; (7) construction of hog houses, feeders, etc.; (8) roofing; (9) framing small buildings; (10) figuring bill of materials; (11) cutting common rafters; (12) applying exterior paint; (13) painting metal surfaces; (14) cleaning and caring for brushes; (15) painting farm implements; (16) minor farm implement repairs; (17) machine adjustments; (18) tractor maintenance and repair; (19) corn picker maintenance and repair; (20) minor gasoline engine adjustments; (21) using electric drill; (22) grinding sickle; (23) using and conditioning hand tools; (24) fence construction and repair; (25) threading nuts and bolts and riveting.

When listing construction of farm equipment by use of the electric welder, hog feeders and waterers were discovered to have been built by more farmers than any other project. Other projects built extensively by farm operators included livestock trailers, loading chutes, and machinery trailers. The projects many farmers indicated that they would like to build were: (1) hog feeders and waterers, (2) cattle feeders, and (3) fuel oil racks.

All of the farm operators reported the following tools as needed in their farming operations: (1) carpenter's square, (2) claw hammer, (3) set of open-end wrenches, (4) pliers, (5) pipe wrench 10" to 12", (6) grease gun. Other tools considered as needed by over ninety per cent of the farm operators were: (1) rule, (2) carpenter's level, (3) assortment of screwdrivers, (4) tin snips, (5) brace-set of bits, (6) hacksaw, (7) vicegrip pliers, (8) assortment of chisels,

(9) set of box end wrenches, (10) socket set and table vice.

On the basis of the findings of this survey the following conclusions concerning a farm mechanics training program were drawn and are listed as follows:

1. Farm machinery maintenance and repair should be an important major part of the farm mechanics training course.
2. Construction with wood, concrete, brick and tile should all be included as worthwhile skills for students to acquire.
3. Knowledge of and ability to perform certain electrical skills is very important in modern farming operations.
4. Painting skills should be given more emphasis, especially in conjunction with farm machinery maintenance and repair.
5. Farmers feel that in order to become proficient as future farm operators students should learn more detailed type of skills than is even required of present farm operators.
6. In order to provide needed training in farm mechanics for both present and prospective farmers, teachers of vocational agriculture need to give careful attention to the selection of equipment to teach many skills.

CHAPTER IV

A FOUR YEAR TEACHING PROGRAM FOR TEACHING FARM MECHANICS IN VOCATIONAL AGRICULTURE AT GREENVILLE-POCAHONTAS HIGH SCHOOL

The teaching program as presented in this chapter has been based primarily upon the results of a survey made of farms and farmers opinions in this area. Teaching objectives have been formulated on a basis of student needs and in addition suggestions are given for students skills and activities which would aid in teaching the objectives. It is felt that the combining of the two attendance areas into the one unit will facilitate the carrying out of this program in that adequate facilities and equipment are now available for carrying out the activities which are presented in this chapter.

YEARLY TIME ALLOCATION OF TEACHING PERIODS FOR FARM MECHANICS

Job	Year Taught and Number of Periods			
	I	II	III	IV
Selecting activities of supervised farming in farm mechanics	5	2	2	2
Developing the home farm shop	5	3	3	3
Selecting and using rope	3			
Using, fitting, and sharpening tools	5	2		
Planning and constructing projects of wood	18			
Using sheet metal		5		
Using hot and cold metal		8		
Farm painting and glazing		12		
Building large projects of wood		16		
Welding			16	5
Constructing and improving farm buildings			10	
Maintaining and repairing farm machinery			15	
Using electricity			14	
Constructing farm masonry				10
Providing farm conveniences				8

Job	Year Taught and Number of Periods I	II	III	IV
Maintaining and repairing power machinery and equipment				19
Remodeling, repairing, and arranging farm buildings				10
Maintaining and repairing electric motors and appliances				10
Constructing and repairing farm fences				5
Total periods of instruction in farm mechanics	36	48	60	72
Total periods for four years: 216				

Job: Selecting Activities of Supervised Farming in Farm Mechanics — Year Taught: I

Teaching Unit Objective for Student — March — Periods: 5

Recognizing need for skills in farm mechanics as related to farming program

Determining projects and jobs in farm mechanics needed on home farm

Planning a long-time program of supervised farming activities in farm mechanics

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Student Skills and Activities

Survey the needs for skills in farm mechanics as related to entire farming program

Survey the needs on the home farm with reference to various phases of farm mechanics

Formulate a plan for activities in farm mechanics to be accomplished in the first year and in each successive year

References:

Starting to Farm, Beard
Your Farming Program, Hammonds and Tabb
Farm Mechanics Text and Handbook, Cook, Scranton, McColly, pp. 31-42

Job: Developing a Home-Farm Shop — Year Taught: I

Teaching Unit Objectives for Student — March — Periods: 5

Planning and organizing a home-farm shop

Equiping a home-farm shop

Storing tools properly

Students Skills and Activities

Arrange for a home-farm shop as a part of a building or as a separate shop building

Draw a tentative farm-shop plan

Make an inventory of home-farm tools and equipment for shop

Arrange home-farm shop tools and equipment

Condition and sharpen the tools for the shop

List home-farm shop equipment needs

List sources of farm shop equipment

Construct equipment for the shop

Suggested Projects:

Anvil base and anvil
Home-made forge
Saw horses
Work benches
First aid cabinet
Welding stand
Install convenience outlets
Construct farm shop
Lumber rack
Mount tools on tool panel
Auger bit rack
Tool cabinets
Miter box
Rehandle tools
Construct chimney
Rack for iron
Concrete floor
Install heat
Machinery trailer
Install hoist

References:

Shopwork on the Farm, Jones
Farmers Shop Book, Roehl and Longhouse
Farm Mechanics Text and Handbook, Cook, Scranton, and McColly, pp.47-60
How to Work with Tools and Wood, Stanley Rule and Level Company
Saw, Tool, and File Manual, Henry Diston and Son, Inc.
"The Farm Shop," Unit 51, Vocational Agriculture Service

Job: Using, Fitting and Sharpening Tools Year Taught: I

Teaching Unit Objectives for Student March Periods: 5

Selecting and using farm shop tools

Cleaning and caring for tools

Sharpening edge tools

Replacing and fitting tool handles

Practicing safety precautions

Student Skills and Activities

Identify and use sharpening equipment

Dress up an emery wheel and a grindstone

Lubricate moving parts of shop tools

Recondition school shop tools

Make a survey of home-farm shop tools and properly condition those tools in need of repair

Examine each tool and properly condition it before using

Protect the edge of all cutting tools while using, handling, and storing

Other Specific skills:

a. Grind and put an edge on chisels and plane blades
b. Sharpen axe, cold chisel, wood chisels, and mower knives
c. Clean a file and rasp
d. Dress a screw driver
e. Fit handles to axe, shovel, hammers, fork, etc.
f. Sharpen wood bits and steel drills
g. Sharpen shears

References:

Shopwork on the Farm, Jones
Farm Mechanics Text and Handbook, Cook, Scranton, and McColly, pp.92-121
Farmer's Shop Book, Roehl and Longhouse
How to Work with Tools and Wood, Stanley Rule and Level Company
Saw, Tool, and File Manual, Henry Diston and Sons

Job: Selecting and Using Rope Year Taught: I

Teaching Unit Objectives for Student March Periods: 3

Selecting and purchasing rope

Handling and caring for rope

Securing the ends of rope

Making and using knots and hitches commonly used on the farm

Splicing and repairing rope

Student Skills and Activities

Group practice activities in securing the ends of rope and in making knots, hitches, and splices

Make rope equipment needed for projects on the home farm

Repair rope equipment on the home farm

References:

Shopwork on the Farm, Jones
Farm Mechanics Text and Handbook, Cook, Scranton, and McColly, pp.189-209

Job: Planning and Constructing Projects of Wood Year Taught: I

Teaching Unit Objective for Student April Periods: 18

Identifying classes of lumber

Selecting and caring for lumber

Selecting and using various wood fasteners and common hardware

Figuring a bill of material

Drawing simple plans and sketches

Student Skills and Activities

Make working sketch for some needed project of wood

Make a bill of materials and purchase needed materials for making the project

Construct the project

Construct and repair F. F. A. equipment

Suggested projects:

Salt boxes
Milk can rack
Trellis
Gates
Guard rails
Pig creep
Milk stool
Tool boxes
Oyster shell box
Broody coops
Self feeder
Book case and magazine rack
Chick feeders
Feeding throughs for hogs
Pig brooders
Gate and show panels
Work benches
Silage cart
Lawn chairs
Poultry nests
Recreational equipment

References:

Shopwork on the Farm, Jones
Farm Mechanics Text and Handbook, Cook, Scranton, and McColly, pp. 60-67, 121-134
380 Things to Make, Cook
500 More Things to Make, Cook
Instroductory Shop Work, Jones and Axelrod
Screw Chart, American Screw Company
How to Work With Tools and Wood, Stanley Rule and Level Company

Special Aids:

Field trip to lumber yard to study classes, grades, and prices of lumber

Field trip to hardware store to identify wood fasteners and common hardware

Slidefilm No. 422, "Using the Square in Laying out a Saw Horse," Vocational Agriculture Service, University of Illinois

Job: Selecting Farm Mechanics Activities to Include the Supervised Farming Program — Year Taught: II

Teaching Unit Objectives for Student — December — Periods: 2

Analyzing need for skills in farm mechanics as related to farming program

Determining projects and skills in farm mechanics needed on home farm

Continue planning of a long-time program of supervised farming skills and activities in farm mechanics

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Student Skills and Activities

Re-survey the need in farm mechanics for ownership projects

Re-survey the needs on the farm home with reference to various phases of farm mechanics

Formulate a plan for skills and activities in farm mechanics to be accomplished this year

References:

Refer to "Selecting Activities of Supervised Farming in Farm Mechanics," Agriculture I

Job: Developing the Home-Farm Shop Year Taught: II

Teaching Unit Objectives for Student December Periods: 3

Developing the home-farm shop

Planning the home-farm shop improvements

Using safety precautions in home-farm shop

Student Skills and Activities

Re-inventory home-farm shop tools and equipment

Re-condition home-farm shop tools and equipment

Improve farm shop facilities

Replan the home-farm shop arrangement

Select and purchase additional home-farm shop tools and equipment

Construct home-farm shop equipment

Visit home-farm shops

Suggested projects:

Refer to "Developing the Home-Farm Shop," Agriculture I

References:

Refer to "Developing the Home-Farm Shop," Agriculture I

Job: Using, Fitting, and Sharpening Tools Year Taught: II

Teaching Unit Objective for Student December Periods: 2

Selecting and using farm shop tools

Cleaning and caring for tools

Practicing safety precautions

Student Skills and Activities

Re-condition school shop tools

Make a re-survey of home farm shop tools and properly condition those tools in need of repair

Examine each tool and properly condition it before using

Protect the edge of all cutting tools while using, handling, and storing

References:

Refer to "Using, Fitting, and Sharpening Tools," Agriculture I

Job: Using Sheet metal Year Taught: II

Teaching Unit Objectives for Student December Periods: 5

Caring for and operating a blow torch or tinners furnace

Selecting, cleaning, and tinning coppers

Selecting kinds of solder

Making and using flux

Soldering seams, holes, and sweating on patches

Making, bending, and cutting tinwork patterns

Using other methods of metal fasteners

Practicing safety precautions

Student Skills and Activities

Group practice activities in jobs

Clean and repair home-farm shop soldering equipment

Construct individual equipment for supervised practice

Make simple sheet metal repairs on home farms

Plan and construct chapter equipment

Suggested projects:

Chick feeder	Pig brooders
Chick brooder	Tool boxes
Mailbox	Nail trays

References:

Farm Mechanics Text and Handbook, Cook, Scranton, and McColly, pp. 239-258

Farmer's Shop Book, Roehl and Longhouse
Shopwork on the Farm, Jones
Farm Shop Practice, Jones
380 Things to Make for the Farm and Home, Cook
500 More Things to Make, Cook

Job: Using Hot and Cold Metal Year Taught: II

Teaching Unit Objectives for Student January Periods: 8

Building and maintaining a forge fire

Measuring and cutting stock

Heating, shaping, and cutting metal

Tempering and reshaping tools

Tempering, punching and drilling metal

Using taps and dies properly

Riveting metal

Using safety precautions

Student Skills and Activities

Group practice activities in jobs

Individual activities related to other units and projects

Sharpen and properly care for common hot and cold metal tools

Plan and do simple farm repair jobs involving hot and cold metal tools

Make simple hot and cold metal projects

Construct chapter and school shop equipment

Construct home-farm shop equipment

Home-made anvil
Milk can rack
Gate fasteners
Punches
Cold chisel
Barn scraper
Fuel oil rack
Hay hooks
Chain repair
Swine weighing equipment
Endgate rods

References:

Farmer's Shop Book, Roehl
Shopwork on the Farm, Jones
Farm Shop Practices, Jones

Job: Farm Painting and Glazing Year Taught: II

Teaching Unit Objectives for Student January Periods: 12

Selecting paint

Mixing and tinting paint

Preparing surfaces for painting

Applying paints

Selecting, cleaning and storing brushes

Selecting and using of other wood preservatives

Measuring and cutting glass

Preparing the sash

Puttying glass

Student Skills and Activities

Paint project equipment and shop projects

Paint and re-paint chapter equipment

Group practice activities in mixing and tinting paint

Paint home-farm buildings, machinery, and equipment

Compare paint formulas from various grades of paint

Estimate amount and cost of paint needed for a particular job

Clean and refinish a piece of furniture

Whitewash a dairy barn

References:

Farm Mechanics Text and Handbook, Cook, Scranton, McColly, pp.155-184
Painting Farm Buildings and Equipment, National Lead Company
Shopwork on the Farm, Jones
Painting on the Farm, Farmers Bulletin 1452
Farm Shop Practice, Jones
Introductory Shop Work, Jones and Axelrod
Selecting and Applying Paints, Extension Circular 261

Job: Building Large Projects of Wood Year Taught: II

Teaching Unit Objectives for Student February Periods: 16

Using the square

Cutting common rafters

Planning, constructing, and repairing farm equipment made of wood

Planning small buildings

Making working drawings

Constructing and repairing small buildings

Student Skills and Activities

Practice the use of the square and cutting common rafters

Plan, construct, and repair farm equipment made of wood

Plan small farm building

Make a working drawing of the plan

Construct and repair small farm buildings

Group construction of a small farm building for experience and possible profit

Construction and repair of F. F. A. and school equipment

Suggested Projects:

Hay rack
Trailer
Chick brooders
Picnic table
Wagon box
Feed bunks
Self feeder
Feeding trough for hogs
Loading chute
Hog houses
Recreational equipment
Dairy managers

References:

Shopwork on the Farm, Jones
Farmers Shop Book, Roehl
Job Operations in Farm Mechanics, Dickenson
"Hog Lot Equipment," Unit 62

Job: Selecting Activities of Supervised Farming in Farm Mechanics — Year Taught: III

Teaching Unit Objectives for Student — October — Periods: 2

Analyzing needs in farm mechanics related to ownership projects

Determining projects and jobs in farm mechanics needed on home farm

Re-planning a long-time program of supervised farming skills and activities in farm mechanics

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Student Skills and Activities

Re-survey the need in farm mechanics for ownership projects

Re-survey the needs of the home farm with reference to various phases of farm mechanics

References:

Refer to "Selecting Activities of Supervised Farming in Farm Mechanics," Agriculture I

Job: Developing the Home-Farm Shop — Year Taught: III

Teaching Unit Objectives for Student — October — Periods: 3

Furthering the development of home-farm shop

Determining home-farm shop needs

Evaluating improvement program

Observing and using safety precautions

Student Skills and Activities
Make an annual inventory of home-farm shop tools and equipment
Re-determine home-farm shop needs
Improve and enlarge upon home-farm shop according to needs
Re-condition shop tools and equipment
Inspect and evaluate home-farm shops
Make programs toward long-time plan for home-farm shop
Suggested projects:
Refer to "Developing the Home-Farm Shop," Agriculture I
References:
Refer to: "Developing the Home-Farm Shop," Agriculture I

Job: Welding Year Taught: III

Teaching Unit Objectives for Student	October November	Periods: 16
Selecting type of welder adapted to home farm situation		
Planning facilities to meet welding needs		
Setting up and adjusting welding equipment		
Observing and practicing safety precautions		
Preparing surfaces for welding		
Selecting and using proper rod for specific jobs		
Performing ordinary welding jobs		
Using cutting torch		
Caring for and maintaining equipment properly		

Student Skills and Activities

Group practice activities in jobs

Individual activities related to other jobs

Construction and repairing chapter equipment

Construct and repair supervised practice projects and home farm equipment

Determine need, possibilities, and cost of welding unit for home farm shop

Select kind of welding unit best adapted to home farm needs and facilities

Suggested projects:

Hog waterers
Milk coolers
Trailer
Rubber tired wagon
Barrel mixer
Labor saving equipment
Weed sprayer
Loading chute
Post hole digger
Machinery trailer
Fuel oil rack
Gates
Clothesline posts
Cattle guard

References:

Farm Mechanics Text and Handbook, Cook, Scranton, and McColly, pp. 285 - 342
Shopwork on the Farm, Jones
Arc and Acetylene Welding, Kerwin
Lessons in Arc Welding, Lincoln Arc Welding Foundation
Welding Helps for Farmers, Lincoln Arc Welding Foundation

Job: Constructing and Improving Farm Buildings Year Taught: III

Teaching Unit Objectives for Student November Periods: 10

Planning type of buildings needed

Planning interior arrangement of farm buildings

Selecting suitable materials for building construction

Making working drawings to scale and read simple blue prints

Recognizing safety factors

Constructing small farm buildings

Student Skills and Activities

Make a long time plan for remodeling, rearranging, and constructing farm buildings

Make a working drawing to scale

Make fire and accident prevention checks

Group activity in small farm building construction

Make needed repairs on farm buildings

Suggested projects:

Milk cooler
Manure pit
Milk house
Venelating shafts
Brooder house
Garage
Poultry range shelter
Bull pen
Bull barn
Home-farm shop
Cattle sheds
Cattle stanchions
Calf pens
Grain bins
Hog houses
Hog shades

References:

Farm Buildings, Carter and Foster
Farm Buildings, Wooley
Beef Cattle Barns, Farmers Bulletin 1350
Dairy Barn Construction, Farmers Bulletin 1342
Planning the Farmstead, Farmers Bulletin 1132
Practical Hog Houses, Farmers Bulletin 1487
380 Things to Make for the Farm and Home, Cook
500 More Things to Make, Cook
Farm Mechanics Text and Handbook, Cook, Scranton, and McColly, pp. 553-567
"The Use of the Square," Unit 84, Vocational Agriculture Service

Special Aids:

Slidefilm No. 421 "Using the Square in Laying out Hip, Valley and Jack Rafters," Vocational Agriculture Service

Job: Maintaining and Repairing Farm Machinery Year Taught: III

Teaching Unit Objectives for Student January Periods: 15

Selecting farm machinery adapted to a particular farm

Storing and caring for machinery properly

Operating and adjusting machinery

Checking machinery for needed repairs

Using instruction book, make repair lists, and order parts

Making repairs on farm machinery

Using safety precautions

Student Skills and Activities

Make an inventory of machinery on home farm

Select farm machinery suitable for a particular farm situation

Determine size of building needed to store home farm machinery

Visit machinery and implement dealers

Visit farm machinery factory

Attend field demonstrations

Operate machinery in connection with supervised practice and home farm enterprises

Make adjustments in machinery operations

Make repair lists and order parts

Keep informed abour new machinery developments

Participate in state machinery safety contest

Suggested projects:

Repair chain
Construct hay rack
Construct wagon
Clean and paint machinery
Inspect for repairs
Make repair lists
Order repair parts
Adjust machine gears
Adjust hitches
Oil and grease machinery
Sharpen sickles
Set up a new piece of machinery
Adjust plow for operation
Adjust mower
Adjust cultivator
Adjust gasoline motors

References:

Farm Mechanics Text and Handbook, Cook, Scranton, and McColly, pp. 367-515
Agricultural Machinery, Davidson
Introducing Shop Work, Jones and Axelrod
Shopwork on the Farm, Jones
Operation, Care and Repair of Machinery, John Deere Company
Farm Machinery, Illinois Extension Service
"Adjusting Tractor Plows," Unit 47 Vocational Agriculture Service

Job: Using Electricity Year Taught: III

Teaching Unit Objectives for Student February Periods: 14

Understanding the basic principles of electricity

Selecting common electrical materials and supplies

Selecting and using common electrical tools

Planning a wiring system

Doing simple wiring and making simple repairs

Calculating electrical costs

Using safety precautions

Student Skills and Activities

Demonstrate fundamentals of electricity with hand generator

Discussions by REA personnel

Plan or sketch simple wiring diagrams using different systems of wiring

Determine cost of materials for wiring some farm building

Group practice activities in jobs

Construction and repair equipment for productive projects and home farm

Consider possibilities of electrical equipment for the home farm for convenience, time-saving, and economy

Suggested projects:

Electric fence
Chick brooder
Pig brooder
Exhaust fans
Hot bed
Install electric bell system
Water heaters
Install switches

Install outlets
Time switch
Generator brushes
Install small appliances
Replace fuses
Wire buildings
Install motors
Repair sockets
Lubricating motors
Clean motors

References:

Shopwork on the Farm, Jones
Farmers Shop Book, Roehl
Farm Shop Practice, Jones
Wiring Simplified, Richter
Practical Electricity and House Wiring, Richter
"Lighting the Farm Home with Electricity, Unit 56, Vocational Agriculture Service

Special Aids:

Electrical Unit, available on loan basis from Vocational Agriculture Service, University of Illinois
Slidefilm No. 401, "Electrical Wiring and Diagramming," Vocational Agriculture Service, University of Illinois
Slidefilm No. 402, "Some Skills in Electrical Wiring," Vocational Agriculture Service, University of Illinois
Slidefilm No. 403, "Identification of Electrical Units," Vocational Agriculture Service, University of Illinois

Job: Selecting Activities of Supervised Farming in Farm Mechanics — Year Taught: IV

Teaching Unit Objectives for Students — September — Periods: 2

Analyzing needs in farm mechanics related to ownership projects

Determining projects and jobs in farm mechanics needed on home farm

Re-planning a long-time program of supervised farming skills and activities in farm mechanics

Student Skills and Activities:

Re-survey the need in farm mechanics for ownership projects

Re-survey the needs of the home farm with reference to various phases of farm mechanics

Formulate a plan for skills and activities in farm mechanics to be accomplished this year

References:

Refer to "Selecting Activities of Supervised Farming in Farm Mechanics," Agriculture I

Job: Developing the Home-Farm Shop Year Taught: IV

Teaching Unit Objectives for Student September Periods: 3

Furthering the development of home-farm shop

Determining home-farm shop needs

Evaluating improvement progress

Observing and using safety precautions

Student Skills and Activities

Made an annual inventory of home-farm shop tools and equipment

Re-determining home-farm shop needs

Improve and enlarge upon home-farm shop according to needs

Recondition shops tools and equipment

Inspect and evaluate home-farm shops

Make progress toward long-time home-farm shop plan

Construct a home-farm shop

Suggested projects:

Refer to "Developing the Home-Farm Shop," Agriculture I

References:

Refer to "Developing the Home-Farm Shop," Agriculture I

Job: Welding Year Taught: IV

Teaching Unit Objectives for Student September Periods: 5

Setting up and adjusting welding equipment

Observing and practicing safety precautions

Caring for and maintaining equipment properly

Hardsurfacing

Brazing

Student Skills and Activities

Group practice skills and activities in jobs

Individual skills and activities related to other jobs

Constructing and repairing chapter equipment

Constructing and repairing supervised practice projects and home farm equipment

Suggested projects:

Refer to "Welding," Agriculture III

References:

Refer to "Welding," Agriculture III

Job: Constructing Farm Masonry Year Taught: IV

Teaching Unit Objectives for Student October Periods: 10

Selecting suitable materials

Estimating amount of material needed using proper proportions

Doing rough concrete work

Doing finished concrete work

Using safety precautions

Estimating quantities of brick, tile, and concrete blocks needed

Laying out and leveling up a foundation

Student Skills and Activities

Calculate materials needed for simple farm jobs

Make test bars of concrete to determine best methods of making concrete

Estimate cost of small concrete, brick, tile, and concrete blocks jobs

Determine where concrete, brick, tile, or concrete block construction could be used on the home farm

Group construction of a project for experience

Individual construction of jobs for supervised practice program

Suggested projects:

Anvil base
Calf and cow stalls
Dipping vats
Stock tank
Milk cooling tanks
Fire place
Livestock guard
Repair flue in chimney
Well curb
Floors
Salt box
Dairy mangers
Side walk
Hog troughs
Manure pit
Corner post anchor
Fence posts
Cistern
Foundations
F.F.A. chapter recreation equipment

References:

Shopwork on the Farm, Jones
Farmer's Shop Book, Roehl and Longhouse
Farm Shop Practice, Jones
Concrete Improvement Around the Home, Portland Cement Ass'n.
Safe Sewage Disposal, Portland Cement Ass'n.
380 Things to Make for the Farm and Home, Cook
500 More Things to Make, Cook
"Making Good Concrete," Unit 37

Special Aids:

Slidefilm No. 430, "Concrete Masonry," Vocational Agriculture Service
Slidefilm No. 431, "Making Farm Concrete," Vocational Agriculture Service

Job: Providing Farm Conveniences Year Taught: IV

Teaching Unit Objectives for Student	October	Periods: 8

Selecting and using pipe for plumbing

Measuring, cutting, and threading pipe

Selecting and using proper fittings

Maintaining plumbing

Considering possible sources of farm water supply

Planning simple water systems

Planning farm sewage disposal systems

Student Skills and Activities

Group practice activities in jobs

Inspect fittings on a plumbing job

Make simple plumbing installations on home farm

Make plumbing repair jobs on home farm

Pipe water to field for productive project

Plan a sewage disposal system for home farm

Have home water supply tested

Improve and increase home water supply

Suggested projects:

Hog waterers
Install water cups in dairy barn
Install showers
Install milking machine
Automatic waterers
Repair faucets and valves
Pipe engine exhaust from building
Pipe water to poultry house, hog house, and farm shop
Make farm pond
Install sink and drain

References:

Farmer's Shop Book, Roehl
Shopwork on the Farm, Jones
Farm Mechanics Text and Handbook, Cook, Scranton, and McColly
Water and Plumbing Systems for Farm Homes, Circular 303
Concrete Improvement Around the Home, Portland Cement Ass'n.
Safe Sewage Disposal, Portland Cement Ass'n.
Farm Plumbing, Farmer's Bulletin 1426
Farmstead Water Supply, Farmer's Bulletin 1448
Sewage and Sewage of Farm Homes, Farmer's Bulletin 1227
Simple Plumbing Repairs, Farmer's Bulletin 1460
380 Things to Make for the Farm and Home, Cook
500 More Things to Make, Cook
Introductory Shop Work, Jones and Axelrod
"Farm Water Systems and Sewage Disposal," Unit 57, Vocational Agriculture Service

Job: Maintaining and Repairing Power Machinery and Equipment — Year Taught: IV

Teaching Unit Objectives for Student — March — Periods: 19

Determining possible use of different kinds of power on the home farm

Determining possible use of different kinds of power machinery and equipment on the home farm

Understanding basic principles of motors

Operating and adjusting power machinery and equipment

Inspecting for troubles and needed repairs

Using instruction book, make repair list, and order parts

Making repairs

Storing and caring properly

Observing and using safety precautions

Student Skills and Activities

Make an inventory of kinds of power in home farm

Select kinds of power suitable for existing needs on the home farm

Lubricate a motor properly

Inspect and service ignition system

Clean and adjust a carburator

Keep informed about new and improved developments

Prepare a piece of machinery for storage

Determine storage facilities needed for home farm

Operate power machinery in connection with supervised practice and home farm enterprises

Make minor repairs on corn pickers

Make minor repairs and adjustments on tractors

Make minor repairs and adjustments on combines

Time a farm motor

Clean and paint a piece of equipment

Service a fuel system

Service motor cooling system

References:

Farm Mechanics Text and Handbook, Cook, Scranton, and McColly
Farm Tractor Maintenance, Morrison
Farm Machinery, Illinois Circular 209
Tractor Repair and Maintenance, Illinois Circular 589
"Tractor Trouble-Shooting," Unit 50, Vocational Agriculture Service
Operation, Care and Repair of Farm Machinery, John Deere and Co.

Job: Remodeling, Repairing, and Arranging Farm Buildings — Year Taught: IV

Teaching Unit Objectives for Students — April — Periods: 10

Planning farmstead arrangement

Planning remodeling of farm buildings to meet present needs

Incorporating devices for convenience, economy, sanitation, comfort, and time-saving

Recognizing fire and accident hazards

Student Skills and Activities

Re-plan long-time farm building remodeling and construction for home farm

Secure farm building plans

Visit building in construction to become familiar with construction details

Determine farm building construction and remodeling costs

Install home-farm conveniences

Repair or remodel farm buildings

Suggested projects:

Refer to "Constructing and Improving Farm Buildings," Agriculture III Remodel, repair, or move some of the present buildings

References:

Refer to "Constructing and Improving Farm Buildings," Agriculture III

Job: Maintaining and Repairing Electric Motors and Appliances Year Taught: IV

Teaching Unit Objectives for Student Periods: 10

Selecting the type and size motor adapted to a particular need

Planning source of power for electric motors

Connecting motors with equipment

Cleaning, lubricating, and maintaining motors

Determining possible use of electrical equipment and appliances on home farm

Cleaning, lubricating, and maintaining electrical equipment and appliances

Observing and using safety precautions

Student Skills and Activities

Install electric motors and equipment on home farm

Mount a portable motor

Replace brushes on a motor

Clean and lubricate an electric motor

Inspect and service shop motors

Reverse a motor

Inspect and service home-farm electrical appliances

Determine what electrical equipment and appliances are practical and economical on the home farm

Install single phase, split-phase, and repulsion-induction motor

Suggested projects:

Refer to "Using Electricity," Agriculture III

References:

Refer to "Using Electricity," Agriculture III
"Electric Motors on the Farm," Unit 52, Vocational Agriculture Service

Special Aids:

Electric Motors Kit, available on loan basis from Vocational Agriculture Service

Job: Constructing and Repairing Farm Fences Year Taught: IV

Teaching Unit Objectives for Student May Periods: 5

Selecting types of fence needed

Selecting kinds and types of posts

Bracing corner and line posts properly

Selecting gates to home-farm needs

Constructing and repairing fences

Using safety precautions

Student Skills and Activities

Observe farm fences and gates in community

Construct and repair fence for livestock productive projects

Construct and repair fence and gates on home farm

Establish multi-flora rose fence

Suggested projects:

Barbed wire reel
Electric fence
Gate fasteners
Multi-flora rose fence
Concrete anchorage
Dog proof fence
Gates
Bull pen fence
Tree guards
Farm yard fence

References:

Farm Fencing, Keystone Steel and Wire Company
How to Erect Farm Fence, Republic Steel Company
Concrete Fence Posts, Portland Cement Ass'n.
"Treating Fence Posts," Unit 78, Vocational Agriculture Service

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Kugler, Harold L., Lessons in Arc Welding. Cleveland, Ohio: Lincoln Arc Welding Foundation, 1950.

Lincoln Electric Company, How to Repair and Build Farm Equipment. Cleveland, Ohio: The Lincoln Electric Company, 1950.

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Sampson, Harry O., Mowery, Albert S., and Kugler, Harold L., Farm Shop Skills. Chicago, American Technical Society, 1955.

Wooley, John C., Farm Buildings. New York: McGraw-Hill Book Company, Inc., 1946

APPENDIX A

FARM MECHANICS SURVEY

I. Name of farmer_____

II. Total acres in farm_____ III. Distance from school_____miles

IV. List the animal enterprises on your farm in order of their importance:

1._____ 2._____ 3._____

V. List the plant enterprises on your farm in order of their importance:

1._____ 2._____ 3._____

VI. Acres Owned_____ Acres Rented_____

VII. Check the following equipment found on your farm:

_____ 1. Corn planter
_____ 2. Rotary hoe
_____ 3. Side delivery rake
_____ 4. Corn picker - mounted
_____ 5. Corn picker - pull type
_____ 6. Feed grinder
_____ 7. Manure loader
_____ 8. Manure spreader
_____ 9. Lime and fertilizer spreader
_____10. Automobile
_____11. Pick-up
_____12. Truck
_____13. Tractor - gasoline
_____14. Tractor - propane-butane
_____15. Silage cutter
_____16. Disk harrow
_____17. Tractor - diesel
_____18. Electric welder
_____19. Oxy-acetylene welder
_____20. Forge
_____21. Disc plow
_____22. Milking machine
_____23. Elevator
_____24. Grain drill - standard
_____25. Grain drill - fertilizer attachment
_____26. Moldboard plow
_____27. Hay baler
_____28. Sprayer
_____29. Spring tooth harrow
_____30. Spike tooth harrow
_____31. Cultivators
_____32. Combine - pull type
_____33. Combine - self propelled
_____34. Mowing machine
_____35. Implement shed
_____36. Farm shop building or room
_____37. Gasoline motors
_____38. Electric motors
_____39. Silage blower
_____40. Wagon
_____41.

VIII. Check if you have the following in your home:

_____ 1. Pressure water system
_____ 2. Septic tank
_____ 3. Electricity
_____ 4.
_____ 5.

IX. Check in column 1, all the skills you have or think a farmer should be able to do.

Check in column 2, all the skills you think a high school student should learn to do in their vocational agriculture courses.

ELECTRICITY	1	2
1. Understanding basic principles of electricity	_____	_____
2. Soldering	_____	_____
3. Replacing fuses	_____	_____
4. Repairing electric cords	_____	_____
5. Splicing electric wires	_____	_____
6. Understanding basic principles of electric motors	_____	_____
7. Reversing electric motors	_____	_____
8. Clean, lubricate and maintain electric motors	_____	_____
9. Doing simple electric wiring	_____	_____

FARM PLUMBING AND WATER SYSTEMS		
1. Installing plumbing fixtures	_____	_____
2. Upkeep and repair of pumps	_____	_____
3. Pipe cutting and threading-fitting	_____	_____
4. Lay sewage tile	_____	_____
5. Repair leaky valves and faucets	_____	_____
6. Clean septic tank	_____	_____
7. Other	_____	_____

CONCRETE		
1. Selecting and preparing concrete mixtures	_____	_____
2. Rough concrete work	_____	_____
3. Finished concrete work	_____	_____
4. Laying bricks, tile, concrete blocks	_____	_____
5. Estimating quantities of bricks, tile, and concrete blocks needed		

CARPENTRY

1. Construction of hog house, feeders, etc.	____	____
2. Building farm buildings	____	____
3. Figuring bill of materials	____	____
4. Sharpening metal bits	____	____
5. Cutting common rafters	____	____
6. Roofing	____	____
7. Framing small buildings	____	____
8. Laying out and level up a foundation	____	____

PAINTING

1. Selecting paint	____	____
2. Mixing paint	____	____
3. Applying exterior paint	____	____
4. Painting metal surfaces	____	____
5. Cleaning and care of brushes	____	____
6. Painting farm implements	____	____

WELDING

1. Cutting metal	____	____
2. Hardsurfacing	____	____
3. Brazing	____	____
4. Arc welding	____	____
5. Oxy-acetylene	____	____
6. Steel fabrication	____	____

FARM MACHINERY MAINTENANCE AND REPAIR

1. Minor repairs on farm implements	____	____
2. Minor adjustments on gasoline engines	____	____
3. Operation, upkeep and minor repairs of combines	____	____
4. Operation, upkeep and minor repairs of corn pickers	____	____
5. Operation, upkeep and minor repairs of tractors	____	____
6. Adjustment of machines	____	____

MISCELLANEOUS

1. Using electric drill	____	____
2. Threading nuts and bolts	____	____
3. Riveting	____	____
4. Grinding sickle	____	____
5. Farm drawing	____	____
6. Fence construction - repair	____	____
7. Reading blueprints	____	____
8. Using and conditioning hand tools	____	____
9. Forge work	____	____

X. Check in column 1, all items or projects which you have made with an electric welder.

Check in column 2, all items or projects you would build if you owned an electric welder.

		1	2
1.	Cattle feeder	____	____
2.	Hog feeder or waterer	____	____
3.	Cattle guard	____	____
4.	Loading chute	____	____
5.	Trailer	____	____
6.	Post hole digger	____	____
7.	Machinery trailer	____	____
8.	Manure loader	____	____
9.	Hay loader	____	____
10.	Weed sprayer	____	____
11.	Fuel oil rack	____	____
12.	Barn floor scraper	____	____
13.	Gates	____	____
14.	Clothesline posts	____	____

XI. Check in column 1, all tools which you think you should have on your farm.

Check in column 2, all tools you do have on your farm.

1.	Electric welder	____	____
2.	Oxy-acetylene	____	____
3.	Drill press	____	____
4.	Band saw	____	____
5.	Belt sander	____	____
6.	Power grinder	____	____
7.	1/2" electric drill	____	____
8.	1/4" electric drill	____	____
9.	Paint sprayer	____	____
10.	Air compressor	____	____
11.	Carpenter's square	____	____
12.	Rule	____	____
13.	Try-square	____	____
14.	Plumb bob	____	____
15.	Micrometer	____	____
16.	Calipers	____	____
17.	Carpenter's level	____	____
18.	Claw hammer	____	____
19.	Ball-pien hammer	____	____
20.	Glass cutter	____	____
21.	Jack plane	____	____
22.	Draw knife	____	____
23.	Brace-set of auger bits	____	____
24.	Miter saw	____	____
25.	Crosscut hand saw	____	____
26.	Rip saw	____	____

27.	Key hole saw	____	____
28.	Choping saw	____	____
29.	Hacksaw	____	____
30.	Miterbox	____	____
31.	Assortment of chisels	____	____
32.	Assortment of scresdrivers	____	____
33.	Set of open-end wrenches	____	____
34.	Set of box-end wrenches	____	____
35.	Socket set	____	____
36.	Crescent wrenches 6"-8"	____	____
37.	Crescent wrenches 10"-12"	____	____
38.	Vise grip pliers	____	____
39.	Tin snips	____	____
40.	Pliers	____	____
41.	Diagonal cutting pliers	____	____
42.	Bolt cutters	____	____
43.	Forge	____	____
44.	Blacksmith's hammer	____	____
45.	Pipe wrench - 10-12"	____	____
46.	Pipe cutters	____	____
47.	Table vise	____	____
48.	Pipe-bolt die set	____	____
49.	Blow torch	____	____
50.	Trouble light	____	____
51.	Trowel	____	____
52.	Chain hoist	____	____
53.	Timber saw	____	____
54.	_____	____	____

VITA

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