

MECHANICAL COMPETENCIES NEEDED BY VOCATIONAL
AGRICULTURE TEACHERS IN OKLAHOMA

By

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PREFACE

The development of a mechanized agriculture has made necessary the training of farmers in mechanical competencies relating to different farming operations. Farm mechanics instruction has been identified as constituting one of the important areas of vocational education in agriculture. Teachers who provide such instruction must possess certain mechanical competencies relating to farming. A great deal of research has been concerned with the methodology of farm mechanics instruction. There has been very little research reported which deals specifically with the identification of the mechanical competencies which are needed by vocational agriculture teachers. In this thesis an attempt has been made to ascertain the mechanical competencies needed by vocational agriculture teachers in Oklahoma.

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CHAPTER I

INTRODUCTION

Agriculture today is a highly mechanized industry. Much of the animal power and human labor formerly used on farms has been replaced with mechanically powered devices. Animal power is slower and less efficient than mechanical power for most farming operations. Even the famous cow pony is frequently being replaced by the jeep, pickup truck, and airplane, and as mechanical power takes over the job of harvesting cotton, one of the last large groups of farm laborers will be required to find employment elsewhere. Successful farm operators must learn to adapt themselves to a changing agriculture that is mechanized.

The design of buildings and other structures especially suitable for use in different farming operations has received much attention from agricultural engineers in recent years. New buildings for animals and poultry are planned to reduce the amount of labor required in livestock and poultry production, to increase feed utilization efficiency, and to maintain livestock and poultry in a healthy condition. Special buildings for use with crop drying equipment are found on some farms. Farmers today are frequently utilizing buildings and structures that have reduced the risk formerly attached to many farming operations and that have increased the overall efficiency of the farming business.

Electricity has made possible several modern farm conveniences. Running water is usually available for home use, for watering livestock and poultry, and for fire fighting. Refrigeration equipment has helped improve the quality of farm produce, dairy products, fruits, and vegetables. Modern farm homes are often well equipped with electrical appliances. Automatic electrical devices have taken much of the drudgery out of farming.

Several kinds of mechanical structures have been designed to aid in the management of soil and water resources. Terraces have helped reduce soil erosion and conserve moisture. Ditch and tile installations are used for drainage purposes. Irrigation farming has made necessary the use of mechanical structures for the control and distribution of water. Special machinery has been developed for use in treating land to reduce wind erosion. Without the application of mechanical principles in the management of soil and water the modern farm operator would be unable to maintain and increase the productivity of his farm.

To service and maintain the mechanical devices and structures on the farm many farm operators have found that it is convenient to have a well equipped farm shop. Most farmers have found that it is desirable to have an assortment of hand tools. Many farm operators have a building that is used primarily as a farm shop. Some farm operators have shops that are equipped with welders and other power equipment. The modern farm operator frequently finds it is necessary to understand how to use tools to build, maintain, and repair many kinds of mechanical structures and devices on the farm.

Statement of the problem. Vocational agriculture teachers are

responsible for giving instruction in the competencies required of farm operators. Since farming operations are rapidly becoming mechanized, the competencies required of farm operators include mechanical skills, abilities, and understandings related to proficiency in farming. Educational programs in vocational agriculture, therefore, must include the teaching of such competencies. To become qualified to provide this instruction in farm mechanics, vocational agriculture teachers must themselves have technical training in certain mechanical competencies. The question, therefore, is asked, "What are the mechanical competencies needed by vocational agriculture teachers?" The identification of mechanical competencies which vocational agriculture teachers must possess is the problem of this thesis.

Definition. The term "mechanical competencies" is used in this thesis to refer to skills, abilities, and understandings that are required of farm operators in the use of farm power and machinery, farm buildings and conveniences, farm electrification, soil and water management devices, and farm shop equipment.

Purpose. The purpose is to ascertain what mechanical competencies should be included in the technical training of vocational agriculture teachers.

Need for the study. Those who are concerned with teacher education in agriculture have a responsibility to provide, in the education of vocational agriculture teachers, training that will enable the primary aim of vocational education in agriculture to be realized. This aim, as set forth by the United States Office of Education in Vocational Division Monograph Number 21, "is to train present and prospective farmers for

proficiency in farming."¹ There is, therefore, a need for vocational agriculture teachers to acquire those competencies which are identified as contributing to proficiency in farming.

There is widespread agreement among agricultural leaders that farm mechanics is one of the general areas in which farmers must acquire certain competencies to be proficient in farming. As stated by Julian A. McPhee,

We must recognize that agriculture is becoming more complex with greater emphasis on science and mechanization. This means that we need to provide, in the curriculum and instructional program, training that will prepare for this type of agriculture.²

Lloyd J. Phipps and Glen C. Cook observed that,

. . . the development of modern farm machinery and labor saving devices . . . has created an increased need for training farmers and farm youth in the maintenance of home conveniences and farm equipment.³

Within the general area of farm mechanics there are five specific areas which are usually recognized as contributing to proficiency in farming. To become proficient in farming there are evidently competencies within each of these five specific areas which farmers should acquire. A committee composed of representatives of the Southern Association of Agricultural Engineers and Vocational Agriculture Specialists has recommended that,

¹United States Office of Education, Educational Objectives in Vocational Agriculture (Vocational Division Monograph No. 21, 1940), p. 3.

²Julian A. McPhee, "The Place of Agriculture in the Junior Colleges," Paper read before the Teacher Trainers Section, Agricultural Education Division, American Vocational Association Convention, San Francisco, California, December 4, 1954.

³Lloyd J. Phipps and Glen C. Cook, Handbook on Teaching Vocational Agriculture (Danville, Illinois, 1952), pp. 30-31.

. . . the agricultural mechanization training in vocational agriculture be designed to meet the needs of students . . . and include farm shop work . . . farm power and machinery . . . farm buildings and conveniences . . . soil and water management . . . and rural electrification.⁴

Vocational agriculture teachers evidently need to be sufficiently competent within each of these five specific areas of farm mechanics to develop the kind of instructional programs that will enable farmers to acquire the mechanical competencies which contribute to proficiency in farming.

Certain research recently completed in one or more of the five specific areas of farm mechanics indicates that an understanding of mechanical competencies which contribute to proficiency in farming is becoming increasingly important. Elmer R. Sealover⁵ indicated that the importance of having a well equipped farm shop increases as mechanization on the farm increases. A course in farm mechanics should, according to Charles S. Finley,⁶ include instruction in the establishment of farm shops, in the use of tools commonly needed on farms, and in the preventive maintenance, adjustment, and repair of farm machinery.

⁴G. E. Henderson et al., "Engineering Phases of Teacher Training for Vocational Agriculture," Agricultural Education Magazine, XVII (1945), 124-125.

⁵Elmer R. Sealover, "Needs as Related to Experience of Members of Farm Mechanics Classes for Young and Adult Farmers at the Mechanicsburg High School," (unpub. Master's thesis, Pennsylvania State College, 1953), as reported in Summaries of Studies in Agricultural Education, Vocational Division Bul. No. 253 (Washington, 1954), pp. 34-35.

⁶Charles S. Finley, "Repair Jobs Performed on Farm Machinery, and Shop Tools and Equipment Used by Arizona Farmers," (unpub. Non-thesis study, University of Arizona, 1952), as reported in Summaries of Studies in Agricultural Education, Vocational Division Bul. No. 253 (Washington, 1954), p. 19.

R. F. Nalley⁷ suggested there is a need for more instruction in plumbing, electricity, farm buildings, and repair and maintenance of farm machinery, and Raymond S. Birdwell⁸ indicated that farmers expressed an interest in attending adult meetings on problems in farm electrification.

In the technical training of vocational agriculture teachers should be included instruction that will enable them to acquire the mechanical competencies which they themselves need to enable them to organize and give instruction in those mechanical competencies which contribute to proficiency in farming. Lloyd J. Phipps and George P. Deyoe pointed out that,

Since farmers expressed interest in all five areas of farm mechanics, a teacher might check to see that the important content of each of these areas is included in his instructional courses.⁹

A review of the available literature, however, shows that no research has been reported that identifies the mechanical skills, abilities, and understandings in all of the five recognized areas of farm mechanics which vocational agriculture teachers must possess. To ascertain what are the mechanical competencies which vocational agriculture teachers

⁷R. F. Nalley, "An Analysis of the Farm Shop Program in Supervisory District One, South Carolina, with Suggestions for Improvement," (unpub. Master's thesis, Clemson College, 1953), as reported in Summaries of Studies in Agricultural Education, Vocational Division Bul. No. 256 (Washington, 1955), pp. 74-75.

⁸Raymond S. Birdwell, "A Study of the Use of Electricity by Farmers in the Sherman Community," (unpub. Non-thesis study, Agricultural and Mechanical College of Texas, 1953), as reported in Summaries of Studies in Agricultural Education, Vocational Division Bul. No. 256 (Washington, 1955), p. 11.

⁹Lloyd 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. No. 253 (Washington, 1954), p. 19.

must possess to enable them to develop effective educational programs in farm mechanics is the primary concern of this thesis.

Scope. This study is concerned with the problem of ascertaining what mechanical competencies, in the areas of farm power and machinery, farm buildings and conveniences, farm electrification, soil and water management, and farm shop, are needed by teachers of vocational agriculture in Oklahoma.

Identification of the mechanical competencies which vocational agriculture teachers in Oklahoma must possess was based upon opinions expressed in individual interviews by forty selected vocational agriculture teachers, forty selected young farmers, and forty selected adult farmers. These interviewees, who were selected by recognized professional leaders in agricultural education and vocational agriculture, were residents of the state of Oklahoma. The mechanical competencies about which these interviewees were asked to express opinions regarding the degree of understanding needed by farmers do not, however, necessarily represent all of the mechanical competencies which may contribute to proficiency in farming in Oklahoma. The mechanical competencies about which these interviewees were asked to express opinions regarding the degree of understanding needed by farmers do not necessarily include those mechanical competencies which contribute the most to proficiency in farming in Oklahoma.

Procedure. To resolve the thesis problem a study was conducted. This study involved the collecting and analyzing of data and the development of certain findings and conclusions. The study procedure included the following steps:

1. Available literature was reviewed and available specialists in

agricultural engineering and in agricultural education at the Agricultural and Mechanical College of Oklahoma were consulted to obtain information for use in the preparation of tentative interview schedules.

2. ^{SP?} Tentative interview schedules were prepared.
3. Each of the five District Supervisors of Vocational Agriculture in Oklahoma was asked to name nine vocational agriculture teachers that he considered, on the basis of his personal judgment and of available records reviewed by him, to have developed better than average total programs in vocational agriculture and better than average educational programs in farm mechanics. In the process of identifying these teachers each supervisor was asked to refer to the monthly and annual reports for 1952, 1953, and 1954, that were filed by the teachers in his supervisory district.
4. Five of the selected teachers who attended the Oklahoma Future Farmer Convention, held at the Agricultural and Mechanical College of Oklahoma during the spring of 1955, were asked to assist with an evaluation of the tentative ^{SP} interview schedules. These five selected teachers were asked to respond, individually and as a group, for purposes of (1) identifying strengths and weaknesses of the instruments, (2) checking for the time required to respond, (3) studying the procedure for administering the interview, and (4) checking clarity and communication.
5. ^{SP?} The tentative interview schedules were revised and the interview schedules shown in Appendix A were prepared for use in securing information for this thesis.
6. Each of the remaining forty selected vocational agriculture teachers was asked to express opinions, in individual interviews conducted in accordance with the prepared interview schedules, regarding the degree of understanding needed by farmers in certain mechanical competencies. Each of these forty selected vocational agriculture teachers was also asked to name one young farmer who was not more than thirty-four years old on January 1, 1955, and that he considered, on the basis of his personal judgment and available records reviewed by him, to have in operation a better than average farming program for his community and who derived at least eighty percent of his family income from the sale of products grown on the farm operated by him. In addition, each of these forty selected vocational agriculture teachers was asked to name one adult farmer who was more than thirty-four years old on January 1, 1955, and that he considered, on the basis of his personal judgment and of available records reviewed by him, to have in operation a better than average farming program for his community and who derived at least eighty percent of his family income from the sale of products grown on the farm operated by him.

7. Each of the forty selected young farmers and each of the forty selected adult farmers was asked, in individual interviews conducted in accordance with the prepared interview schedules, to express opinions regarding the degree of understanding needed by farmers in certain mechanical competencies.
8. A compilation and analysis of the information obtained in the individual interviews was made to ascertain the degree of understanding which the selected interviewees indicated is needed by farmers in each of the mechanical competencies considered.
9. Mechanical competencies which, according to opinions expressed by the selected interviewees, contribute to proficiency in farming in Oklahoma and about which the interviewees indicated farmers need some degree of understanding were identified as being needed by teachers of vocational agriculture in Oklahoma.

CHAPTER II

PRESENTATION AND ANALYSIS OF DATA

Data presented in this chapter were obtained in individual interviews with forty selected vocational agriculture teachers, forty selected young farmers, and forty selected adult farmers. Each of these selected interviewees was asked to express opinions concerning the degree of understanding needed by farmers in certain mechanical competencies. The opinions expressed by each interviewee concerning each mechanical competency were analyzed and tabulated on the following basis:

1. An interviewee was considered to be implying that a farmer needs an extensive and personal understanding in a competency when the interviewee expressed the opinion that a farmer needs to have sufficient understanding to be able himself to perform the functions normally thought of as being involved in the competency.
2. An interviewee was considered to be implying that a farmer needs to understand only when and how to get help when the interviewee expressed the opinion that a farmer should know when to seek skilled or professional assistance and should know how to obtain skilled or professional assistance but when, according to the expressed opinion of the interviewee, the farmer does not need to be able himself to perform the functions normally associated with the competency.
3. An interviewee was considered to be implying that a farmer needs little or no personal understanding in a competency when the interviewee expressed the opinion that the performance of a competency was of little or no value in conducting farming operations.

4. An interviewee was considered to have made no comment regarding the degree of understanding needed by a farmer in a competency when the interviewee either declined to make a comment about the competency or when the interviewee indicated that he did not personally know enough about the competency to make a valid judgment regarding the degree of understanding in the competency needed by a farmer.

The mechanical competencies about which the selected interviewees were asked to express opinions were divided into the following five groups: (1) farm power and machinery competencies, (2) farm buildings and conveniences competencies, (3) farm electrification competencies, (4) soil and water management competencies, and (5) farm shop competencies. One section of this chapter is devoted to a consideration of the opinions expressed by the interviewees concerning each of these groups of competencies.

Tables in this chapter are arranged to show the degree of understanding needed by farmers in each mechanical competency as indicated (1) by the expressed opinions of the forty selected vocational agriculture teachers; (2) by the expressed opinions of the forty selected young farmers; (3) by the expressed opinions of the forty selected adult farmers; and (4) by the expressed opinions of all of the teachers, young farmers, and adult farmers combined. An analysis of each table is given and certain comments which were made by the interviewees are noted.

Farm Power and Machinery Competencies

The size, type, and number of power units and machines observed on the various farms indicated that the investment, per farm, in power and machinery was greater in Western Oklahoma than in Eastern Oklahoma. The section of the state in which the interviewees resided did not have

any noticeable influence on the opinions expressed regarding the degree of understanding needed by farmers in each of the farm power and machinery competencies about which they were asked.

Several of the young farmers and several of the adult farmers interviewed used horses in working with cattle. Only one farmer, an adult farmer, owned a team and harness, and this man also owned one tractor. Each of the young farmers and each of the adult farmers used one or more tractors in farming operations they conducted. Each of the young farmers and each of the adult farmers used one or more trucks, pickups or larger units, in farming operations they conducted. One of the young farmers owned and operated an airplane that was used to spray and dust crops, inspect cattle, and provide family transportation.

The vocational agriculture teachers interviewed expressed the general opinion that the investment in farm power and machinery used on farms is increasing every year. Each teacher interviewed reported that farmers had asked for information to use in solving problems related to the use of farm power and machinery.

Tables I through XX are arranged to indicate the opinions expressed by the selected interviewees concerning the degree of understanding needed by farmers in certain farm power and machinery competencies.

Selecting farm trucks. Table I shows that 93.3 percent of the interviewees expressed the opinion that farmers need an extensive and personal understanding of the mechanical characteristics to be considered in selecting farm trucks. Only 5.0 percent of those interviewed expressed the opinion that farmers need to understand only when and how to get help in selecting farm trucks. Only 1.7 percent of the inter-

viewees made no comment regarding the degree of understanding needed by farmers in the mechanical characteristics to be considered in selecting farm trucks.

TABLE I
DEGREE OF UNDERSTANDING NEEDED BY FARMERS
IN SELECTING FARM TRUCKS

Degree of Understanding	Opinions Expressed by			Combined Opinions
	Teachers*	Young Farmers*	Adult Farmers*	
Extensive and personal	95.0%	87.5%	97.5%	93.3%
When and how to get help	5.0	7.5	2.5	5.0
Little or none	0.0	0.0	0.0	0.0
No comment	0.0	5.0	0.0	1.7

*Number interviewed: 40 teachers, 40 young farmers, 40 adult farmers

Selecting farm tractors. Table II shows that 100.0 percent of the interviewees expressed the opinion that farmers need an extensive and

TABLE II
DEGREE OF UNDERSTANDING NEEDED BY FARMERS
IN SELECTING FARM TRACTORS

Degree of Understanding	Opinions Expressed by			Combined Opinions
	Teachers*	Young Farmers*	Adult Farmers*	
Extensive and personal	100.0%	100.0%	100.0%	100.0%
When and how to get help	0.0	0.0	0.0	0.0
Little or none	0.0	0.0	0.0	0.0
No comment	0.0	0.0	0.0	0.0

*Number interviewed: 40 teachers, 40 young farmers, 40 adult farmers

personal understanding of the mechanical characteristics to be considered in selecting farm tractors.

Selecting stationary engines. Table III shows that 52.5 percent of

the interviewees expressed the opinion that farmers need an extensive and personal understanding of the mechanical characteristics to be considered in selecting stationary engines, 43.3 percent of those interviewed expressed the opinion that farmers need to understand only when and how to get help in selecting stationary engines, only 1.7 percent of the interviewees expressed the opinion that farmers need little or no personal understanding of the mechanical characteristics to be considered in selecting stationary engines, and only 2.5 percent of those interviewed made no comment regarding the degree of understanding needed by farmers in selecting stationary engines.

TABLE III
DEGREE OF UNDERSTANDING NEEDED BY FARMERS
IN SELECTING STATIONARY ENGINES

Degree of Understanding	Opinions Expressed by			Combined Opinions
	Teachers*	Young Farmers*	Adult Farmers*	
Extensive and personal	37.5%	42.5%	77.5%	52.5%
When and how to get help	60.0	47.5	22.5	43.3
Little or none	0.0	5.0	0.0	1.7
No comment	2.5	5.0	0.0	2.5

*Number interviewed: 40 teachers, 40 young farmers, 40 adult farmers

There was no reason that was readily discernable to indicate definitely why the three groups of interviewees expressed such diverse opinions regarding the degree of understanding needed by farmers in selecting stationary engines. Certain teachers did remark that stationary engines were generally used for a single purpose and that the engine was usually bought as a part of the machine it powered and that the engine was usually matched, at the factory, to the machine it powered.

Because of the wide diversity of opinions expressed by the three groups respectively and because of the relatively small and inconclusive majority of the total number of interviewees who expressed the opinion that farmers need an extensive and personal understanding in selecting stationary engines one may definitely conclude only that, according to the expressed opinions of those interviewed, farmers need to know at least enough about selecting stationary engines to know when and how to get help.

Lubricating engines and farm machinery. Table IV shows that 100.0

TABLE IV

DEGREE OF UNDERSTANDING NEEDED BY FARMERS IN
LUBRICATING ENGINES AND FARM MACHINERY

Degree of Understanding	Opinions Expressed by			Combined Opinions
	Teachers*	Young Farmers*	Adult Farmers*	
Extensive and personal	100.0%	100.0%	100.0%	100.0%
When and how to get help	0.0	0.0	0.0	0.0
Little or none	0.0	0.0	0.0	0.0
No comment	0.0	0.0	0.0	0.0

*Number interviewed: 40 teachers, 40 young farmers, 40 adult farmers

percent of those interviewed expressed the opinion that farmers need an extensive and personal understanding in lubricating engines and farm machinery.

Converting engines to use butane, propane, or natural gas. Several of the interviewees indicated that farmers residing within their respective communities were considering the possibility of converting gasoline engines to use butane, propane, or natural gas. As far as the installation of the conversion devices on gasoline engines was concerned

table V shows that 20.0 percent of the interviewees expressed the opinion that farmers need an extensive and personal understanding in

TABLE V
DEGREE OF UNDERSTANDING NEEDED BY FARMERS IN CONVERTING
ENGINES TO USE BUTANE, PROPANE, OR NATURAL GAS

Degree of Understanding	Opinions Expressed by			Combined Opinions
	Teachers*	Young Farmers*	Adult Farmers*	
Extensive and personal	10.0%	22.5%	27.5%	20.0%
When and how to get help	87.5	72.5	55.0	71.7
Little or none	0.0	2.5	10.0	4.2
No comment	2.5	2.5	7.5	4.2

*Number interviewed: 40 teachers, 40 young farmers, 40 adult farmers

this competency while 71.7 percent of those interviewed expressed the opinion that farmers need to understand only when and how to get help in converting engines to use butane, propane, or natural gas. Only 4.2 percent of those interviewed expressed the opinion that farmers need little or no personal understanding and only 4.2 percent of the interviewees made no comment regarding the degree of understanding needed by farmers in converting engines to use butane, propane, or natural gas.

While a majority of those interviewed within each group of interviewees expressed the opinion that farmers need to understand only when and how to get help in converting engines to use butane, propane, or natural gas, there was a considerable variation between the number of interviewees in each group which concurred in this opinion. There was no reason that was readily discernable to indicate why 87.5 percent of the teachers interviewed expressed the opinion that farmers need to understand only when and how to get help in converting engines to use

butane, propane, or natural gas while 72.5 percent of the young farmers interviewed and only 55.0 percent of the adult farmers interviewed concurred in this opinion.

Servicing engine fuel systems. Table VI shows that 82.5 percent of

TABLE VI

DEGREE OF UNDERSTANDING NEEDED BY FARMERS
IN SERVICING ENGINE FUEL SYSTEMS

Degree of Understanding	Opinions Expressed by			Combined Opinions
	Teachers*	Young Farmers*	Adult Farmers*	
Extensive and personal	75.0%	80.0%	92.5%	82.5%
When and how to get help	22.5	12.5	2.5	12.5
Little or none	0.0	2.5	2.5	1.7
No comment	2.5	5.0	2.5	3.3

*Number interviewed: 40 teachers, 40 young farmers, 40 adult farmers

the interviewees expressed the opinion that farmers need an extensive and personal understanding in the servicing of engine fuel systems while 12.5 percent of those interviewed expressed the opinion that farmers need to understand only when and how to get help in servicing engine fuel systems. Only 1.7 percent of the interviewees expressed the opinion that farmers need little or no personal understanding and only 3.3 percent of those interviewed made no comment regarding the degree of understanding needed by farmers in servicing engine fuel systems.

Reboring an engine block. There was rather uniform agreement by the three groups of respondents that farmers need to understand only when and how to get help in reboring an engine block. Table VII shows that only 3.3 percent of the interviewees expressed the opinion that

farmers need an extensive and personal understanding in the reboring of an engine block while 86.7 percent of those interviewed expressed the opinion that farmers need to understand only when and how to get help in reboring an engine block. Only 5.0 percent of the interviewees expressed the opinion that farmers need little or no understanding and only 5.0 percent of those interviewed made no comment regarding the degree of understanding needed by farmers in how to rebore an engine block.

TABLE VII

DEGREE OF UNDERSTANDING NEEDED BY FARMERS
IN REBORING AN ENGINE BLOCK

Degree of Understanding	Opinions Expressed by			Combined Opinions
	Teachers*	Young Farmers*	Adult Farmers*	
Extensive and personal	0.0%	2.5%	7.5%	3.3%
When and how to get help	90.0	87.5	82.5	86.7
Little or none	5.0	10.0	0.0	5.0
No comment	5.0	0.0	10.0	5.0

*Number interviewed: 40 teachers, 40 young farmers, 40 adult farmers

Replacing engine sleeves. There was a high proportion of each group of respondents that expressed the opinion that farmers need to understand only when and how to get help in replacing engine sleeves. Table VIII shows that only 11.7 percent of the interviewees expressed the opinion that farmers need an extensive and personal understanding in replacing engine sleeves while 76.7 percent of those interviewed expressed the opinion that farmers need to understand only when and how to get help. Only 7.5 percent of the interviewees made no comment regarding the degree of understanding needed by farmers in replacing engine sleeves.

TABLE VIII

DEGREE OF UNDERSTANDING NEEDED BY FARMERS
IN REPLACING ENGINE SLEEVES

Degree of Understanding	Opinions Expressed by			Combined Opinions
	Teachers*	Young Farmers*	Adult Farmers*	
Extensive and personal	5.0%	12.5%	17.5%	11.7%
When and how to get help	72.5	80.0	77.5	76.7
Little or none	0.0	0.0	0.0	0.0
No comment	10.0	7.5	5.0	7.5

*Number interviewed: 40 teachers, 40 young farmers, 40 adult farmers

Replacing engine pistons and rings. A high proportion of each group of respondents expressed the opinion that farmers need to understand only when and how to get help in replacing engine pistons and rings. Table IX shows that only 11.7 percent of those interviewed

TABLE IX

DEGREE OF UNDERSTANDING NEEDED BY FARMERS
IN REPLACING ENGINE PISTONS AND RINGS

Degree of Understanding	Opinions Expressed by			Combined Opinions
	Teachers*	Young Farmers*	Adult Farmers*	
Extensive and personal	5.0%	12.5%	17.5%	11.7%
When and how to get help	87.5	80.0	77.5	81.7
Little or none	0.0	0.0	0.0	0.0
No comment	7.5	7.5	5.0	6.6

*Number interviewed: 40 teachers, 40 young farmers, 40 adult farmers

expressed the opinion that farmers need an extensive and personal understanding in replacing engine pistons and rings while 81.7 percent of the interviewees expressed the opinion that farmers need to understand only when and how to get help. Only 6.7 percent of those interviewed made no

comment regarding the degree of understanding needed by farmers in replacing engine pistons and rings.

Grinding engine valves. Table X shows that only 17.5 percent of

TABLE X
DEGREE OF UNDERSTANDING NEEDED BY FARMERS
IN GRINDING ENGINE VALVES

Degree of Understanding	Opinions Expressed by			Combined Opinions
	Teachers*	Young Farmers*	Adult Farmers*	
Extensive and personal	7.5%	7.5%	37.5%	17.5%
When and how to get help	87.5	85.0	47.5	73.3
Little or none	0.0	0.0	0.0	0.0
No comment	5.0	7.5	15.0	9.2

*Number interviewed: 40 teachers, 40 young farmers, 40 adult farmers

the interviewees expressed the opinion that farmers need an extensive and personal understanding in grinding engine valves while 73.3 percent of those interviewed expressed the opinion that farmers need to understand only when and how to get help. Only 9.2 percent of those interviewed made no comment regarding the degree of understanding needed by farmers in grinding engine valves.

There was no clear indication why 87.5 percent of the teachers and 85.0 percent of the young farmers interviewed expressed the opinion that farmers need to understand only when and how to get help in grinding engine valves while only 47.5 percent of the adult farmers expressed a similar opinion. Since a clear majority of the interviewees did express the opinion that farmers need to understand only when and how to get assistance, and since this was the most popular choice among all three groups of respondents, one may conclude with a fair degree of confidence

that, based upon these expressed opinions, farmers need to understand only when and how to get help in grinding engine valves.

Adjusting engine valves. Table XI shows that only 43.3 percent of

TABLE XI
DEGREE OF UNDERSTANDING NEEDED BY FARMERS
IN ADJUSTING ENGINE VALVES

Degree of Understanding	Opinions Expressed by			Combined Opinions
	Teachers*	Young Farmers*	Adult Farmers*	
Extensive and personal	35.0%	40.0%	55.0%	43.3%
When and how to get help	62.5	55.0	40.0	52.5
Little or none	0.0	0.0	0.0	0.0
No comment	2.5	5.0	5.0	4.2

*Number interviewed: 40 teachers, 40 young farmers, 40 adult farmers

the interviewees expressed the opinion that farmers need an extensive and personal understanding in adjusting engine valves while 52.5 percent of those interviewed expressed the opinion that farmers need to understand only when and how to get help in adjusting engine valves. Only 4.2 percent of the interviewees made no comment regarding the degree of understanding needed by farmers in adjusting engine valves.

There was no clear indication why 62.5 percent of the teachers and 55.0 percent of the young farmers interviewed expressed the opinion that farmers need to understand only when and how to get help in adjusting engine valves while only 40.0 percent of the adult farmers expressed a similar opinion. The interviewer felt that the opinions expressed by the relatively small majority of the interviewees indicating that farmers need to understand only when and how to get help in adjusting engine valves cannot be accepted as conclusive evidence that farmers need to

understand only when and how to get help in adjusting engine valves; however, one may definitely conclude that, based upon the opinions expressed by the respondents, farmers do need to understand at least enough about adjusting engine valves to know when and how to get help.

Adjusting crankshaft bearings. Table XII shows that only 18.3 per-

TABLE XII

DEGREE OF UNDERSTANDING NEEDED BY FARMERS
IN ADJUSTING CRANKSHAFT BEARINGS

Degree of Understanding	Opinions Expressed by			Combined Opinions
	Teachers*	Young Farmers*	Adult Farmers*	
Extensive and personal	12.5%	22.5%	20.0%	18.3%
When and how to get help	80.0	70.0	75.0	75.0
Little or none	0.0	0.0	0.0	0.0
No comment	7.5	7.5	5.0	6.7

*Number interviewed: 40 teachers, 40 young farmers, 40 adult farmers

cent of the interviewees expressed the opinion that farmers need an extensive and personal understanding in adjusting crankshaft bearings while 75.0 percent of the respondents expressed the opinion that farmers need to understand only when and how to get help in adjusting crankshaft bearings. Only 6.7 percent of those interviewed made no comment regarding the degree of understanding needed by farmers in adjusting crankshaft bearings.

Servicing engine ignition systems. A high proportion of each group of respondents expressed the opinion that farmers need an extensive and personal understanding in the servicing of engine ignition systems. Table XIII shows that 75.8 percent of those interviewed expressed the opinion that farmers need an extensive and personal understanding in

servicing engine ignition systems while only 20.8 percent of those interviewed expressed the opinion that farmers need to understand only when and how to get help in servicing engine ignition systems. Only 0.8 percent of the respondents expressed the opinion that farmers need little or no personal understanding in the servicing of engine ignition systems, and only 2.5 percent of those interviewed made no comment regarding the degree of understanding needed by farmers in servicing engine ignition systems.

TABLE XIII

DEGREE OF UNDERSTANDING NEEDED BY FARMERS
IN SERVICING ENGINE IGNITION SYSTEMS

Degree of Understanding	Opinions Expressed by			Combined Opinions
	Teachers*	Young Farmers*	Adult Farmers*	
Extensive and personal	72.5%	80.0%	75.0%	75.8%
When and how to get help	25.0	12.5	25.0	20.9
Little or none	0.0	2.5	0.0	0.8
No comment	2.5	5.0	0.0	2.5

*Number interviewed: 40 teachers, 40 young farmers, 40 adult farmers

Servicing engine cooling systems. There was rather uniform agreement by the three groups of respondents that farmers need an extensive and personal understanding in the servicing of engine cooling systems. Table XIV shows that 95.8 percent of the interviewees expressed the opinion that farmers need an extensive and personal understanding in the servicing of engine cooling systems while only 4.2 percent of those interviewed expressed the opinion that farmers need to understand only when and how to get help in the servicing of cooling systems on engines.

TABLE XIV

DEGREE OF UNDERSTANDING NEEDED BY FARMERS
IN SERVICING ENGINE COOLING SYSTEMS

Degree of Understanding	Opinions Expressed by			Combined Opinions
	Teachers*	Young Farmers*	Adult Farmers*	
Extensive and personal	95.0%	95.0%	97.5%	95.8%
When and how to get help	5.0	5.0	2.5	4.2
Little or none	0.0	0.0	0.0	0.0
No comment	0.0	0.0	0.0	0.0

*Number interviewed: 40 teachers, 40 young farmers, 40 adult farmers

Replacing and adjusting clutches. While 65.8 percent of the interviewees expressed the opinion that farmers need an extensive and personal understanding in replacing and adjusting clutches as is shown in table XV, 30.0 percent of those interviewed expressed the opinion that farmers

TABLE XV

DEGREE OF UNDERSTANDING NEEDED BY FARMERS
IN REPLACING AND ADJUSTING CLUTCHES

Degree of Understanding	Opinions Expressed by			Combined Opinions
	Teachers*	Young Farmers*	Adult Farmers*	
Extensive and personal	65.0%	60.0%	72.5%	65.8%
When and how to get help	30.0	37.5	22.5	30.0
Little or none	0.0	0.0	0.0	0.0
No comment	5.0	2.5	5.0	4.2

*Number interviewed: 40 teachers, 40 young farmers, 40 adult farmers

need to understand only when and how to get help in replacing and adjusting clutches. Only 4.2 percent of those interviewed made no comment regarding the degree of understanding needed by farmers in replacing and adjusting clutches.

Repairing and adjusting brakes. A high proportion of the interviewees in each group agreed that farmers need an extensive and personal understanding in the repair and adjustment of brakes. Table XVI shows

TABLE XVI
DEGREE OF UNDERSTANDING NEEDED BY FARMERS
IN REPAIRING AND ADJUSTING BRAKES

Degree of Understanding	Opinions Expressed by			Combined Opinions
	Teachers*	Young Farmers*	Adult Farmers*	
Extensive and personal	90.0%	90.0%	87.5%	89.2%
When and how to get help	7.5	10.0	7.5	8.3
Little or none	0.0	0.0	0.0	0.0
No comment	2.5	0.0	5.0	2.5

*Number interviewed: 40 teachers, 40 young farmers, 40 adult farmers

that 89.2 percent of the interviewees expressed the opinion that farmers need an extensive and personal understanding in repairing and adjusting brakes while only 8.3 percent of those interviewed expressed the opinion that farmers need to understand only when and how to get help in the repair and adjustment of brakes. Only 2.5 percent of the interviewees made no comment regarding the degree of understanding needed by farmers in repairing and adjusting brakes.

Servicing transmissions. Table XVII shows that 70.0 percent of the interviewees expressed the opinion that farmers need an extensive and personal understanding in servicing transmissions while only 28.3 percent of those interviewed expressed the opinion that farmers need to understand only when and how to get help in servicing transmissions. Only 1.7 percent of the interviewees made no comment regarding the degree of understanding needed by farmers in servicing transmissions.

TABLE XVII
DEGREE OF UNDERSTANDING NEEDED BY FARMERS
IN SERVICING TRANSMISSIONS

Degree of Understanding	Opinions Expressed by			Combined Opinions
	Teachers*	Young Farmers*	Adult Farmers*	
Extensive and personal	52.5%	72.5%	85.0%	70.0%
When and how to get help	45.0	27.5	12.5	28.3
Little or none	0.0	0.0	0.0	0.0
No comment	2.5	0.0	2.5	1.7

*Number interviewed: 40 teachers, 40 young farmers, 40 adult farmers

There was no reason that was readily discernable to indicate definitely why the three groups of respondents expressed opinions which differed greatly regarding the degree of understanding needed by farmers in servicing transmissions. According to opinions expressed by 85.0 percent of the adult farmers, farmers need an extensive and personal understanding in the servicing of transmissions; however, only 52.5 percent of the teachers and 72.5 percent of the young farmers concurred with the adult farmers in this opinion. One may surmise that the opinions expressed by some of the adult farmers were influenced by experiences which they may have had in servicing transmissions when these mechanisms were relatively simple. One may also surmise that the teachers had access to information about the latest developments in these mechanisms, and that the opinions of certain teachers may have been influenced by the knowledge that many types of transmissions used on modern power machinery are complicated and require a high degree of skill as well as special tools for servicing.

Servicing final drives. Table XVIII shows that 64.2 percent of the interviewees expressed the opinion that farmers need an extensive and

personal understanding in servicing final drives while only 33.3 percent of those interviewed expressed the opinion that farmers need to understand only when and how to get help in servicing final drives. Only 2.5 percent of the interviewees made no comment regarding the degree of understanding needed by farmers in the servicing of final drives.

TABLE XVIII

DEGREE OF UNDERSTANDING NEEDED BY FARMERS
IN SERVICING FINAL DRIVES

Degree of Understanding	Opinions Expressed by			Combined Opinions
	Teachers*	Young Farmers*	Adult Farmers*	
Extensive and personal	47.5%	65.0%	80.0%	64.2%
When and how to get help	47.5	35.0	17.5	33.3
Little or none	0.0	0.0	0.0	0.0
No comment	5.0	0.0	2.5	2.5

*Number interviewed: 40 teachers, 40 young farmers, 40 adult farmers

There was no reason that was discernable to indicate definitely why the three groups of respondents expressed opinions which differed greatly regarding the degree of understanding needed by farmers in servicing final drives. Farmers need an extensive and personal understanding according to opinions expressed by 80.0 percent of the adult farmers; however, only 47.5 percent of the teachers and 65.0 percent of the young farmers concurred in this opinion. One may surmise that the opinions expressed by certain adult farmers may have been influenced by experiences which they may have had in servicing final drives when these mechanisms were relatively simple, and that the teachers may have had access to information relating to the latest developments in these mechanisms and that the expressed opinions of certain teachers may have

been influenced by the knowledge that many types of final drives used on modern power machinery are complicated and require a high degree of skill as well as special tools in servicing. A point of interest is that the teachers were evenly divided on this point with 47.5 percent expressing the opinion that farmers need an extensive and personal understanding, and with 47.5 percent expressing the opinion that farmers need to understand only when and how to get help in servicing final drives.

Selecting farm machinery. Table XIX shows that 100.0 percent of

TABLE XIX

DEGREE OF UNDERSTANDING NEEDED BY FARMERS
IN SELECTING FARM MACHINERY

Degree of Understanding	Opinions Expressed by			Combined Opinions
	Teachers*	Young Farmers*	Adult Farmers*	
Extensive and personal	100.0%	100.0%	100.0%	100.0%
When and how to get help	0.0	0.0	0.0	0.0
Little or none	0.0	0.0	0.0	0.0
No comment	0.0	0.0	0.0	0.0

*Number interviewed: 40 teachers, 40 young farmers, 40 adult farmers

the interviewees expressed the opinion that farmers need an extensive and personal understanding of the mechanical characteristics to be considered in selecting farm machinery.

Servicing and repairing farm machinery. Table XX shows that 100.0 percent of those interviewed expressed the opinion that farmers need an extensive and personal understanding in the servicing and repairing of farm machinery.

Summary of opinions expressed concerning the degree of understanding needed by farmers in twenty farm power and machinery competencies. The

respondents unanimously agreed that farmers need an extensive and personal understanding in selecting farm tractors, in lubricating engines and farm machinery, in selecting farm machinery, and in servicing and repairing farm machinery.

TABLE XI
DEGREE OF UNDERSTANDING NEEDED BY FARMERS IN
SERVICING AND REPAIRING FARM MACHINERY

Degree of Understanding	Opinions Expressed by			Combined Opinions
	Teachers*	Young Farmers*	Adult Farmers*	
Extensive and personal	100.0%	100.0%	100.0%	100.0%
When and how to get help	0.0	0.0	0.0	0.0
Little or none	0.0	0.0	0.0	0.0
No comment	0.0	0.0	0.0	0.0

*Number interviewed: 40 teachers, 40 young farmers, 40 adult farmers

A majority of the respondents agreed that farmers need an extensive and personal understanding in selecting farm trucks, in selecting stationary engines, in servicing engine fuel systems, in servicing engine ignition systems, in servicing engine cooling systems, in replacing and adjusting clutches, in repairing and adjusting brakes, in servicing transmissions, and in servicing final drives.

A majority of the respondents agreed that farmers need to understand only when and how to get help in converting engines to use butane, propane, and natural gas, in reboring an engine block, in replacing engine sleeves, in replacing engine pistons and rings, in grinding engine valves, in adjusting engine valves, and in adjusting crankshaft bearings.

Farm Buildings and Conveniences Competencies

On the farms operated by the selected young farmers and selected adult farmers and in the communities where the selected interviewees resided there were observed many new buildings and structures that were designed for special uses in farming. Most of these new buildings and structures were evidently designed and built in a manner to increase the efficiency of the overall farming operation and to afford the greatest possible convenience to the farm operator and other farm workers. Throughout Oklahoma there was evidence of careful attention being given to farm and home conveniences. Running water was generally found in the homes of the young farmers and in the homes of the adult farmers interviewed. Many farm homes were observed to have sanitary bathroom facilities. Modern farm families are evidently enjoying most of the conveniences in the farm home that were once found only in city homes.

The vocational agriculture teachers interviewed expressed the general opinion that farmers are now considering the details in buildings and other structures which add to the efficiency of the total farming operation and which help maintain a favorable environment on the farm. Each teacher interviewed reported that farmers had asked for information that would be helpful in solving farm building problems or that would assist in the improvement of farm conveniences.

Tables XXI through XLVIII are arranged to indicate the opinions expressed by the selected interviewees concerning the degree of understanding needed by farmers in certain competencies related to farm buildings and conveniences.

Making engineering drawings. Table XXI shows that 54.2 percent of the interviewees expressed the opinion that farmers need little or no

TABLE XXI

DEGREE OF UNDERSTANDING NEEDED BY FARMERS
IN MAKING ENGINEERING DRAWINGS

Degree of Understanding	Opinions Expressed by			Combined Opinions
	Teachers*	Young Farmers*	Adult Farmers*	
Extensive and personal	22.5%	7.5%	5.0%	11.7%
When and how to get help	62.5	5.0	15.0	27.5
Little or none	10.0	72.5	80.0	54.2
No comment	5.0	15.0	0.0	6.6

*Number interviewed: 40 teachers, 40 young farmers, 40 adult farmers

personal understanding in making engineering drawings while 27.5 percent of those interviewed expressed the opinion that farmers need to understand only when and how to get help in making engineering drawings. Only 11.7 percent of those interviewed expressed the opinion that farmers need an extensive and personal understanding in the making of engineering drawings. Of those interviewed, only 6.6 percent made no comment regarding the degree of understanding needed by farmers in making engineering drawings.

There was a wide divergence of opinion among the three groups of respondents concerning the degree of understanding needed by farmers in making engineering drawings. Of the teachers interviewed, 62.5 percent expressed the opinion that farmers need to understand only when and how to get help, 22.5 percent expressed the opinion that farmers need an extensive and personal understanding, and 10.0 percent expressed the opinion that farmers need little or no personal understanding in making engineering drawings. Of the young farmers interviewed, 72.5 percent

expressed the opinion that farmers need little or no personal understanding, 7.5 percent expressed the opinion that farmers need an extensive and personal understanding, and 5.0 percent expressed the opinion that farmers need to understand only when and how to get help in making engineering drawings. Of the adult farmers interviewed, 80.0 percent expressed the opinion that farmers need little or no personal understanding, 15.0 percent expressed the opinion that farmers need to understand only when and how to get help, and 5.0 percent expressed the opinion that farmers need an extensive and personal understanding in making engineering drawings.

Difficulty was experienced in getting the young farmers and the adult farmers interviewed to understand what was meant by the term "engineering drawings." Clarity of communication was also difficult to establish between the interviewer and the teachers. The term "making sketches to scale" appeared to be understood much better by the interviewees than was the term "engineering drawings." The interviewer is of the opinion that the results shown in table XXII are much more valid and reliable than are those shown in table XXI.

Making sketches to scale. Table XXII shows that 97.5 percent of the interviewees expressed the opinion that farmers need an extensive and personal understanding in making sketches to scale while only 0.8 percent of those interviewed expressed the opinion that farmers need to understand only when and how to get help. Only 1.7 percent of the respondents expressed the opinion that farmers need little or no personal understanding in the making of sketches to scale.

Several teachers interviewed expressed the opinion that if farmers could make sketches to scale they would be able to make all of the work-

ing sketches they would need on the farm without having to know how to draw in the detail usually required in engineering drawings. Several of the young farmers and adult farmers expressed agreement with this opinion.

TABLE XXII

DEGREE OF UNDERSTANDING NEEDED BY FARMERS
IN MAKING SKETCHES TO SCALE

Degree of Understanding	Opinions Expressed by			Combined Opinions
	Teachers*	Young Farmers*	Adult Farmers*	
Extensive and personal	100.0%	97.5%	95.0%	97.5%
When and how to get help	0.0	0.0	2.5	0.8
Little or none	0.0	2.5	2.5	1.7
No comment	0.0	0.0	0.0	0.0

*Number interviewed: 40 teachers, 40 young farmers, 40 adult farmers

Planning farm buildings. Table XXIII shows that 75.8 percent of the interviewees expressed the opinion that farmers need an extensive

TABLE XXIII

DEGREE OF UNDERSTANDING NEEDED BY FARMERS
IN PLANNING FARM BUILDINGS

Degree of Understanding	Opinions Expressed by			Combined Opinions
	Teachers*	Young Farmers*	Adult Farmers*	
Extensive and personal	67.5%	82.5%	77.5%	75.8%
When and how to get help	32.5	17.5	22.5	24.2
Little or none	0.0	0.0	0.0	0.0
No comment	0.0	0.0	0.0	0.0

*Number interviewed: 40 teachers, 40 young farmers, 40 adult farmers

and personal understanding in planning farm buildings while only 24.2 percent of the interviewees expressed the opinion that farmers need to understand only when and how to get help in planning farm buildings.

Estimating building costs. Table XXIV shows that 76.7 percent of the interviewees expressed the opinion that farmers need an extensive

TABLE XXIV

DEGREE OF UNDERSTANDING NEEDED BY FARMERS
IN ESTIMATING BUILDING COSTS

Degree of Understanding	Opinions Expressed by			Combined Opinions
	Teachers*	Young Farmers*	Adult Farmers*	
Extensive and personal	70.7%	82.5%	77.5%	76.7%
When and how to get help	30.0	17.5	22.5	23.3
Little or none	0.0	0.0	0.0	0.0
No comment	0.0	0.0	0.0	0.0

*Number interviewed: 40 teachers, 40 young farmers, 40 adult farmers

and personal understanding in estimating building costs. Only 23.3 percent of those interviewed expressed the opinion that farmers need to understand only when and how to get help in estimating building costs.

Building with concrete. Concrete is being used in the construction of buildings, silos, feeding floors, watering troughs, and other structures used on the farm. Table XXV shows that 100.0 percent of the interviewees

TABLE XXV

DEGREE OF UNDERSTANDING NEEDED BY FARMERS
IN BUILDING WITH CONCRETE

Degree of Understanding	Opinions Expressed by			Combined Opinions
	Teachers*	Young Farmers*	Adult Farmers*	
Extensive and personal	100.0%	100.0%	100.0%	100.0%
When and how to get help	0.0	0.0	0.0	0.0
Little or none	0.0	0.0	0.0	0.0
No comment	0.0	0.0	0.0	0.0

*Number interviewed: 40 teachers, 40 young farmers, 40 adult farmers

expressed the opinion that farmers need an extensive and personal understanding in using concrete to build things for the farm.

Building with lumber. Lumber has long been recognized as a building material commonly used on farms. Table XXVI shows that the

TABLE XXVI
DEGREE OF UNDERSTANDING NEEDED BY FARMERS
IN BUILDING WITH LUMBER

Degree of Understanding	Opinions Expressed by			Combined Opinions
	Teachers*	Young Farmers*	Adult Farmers*	
Extensive and personal	100.0%	100.0%	100.0%	100.0%
When and how to get help	0.0	0.0	0.0	0.0
Little or none	0.0	0.0	0.0	0.0
No comment	0.0	0.0	0.0	0.0

*Number interviewed: 40 teachers, 40 young farmers, 40 adult farmers

respondents agreed unanimously that farmers need an extensive and personal understanding in using lumber to build things for the farm.

Building with pre-fabricated materials. Since World War II ended the use of pre-fabricated materials in building on farms has increased greatly. Table XXVII shows that 60.8 percent of the interviewees

TABLE XXVII
DEGREE OF UNDERSTANDING NEEDED BY FARMERS IN
BUILDING WITH PRE-FABRICATED MATERIALS

Degree of Understanding	Opinions Expressed by			Combined Opinions
	Teachers*	Young Farmers*	Adult Farmers*	
Extensive and personal	55.0%	65.0%	62.5%	60.8%
When and how to get help	45.0	35.0	37.5	39.2
Little or none	0.0	0.0	0.0	0.0
No comment	0.0	0.0	0.0	0.0

*Number interviewed: 40 teachers, 40 young farmers, 40 adult farmers

expressed the opinion that farmers need an extensive and personal understanding in building structures of pre-fabricated materials while 39.2 percent of those interviewed expressed the opinion that farmers need to understand only when and how to obtain help in building with pre-fabricated materials.

Building with metal. The use of sheet metal in farm building has been common for many years. Today one may occasionally observe a farm building which also has a metal framework. Metal feeders, watering troughs, and other livestock and poultry equipment made of metal may be observed on many modern farms. Table XXVIII shows that 100.0 percent of

TABLE XXVIII

DEGREE OF UNDERSTANDING NEEDED BY FARMERS
IN BUILDING WITH METAL

Degree of Understanding	Opinions Expressed by			Combined Opinions
	Teachers*	Young Farmers*	Adult Farmers*	
Extensive and personal	100.0%	100.0%	100.0%	100.0%
When and how to get help	0.0	0.0	0.0	0.0
Little or none	0.0	0.0	0.0	0.0
No comment	0.0	0.0	0.0	0.0

*Number interviewed: 40 teachers, 40 young farmers, 40 adult farmers

those interviewed expressed the opinion that farmers need an extensive and personal understanding in building with metal.

Repairing farm buildings. Keeping buildings properly repaired has long been considered to be an important job on most farms. Table XXIX shows that 100.0 percent of the interviewees expressed the opinion that farmers need to have an extensive and personal understanding in the repairing of farm buildings.

TABLE XXIX

DEGREE OF UNDERSTANDING NEEDED BY FARMERS
IN REPAIRING FARM BUILDINGS

Degree of Understanding	Opinions Expressed by			Combined Opinions
	Teachers*	Young Farmers*	Adult Farmers*	
Extensive and personal	100.0%	100.0%	100.0%	100.0%
When and how to get help	0.0	0.0	0.0	0.0
Little or none	0.0	0.0	0.0	0.0
No comment	0.0	0.0	0.0	0.0

*Number interviewed: 40 teachers, 40 young farmers, 40 adult farmers

Planning livestock and poultry equipment. Table XXX shows that all of the respondents agreed that farmers need an extensive and personal understanding in planning livestock and poultry equipment.

TABLE XXX

DEGREE OF UNDERSTANDING NEEDED BY FARMERS IN
PLANNING LIVESTOCK AND POULTRY EQUIPMENT

Degree of Understanding	Opinions Expressed by			Combined Opinions
	Teachers*	Young Farmers*	Adult Farmers*	
Extensive and personal	100.0%	100.0%	100.0%	100.0%
When and how to get help	0.0	0.0	0.0	0.0
Little or none	0.0	0.0	0.0	0.0
No comment	0.0	0.0	0.0	0.0

*Number interviewed: 40 teachers, 40 young farmers, 40 adult farmers

Building livestock and poultry equipment. Some farm labor may be efficiently utilized in building livestock and poultry equipment used on the farm. Table XXXI shows that 100.0 percent of those interviewed expressed the opinion that farmers need an extensive and personal understanding in the building of livestock and poultry equipment.

TABLE XXXI

DEGREE OF UNDERSTANDING NEEDED BY FARMERS IN
BUILDING LIVESTOCK AND POULTRY EQUIPMENT

Degree of Understanding	Opinions Expressed by			Combined Opinions
	Teachers*	Young Farmers*	Adult Farmers*	
Extensive and personal	100.0%	100.0%	100.0%	100.0%
When and how to get help	0.0	0.0	0.0	0.0
Little or none	0.0	0.0	0.0	0.0
No comment	0.0	0.0	0.0	0.0

*Number interviewed: 40 teachers, 40 young farmers, 40 adult farmers

Repairing livestock and poultry equipment. Repairing livestock and poultry equipment is one of the farm mechanics jobs that may frequently be done on the farm. Table XXXII shows that 100.0 percent of those

TABLE XXXII

DEGREE OF UNDERSTANDING NEEDED BY FARMERS IN
REPAIRING LIVESTOCK AND POULTRY EQUIPMENT

Degree of Understanding	Opinions Expressed by			Combined Opinions
	Teachers*	Young Farmers*	Adult Farmers*	
Extensive and personal	100.0%	100.0%	100.0%	100.0%
When and how to get help	0.0	0.0	0.0	0.0
Little or none	0.0	0.0	0.0	0.0
No comment	0.0	0.0	0.0	0.0

*Number interviewed: 40 teachers, 40 young farmers, 40 adult farmers

interviewed expressed the opinion that farmers need an extensive and personal understanding in the repairing of livestock and poultry equipment.

Planning fence arrangements. Table XXXIII shows that all of the respondents agreed that farmers need an extensive and personal understanding in the planning of fence arrangements on the farm.

TABLE XXXIII

DEGREE OF UNDERSTANDING NEEDED BY FARMERS
IN PLANNING FENCE ARRANGEMENTS

Degree of Understanding	Opinions Expressed by			Combined Opinions
	Teachers*	Young Farmers*	Adult Farmers*	
Extensive and personal	100.0%	100.0%	100.0%	100.0%
When and how to get help	0.0	0.0	0.0	0.0
Little or none	0.0	0.0	0.0	0.0
No comment	0.0	0.0	0.0	0.0

*Number interviewed: 40 teachers, 40 young farmers, 40 adult farmers

Building fences. Table XXXIV shows that 99.2 percent of the interviewees expressed the opinion that farmers need an extensive and personal

TABLE XXXIV

DEGREE OF UNDERSTANDING NEEDED BY FARMERS
IN BUILDING FENCES

Degree of Understanding	Opinions Expressed by			Combined Opinions
	Teachers*	Young Farmers*	Adult Farmers*	
Extensive and personal	100.0%	100.0%	97.5%	99.2%
When and how to get help	0.0	0.0	2.5	0.8
Little or none	0.0	0.0	0.0	0.0
No comment	0.0	0.0	0.0	0.0

*Number interviewed: 40 teachers, 40 young farmers, 40 adult farmers

understanding in building fences while only 0.8 percent of the respondents expressed the opinion that farmers need to understand only when and how to get help in building fences. The single adult farmer who indicated that farmers need to understand only when and how to get help in building fences reported that he contracted with a fence builder to construct all of the fences on his farm.

Repairing fences. Table XXXV shows that all respondents agreed that farmers need an extensive and personal understanding in repairing fences.

TABLE XXXV
DEGREE OF UNDERSTANDING NEEDED BY FARMERS
IN REPAIRING FENCES

Degree of Understanding	Opinions Expressed by			Combined Opinions
	Teachers*	Young Farmers*	Adult Farmers*	
Extensive and personal	100.0%	100.0%	100.0%	100.0%
When and how to get help	0.0	0.0	0.0	0.0
Little or none	0.0	0.0	0.0	0.0
No comment	0.0	0.0	0.0	0.0

*Number interviewed: 40 teachers, 40 young farmers, 40 adult farmers

Planning sewage disposal systems. Running water systems have made possible the installation of sanitary sewage disposal systems on many farms. Table XXXVI shows that 50.8 percent of the interviewees expressed

TABLE XXXVI
DEGREE OF UNDERSTANDING NEEDED BY FARMERS
IN PLANNING SEWAGE DISPOSAL SYSTEMS

Degree of Understanding	Opinions Expressed by			Combined Opinions
	Teachers*	Young Farmers*	Adult Farmers*	
Extensive and personal	55.0%	47.5%	50.0%	50.8%
When and how to get help	45.0	50.0	50.0	48.4
Little or none	0.0	2.5	0.0	0.8
No comment	0.0	0.0	0.0	0.0

*Number interviewed: 40 teachers, 40 young farmers, 40 adult farmers

the opinion that farmers need an extensive and personal understanding in planning sewage disposal systems, 48.4 percent of those interviewed expressed the opinion that farmers need to understand only when and how to

get help, and that only 0.8 percent of the interviewees expressed the opinion that farmers need little or no personal understanding in the planning of sewage disposal systems.

Some of the interviewees who expressed the opinion that farmers need to understand only when and how to get help in planning sewage disposal systems reported that detailed plans were available from commercial concerns and from other sources, and that farmers merely needed to have the ability to read these plans. Some of those in this category expressed the opinion that farmers would do well to have skilled plumbers lay out sewage disposal systems. The single young farmer who expressed the opinion that farmers need little or no personal understanding in the planning of sewage disposal systems stated that he was perfectly happy with his outdoor privy. With this one exception, all of those who commented regarding the degree of understanding needed by farmers in planning sewage disposal systems agreed that farmers either needed to understand how to plan systems or how to get help in planning sewage disposal systems.

Installing sewage disposal systems. Table XXXVII shows that 59.2

TABLE XXXVII

DEGREE OF UNDERSTANDING NEEDED BY FARMERS
IN INSTALLING SEWAGE DISPOSAL SYSTEMS

Degree of Understanding	Opinions Expressed by			Combined Opinions
	Teachers*	Young Farmers*	Adult Farmers*	
Extensive and personal	55.0%	57.5%	65.0%	59.2%
When and how to get help	45.0	40.0	35.0	40.0
Little or none	0.0	2.5	0.0	0.8
No comment	0.0	0.0	0.0	0.0

*Number interviewed: 40 teachers, 40 young farmers, 40 adult farmers

percent of the interviewees expressed the opinion that farmers need an extensive and personal understanding in installing sewage disposal systems while only 40.0 percent of those interviewed expressed the opinion that farmers need to understand only when and how to get help in the installation of sewage disposal systems. Only 0.8 percent of those interviewed expressed the opinion that farmers need little or no personal understanding in the installation of sewage disposal systems, and this represented the single young farmer who, as reported previously, stated that he was satisfied with his outdoor privy.

Servicing sewage disposal systems. Table XXXVIII shows that 71.7

TABLE XXXVIII

DEGREE OF UNDERSTANDING NEEDED BY FARMERS
IN SERVICING SEWAGE DISPOSAL SYSTEMS

Degree of Understanding	Opinions Expressed by			Combined Opinions
	Teachers*	Young Farmers*	Adult Farmers*	
Extensive and personal	77.5%	72.5%	65.0%	71.7%
When and how to get help	22.5	22.5	35.0	26.7
Little or none	0.0	2.5	0.0	0.8
No comment	0.0	2.5	0.0	0.8

*Number interviewed: 40 teachers, 40 young farmers, 40 adult farmers

percent of the interviewees expressed the opinion that farmers need an extensive and personal understanding in how to service sewage disposal systems. Only 26.7 percent of those interviewed expressed the opinion that farmers need to understand only when and how to get help in the servicing of sewage disposal systems. Only 0.8 percent of the interviewees expressed the opinion that farmers need little or no personal understanding, and only 0.8 percent made no comment regarding the degree

of understanding needed by farmers in servicing sewage disposal systems.

Planning farm water systems. Table XXXIX shows that 70.8 percent

TABLE XXXIX

DEGREE OF UNDERSTANDING NEEDED BY FARMERS
IN PLANNING FARM WATER SYSTEMS

Degree of Understanding	Opinions Expressed by			Combined Opinions
	Teachers*	Young Farmers*	Adult Farmers*	
Extensive and personal	70.0%	70.0%	72.5%	70.8%
When and how to get help	30.0	30.0	27.5	29.2
Little or none	0.0	0.0	0.0	0.0
No comment	0.0	0.0	0.0	0.0

*Number interviewed: 40 teachers, 40 young farmers, 40 adult farmers

of the interviewees expressed the opinion that farmers need an extensive and personal understanding of how to plan farm water systems. Only 29.2 percent of those interviewed expressed the opinion that farmers need to understand only when and how to get help in planning farm water systems.

Installing farm water system plumbing. Table XL shows that 75.0 percent of the interviewees expressed the opinion that farmers need an

TABLE XL

DEGREE OF UNDERSTANDING NEEDED BY FARMERS IN
INSTALLING FARM WATER SYSTEM PLUMBING

Degree of Understanding	Opinions Expressed by			Combined Opinions
	Teachers*	Young Farmers*	Adult Farmers*	
Extensive and personal	77.5%	75.0%	72.5%	75.0%
When and how to get help	22.5	25.0	27.5	25.0
Little or none	0.0	0.0	0.0	0.0
No comment	0.0	0.0	0.0	0.0

*Number interviewed: 40 teachers, 40 young farmers, 40 adult farmers

extensive and personal understanding in the installation of farm water system plumbing. Only 25.0 percent of the respondents expressed the opinion that farmers need to understand only when and how to get help in installing farm water system plumbing.

Servicing and repairing farm water systems. Table XLI shows that

TABLE XLI

DEGREE OF UNDERSTANDING NEEDED BY FARMERS IN
SERVICING AND REPAIRING FARM WATER SYSTEMS

Degree of Understanding	Opinions Expressed by			Combined Opinions
	Teachers*	Young Farmers*	Adult Farmers*	
Extensive and personal	100.0%	90.0%	95.0%	95.0%
When and how to get help	0.0	10.0	5.0	5.0
Little or none	0.0	0.0	0.0	0.0
No comment	0.0	0.0	0.0	0.0

*Number interviewed: 40 teachers, 40 young farmers, 40 adult farmers

95.0 percent of the respondents agreed that farmers need an extensive and personal understanding in the servicing and repairing of farm water systems. Only 5.0 percent of those interviewed expressed the opinion that farmers need to understand only when and how to get help in servicing and repairing farm water systems.

Selecting water pump, motor, and pressure tank. Table XLII shows that 61.7 percent of the interviewees expressed the opinion that farmers need an extensive and personal understanding in the selection of a water pump, motor, and pressure tank. Only 38.3 percent of those interviewed expressed the opinion that farmers need to understand only when and how to get help in selecting a water pump, motor, and pressure tank for use on the farm.

TABLE XLII

DEGREE OF UNDERSTANDING NEEDED BY FARMERS IN SELECTING
WATER PUMP, MOTOR, AND PRESSURE TANK

Degree of Understanding	Opinions Expressed by			Combined Opinions
	Teachers*	Young Farmers*	Adult Farmers*	
Extensive and personal	67.5%	62.5%	55.0%	61.7%
When and how to get help	32.5	37.5	45.0	38.3
Little or none	0.0	0.0	0.0	0.0
No comment	0.0	0.0	0.0	0.0

*Number interviewed: 40 teachers, 40 young farmers, 40 adult farmers

Installing water pump, motor, and pressure tank. Table XLIII shows that 63.3 percent of the interviewees expressed the opinion that farmers

TABLE XLIII

DEGREE OF UNDERSTANDING NEEDED BY FARMERS IN INSTALLING
WATER PUMP, MOTOR, AND PRESSURE TANK

Degree of Understanding	Opinions Expressed by			Combined Opinions
	Teachers*	Young Farmers*	Adult Farmers*	
Extensive and personal	60.0%	57.5%	72.5%	63.3%
When and how to get help	40.0	42.5	27.5	36.7
Little or none	0.0	0.0	0.0	0.0
No comment	0.0	0.0	0.0	0.0

*Number interviewed: 40 teachers, 40 young farmers, 40 adult farmers

need an extensive and personal understanding in the installation of a water pump, motor, and pressure tank. Only 36.6 percent of those interviewed expressed the opinion that farmers need to understand only when and how to get help in installing a water pump, motor, and pressure tank.

Servicing water pump, motor, and pressure tank. That 96.7 percent

of the respondents agreed that farmers need an extensive and personal understanding in the servicing of a water pump, motor, and pressure tank is shown in table XLIV. Only 3.3 percent of those interviewed expressed

TABLE XLIV
DEGREE OF UNDERSTANDING NEEDED BY FARMERS IN SERVICING
WATER PUMP, MOTOR, AND PRESSURE TANK

Degree of Understanding	Opinions Expressed by			Combined Opinions
	Teachers*	Young Farmers*	Adult Farmers*	
Extensive and personal	100.0%	92.5%	97.5%	96.7%
When and how to get help	0.0	7.5	2.5	3.3
Little or none	0.0	0.0	0.0	0.0
No comment	0.0	0.0	0.0	0.0

*Number interviewed: 40 teachers, 40 young farmers, 40 adult farmers

the opinion that farmers need to understand only when and how to get help in servicing a water pump, motor, and pressure tank.

Filtering and treating water. Table XLV shows that 96.7 percent of

TABLE XLV
DEGREE OF UNDERSTANDING NEEDED BY FARMERS
IN FILTERING AND TREATING WATER

Degree of Understanding	Opinions Expressed by			Combined Opinions
	Teachers*	Young Farmers*	Adult Farmers*	
Extensive and personal	100.0%	92.5%	97.5%	96.7%
When and how to get help	0.0	7.5	2.5	3.3
Little or none	0.0	0.0	0.0	0.0
No comment	0.0	0.0	0.0	0.0

*Number interviewed: 40 teachers, 40 young farmers, 40 adult farmers

the respondents agreed that farmers need an extensive and personal understanding in filtering and treating water. Only 3.3 percent of those

interviewed expressed the opinion that farmers need to understand only when and how to get help in filtering and treating water.

Planning heating systems for farm buildings. Table XLVI shows that

TABLE XLVI

DEGREE OF UNDERSTANDING NEEDED BY FARMERS IN
PLANNING HEATING SYSTEMS FOR FARM BUILDINGS

Degree of Understanding	Opinions Expressed by			Combined Opinions
	Teachers*	Young Farmers*	Adult Farmers*	
Extensive and personal	22.5%	7.5%	0.0%	10.0%
When and how to get help	77.5	92.5	100.0	90.0
Little or none	0.0	0.0	0.0	0.0
No comment	0.0	0.0	0.0	0.0

*Number interviewed: 40 teachers, 40 young farmers, 40 adult farmers

only 10.0 percent of the interviewees expressed the opinion that farmers need an extensive and personal understanding in the planning of heating systems for farm buildings while 90.0 percent of those interviewed expressed the opinion that farmers need to understand only when and how to get help in planning heating systems for farm buildings.

Installing heating equipment. Table XLVII shows that only 35.8 per-

TABLE XLVII

DEGREE OF UNDERSTANDING NEEDED BY FARMERS
IN INSTALLING HEATING EQUIPMENT

Degree of Understanding	Opinions Expressed by			Combined Opinions
	Teachers*	Young Farmers*	Adult Farmers*	
Extensive and personal	25.0%	42.5%	40.0%	35.8%
When and how to get help	75.0	57.5	60.0	64.2
Little or none	0.0	0.0	0.0	0.0
No comment	0.0	0.0	0.0	0.0

*Number interviewed: 40 teachers, 40 young farmers, 40 adult farmers

cent of the interviewees expressed the opinion that farmers need an extensive and personal understanding in the installation of heating equipment while 64.2 percent of those interviewed expressed the opinion that farmers need to understand only when and how to get help in installing heating equipment.

Servicing and repairing heating equipment. Table XLVIII shows that

TABLE XLVIII

DEGREE OF UNDERSTANDING NEEDED BY FARMERS IN SERVICING
AND REPAIRING HEATING EQUIPMENT

Degree of Understanding	Opinions Expressed by			Combined Opinions
	Teachers*	Young Farmers*	Adult Farmers*	
Extensive and personal	92.5%	87.5%	95.0%	91.7%
When and how to get help	7.5	12.5	5.0	8.3
Little or none	0.0	0.0	0.0	0.0
No comment	0.0	0.0	0.0	0.0

*Number interviewed: 40 teachers, 40 young farmers, 40 adult farmers

91.7 percent of the interviewees expressed the opinion that farmers need an extensive and personal understanding in the servicing and repairing of heating equipment while only 8.3 percent of those interviewed expressed the opinion that farmers need to understand only when and how to get help in servicing and repairing heating equipment used in farm buildings.

Summary of opinions expressed concerning the degree of understanding needed by farmers in twenty-eight farm buildings and conveniences competencies. The respondents unanimously agreed that farmers need an extensive and personal understanding in building with concrete, in building with lumber, in building with metal, in repairing farm buildings, in

planning livestock and poultry equipment, in building livestock and poultry equipment, in repairing livestock and poultry equipment, in planning fence arrangements, and in repairing fences.

A majority of the respondents agreed that farmers need an extensive and personal understanding in making sketches to scale; in planning farm buildings; in estimating building costs; in building with pre-fabricated materials; in building fences; planning sewage disposal systems; in installing sewage disposal systems; in servicing sewage disposal systems; in planning farm water systems; in installing farm water system plumbing; in servicing and repairing farm water systems; in selecting a water pump, motor, and pressure tank; in installing a water pump, motor, and pressure tank; in servicing a water pump, motor, and pressure tank; in filtering and treating water; and in servicing and repairing heating systems.

A majority of the respondents agreed that farmers need to understand only when and how to get help in planning heating systems for farm buildings, and in installing heating equipment.

A majority of the respondents agreed that farmers need little or no personal understanding in making engineering drawings.

Farm Electrification Competencies

Electricity was available on all of the farms operated by the young farmers and adult farmers interviewed. These selected young farmers and these selected adult farmers expressed general agreement with the statement that electric power was making possible many conveniences inside the farm home and outside the farm home. Certain young farmers and certain adult farmers remarked that electric power had replaced one hired hand on the farm and had also replaced a part-time hired woman in

the farm home. On each farm where a selected interviewee resided there were four or more electric motors, and in the farm home where a selected interviewee resided were seven or more electric appliances.

The vocational agriculture teachers interviewed were asked to estimate the percentage of all farms within their respective service areas which were equipped with electricity on January 1, 1955. The estimates ranged from 80 percent to 100 percent with a mean of 87.4 percent. Each teacher interviewed reported that farmers had asked for information that would be useful in helping adapt electric power to farm uses.

Tables XLIX through LXV are arranged to show the opinions expressed by the selected interviewees concerning the degree of understanding needed by farmers in certain farm electrification competencies.

Planning electric wiring systems. Table XLIX shows that only 40.8

TABLE XLIX

DEGREE OF UNDERSTANDING NEEDED BY FARMERS
IN PLANNING ELECTRIC WIRING SYSTEMS

Degree of Understanding	Opinions Expressed by			Combined Opinions
	Teachers*	Young Farmers*	Adult Farmers*	
Extensive and personal	40.0%	35.0%	47.5%	40.8%
When and how to get help	52.5	62.5	50.0	55.0
Little or none	0.0	0.0	0.0	0.0
No comment	7.5	2.5	2.5	4.2

*Number interviewed: 40 teachers, 40 young farmers, 40 adult farmers

percent of the interviewees expressed the opinion that farmers need an extensive and personal understanding in the planning of electric wiring systems while 55.0 percent of those interviewed expressed the opinion

that farmers need to understand only when and how to get assistance in planning electric wiring systems. Only 4.2 percent of the interviewees made no comment regarding the degree of understanding needed by farmers in planning electric wiring systems.

Estimating cost of electric wiring. Table L shows that 54.2 percent

TABLE L

DEGREE OF UNDERSTANDING NEEDED BY FARMERS
IN ESTIMATING COST OF ELECTRIC WIRING

Degree of Understanding	Opinions Expressed by			Combined Opinions
	Teachers*	Young Farmers*	Adult Farmers*	
Extensive and personal	40.0%	55.0%	67.5%	54.2%
When and how to get help	57.5	42.5	30.0	43.3
Little or none	0.0	0.0	0.0	0.0
No comment	2.5	2.5	2.5	2.5

*Number interviewed: 40 teachers, 40 young farmers, 40 adult farmers

of the interviewees expressed the opinion that farmers need an extensive and personal understanding in estimating the cost of electric wiring while 43.3 percent of those interviewed expressed the opinion that farmers need to understand only when and how to get help. Only 2.5 percent of the interviewees made no comment regarding the degree of understanding needed by farmers in estimating the cost of electric wiring.

The three groups of respondents did not agree concerning the degree of understanding needed by farmers in estimating the cost of electric wiring. While 67.5 percent of the adult farmers expressed the opinion that farmers need an extensive and personal understanding, only 55.0 percent of the young farmers and only 40.0 percent of the teachers concurred in this opinion. The only clearly definite conclusion that

can be made that is based upon the opinions expressed by these selected interviewees is that farmers must either possess an extensive and personal understanding or understand when and how to get help in estimating the cost of electric wiring.

Installing electric wiring. Table LI shows that 54.2 percent of

TABLE LI

DEGREE OF UNDERSTANDING NEEDED BY FARMERS
IN INSTALLING ELECTRIC WIRING

Degree of Understanding	Opinions Expressed by			Combined Opinions
	Teachers*	Young Farmers*	Adult Farmers*	
Extensive and personal	47.5%	55.0%	60.0%	54.2%
When and how to get help	52.5	42.5	37.5	44.2
Little or none	0.0	0.0	0.0	0.0
No comment	0.0	2.5	2.5	1.6

*Number interviewed: 40 teachers, 40 young farmers, 40 adult farmers

the interviewees expressed the opinion that farmers need an extensive and personal understanding in installing electric wiring while 44.2 percent expressed the opinion that farmers need to understand only when and how to get help. Only 1.6 percent of those interviewed made no comment regarding the degree of understanding needed by farmers in installing electric wiring.

The three groups of interviewees did not agree concerning the degree of understanding needed by farmers in installing electric wiring. While 60.0 percent of the adult farmers expressed the opinion that farmers need an extensive and personal understanding, only 55.0 percent of the young farmers, and only 47.5 percent of the teachers concurred in this opinion. The only clearly definite conclusion that can be made that

is based upon the opinions expressed by these selected interviewees is that farmers must either possess an extensive and personal understanding of this competency or understand when and how to get help in installing electric wiring. Certain of the interviewees who concurred in this latter opinion suggested that most of the wiring on the farm should be done by a licensed electrician.

Repairing electric wiring. A high proportion of each group of respondents agreed that farmers need an extensive and personal understanding in the repairing of electric wiring. Table LII shows that 84.2

TABLE LII

DEGREE OF UNDERSTANDING NEEDED BY FARMERS
IN REPAIRING ELECTRIC WIRING

Degree of Understanding	Opinions Expressed by			Combined Opinions
	Teachers*	Young Farmers*	Adult Farmers*	
Extensive and personal	92.5%	87.5%	72.5%	84.2%
When and how to get help	7.5	10.0	22.5	13.3
Little or none	0.0	0.0	0.0	0.0
No comment	0.0	2.5	5.0	2.5

*Number interviewed: 40 teachers, 40 young farmers, 40 adult farmers

percent of the interviewees expressed the opinion that farmers need an extensive and personal understanding in repairing electric wiring. Only 13.3 percent of those interviewed expressed the opinion that farmers need to understand only when and how to get help, and only 2.5 percent of the interviewees made no comment regarding the degree of understanding needed by farmers in repairing electric wiring.

Estimating electric power demand. A high proportion of each group of respondents agreed that farmers need an extensive and personal under-

standing in estimating electric power demand. Table LIII shows that 78.3 percent of the interviewees expressed the opinion that farmers need

TABLE LIII
DEGREE OF UNDERSTANDING NEEDED BY FARMERS
IN ESTIMATING ELECTRIC POWER DEMAND

Degree of Understanding	Opinions Expressed by			Combined Opinions
	Teachers*	Young Farmers*	Adult Farmers*	
Extensive and personal	70.0%	75.0%	90.0%	78.3%
When and how to get help	22.5	22.5	5.0	16.7
Little or none	0.0	0.0	0.0	0.0
No comment	7.5	2.5	5.0	5.0

*Number interviewed: 40 teachers, 40 young farmers, 40 adult farmers

an extensive and personal understanding in estimating electric power demand. Only 16.7 percent of those interviewed expressed the opinion that farmers need to understand only when and how to get help, and only 5.0 percent of the interviewees made no comment regarding the degree of understanding needed by farmers in estimating electric power demand.

Estimating electric power cost. Table LIV shows that 60.8 percent of the interviewees expressed the opinion that farmers need an extensive

TABLE LIV
DEGREE OF UNDERSTANDING NEEDED BY FARMERS
IN ESTIMATING ELECTRIC POWER COST

Degree of Understanding	Opinions Expressed by			Combined Opinions
	Teachers*	Young Farmers*	Adult Farmers*	
Extensive and personal	52.5%	67.5%	62.5%	60.8%
When and how to get help	42.5	30.0	35.0	35.8
Little or none	0.0	0.0	0.0	0.0
No comment	5.0	2.5	2.5	3.3

*Number interviewed: 40 teachers, 40 young farmers, 40 adult farmers

and personal understanding in estimating the cost of electric power. Only 35.8 percent of those interviewed expressed the opinion that farmers need to understand only when and how to get help, and only 3.3 percent of the interviewees made no comment regarding the degree of understanding needed by farmers in estimating the cost of electric power.

Selecting electric motors. Table LV shows that 39.2 percent of the

TABLE LV

DEGREE OF UNDERSTANDING NEEDED BY FARMERS
IN SELECTING ELECTRIC MOTORS

Degree of Understanding	Opinions Expressed by			Combined Opinions
	Teachers*	Young Farmers*	Adult Farmers*	
Extensive and personal	30.0%	40.0%	47.5%	39.2%
When and how to get help	70.0	57.5	50.0	59.2
Little or none	0.0	0.0	0.0	0.0
No comment	0.0	2.5	2.5	1.6

*Number interviewed: 40 teachers, 40 young farmers, 40 adult farmers

interviewees expressed the opinion that farmers need an extensive and personal understanding of the characteristics to be considered in selecting electric motors. There were 59.2 percent of those interviewed who expressed the opinion that farmers need to understand only when and how to get help in selecting electric motors. Only 1.6 percent of the interviewees made no comment regarding the degree of understanding needed by farmers in selecting electric motors.

Servicing electric motors. Table LVI shows that 97.5 percent of the respondents expressed the opinion that farmers need an extensive and personal understanding in the servicing of electric motors. Only 1.7 percent of the interviewees expressed the opinion that farmers need to

understand only when and how to get help, and only 0.8 percent of the interviewees made no comment regarding the degree of understanding needed by farmers in servicing electric motors.

TABLE LVI
DEGREE OF UNDERSTANDING NEEDED BY FARMERS
IN SERVICING ELECTRIC MOTORS

Degree of Understanding	Opinions Expressed by			Combined Opinions
	Teachers*	Young Farmers*	Adult Farmers*	
Extensive and personal	100.0%	95.0%	97.5%	97.5%
When and how to get help	0.0	2.5	2.5	1.7
Little or none	0.0	0.0	0.0	0.0
No comment	0.0	2.5	0.0	0.8

*Number interviewed: 40 teachers, 40 young farmers, 40 adult farmers

Planning electric switching systems. Table LVII shows that only 28.3 percent of the interviewees expressed the opinion that farmers need an extensive and personal understanding in the planning of electric switching systems while 66.7 percent of those interviewed expressed the

TABLE LVII
DEGREE OF UNDERSTANDING NEEDED BY FARMERS
IN PLANNING ELECTRIC SWITCHING SYSTEMS

Degree of Understanding	Opinions Expressed by			Combined Opinions
	Teachers*	Young Farmers*	Adult Farmers*	
Extensive and personal	37.5%	35.0%	12.5%	28.3%
When and how to get help	55.0	62.5	82.5	66.7
Little or none	0.0	0.0	0.0	0.0
No comment	7.5	2.5	5.0	5.0

*Number interviewed: 40 teachers, 40 young farmers, 40 adult farmers

opinion that farmers need to understand only when and how to get help in doing this job. Only 5.0 percent of those interviewed made no comment regarding the degree of understanding needed by farmers in planning electric switching systems.

Selecting electric overload protectors. Table LVIII shows that

TABLE LVIII

DEGREE OF UNDERSTANDING NEEDED BY FARMERS IN
SELECTING ELECTRIC OVERLOAD PROTECTORS

Degree of Understanding	Opinions Expressed by			Combined Opinions
	Teachers*	Young Farmers*	Adult Farmers*	
Extensive and personal	30.0%	45.0%	17.5%	30.8%
When and how to get help	67.5	52.5	82.5	67.5
Little or none	0.0	0.0	0.0	0.0
No comment	2.5	2.5	0.0	1.7

*Number interviewed: 40 teachers, 40 young farmers, 40 adult farmers

only 30.8 percent of the interviewees expressed the opinion that farmers need an extensive and personal understanding in selecting electric overload protectors while 67.5 percent of those interviewed expressed the opinion that farmers need to understand only when and how to get help in selecting electric overload protectors. Only 1.7 percent of those interviewed made no comment regarding the degree of understanding needed by farmers in selecting electric overload protectors.

Servicing electric overload protectors. Table LIX shows that 61.7 percent of the interviewees expressed the opinion that farmers need an extensive and personal understanding in the servicing of electric overload protectors. Only 35.8 percent of those interviewed expressed the opinion that farmers need to understand only when and how to get help,

and only 2.5 percent of those interviewed made no comment regarding the degree of understanding needed by farmers in servicing electric overload protectors.

TABLE LIX

DEGREE OF UNDERSTANDING NEEDED BY FARMERS IN
SERVICING ELECTRIC OVERLOAD PROTECTORS

Degree of Understanding	Opinions Expressed by			Combined Opinions
	Teachers*	Young Farmers*	Adult Farmers*	
Extensive and personal	52.5%	60.0%	72.5%	61.7%
When and how to get help	45.0	37.5	25.0	35.8
Little or none	0.0	0.0	0.0	0.0
No comment	2.5	2.5	2.5	2.5

*Number interviewed: 40 teachers, 40 young farmers, 40 adult farmers

Selecting electric appliances. A high proportion of each group of respondents agreed that farmers need an extensive and personal understanding in selecting electric appliances. Table LX shows that 88.3 percent of the interviewees expressed the opinion that farmers need an

TABLE LX

DEGREE OF UNDERSTANDING NEEDED BY FARMERS
IN SELECTING ELECTRIC APPLIANCES

Degree of Understanding	Opinions Expressed by			Combined Opinions
	Teachers*	Young Farmers*	Adult Farmers*	
Extensive and personal	80.0%	97.5%	87.5%	88.3%
When and how to get help	17.5	0.0	12.5	10.0
Little or none	0.0	0.0	0.0	0.0
No comment	2.5	2.5	0.0	1.7

*Number interviewed: 40 teachers, 40 young farmers, 40 adult farmers

extensive and personal understanding of the characteristics to be considered in selecting electric appliances. Only 10.0 percent of those interviewed expressed the opinion that farmers need to understand only when and how to get help, and only 1.7 percent of the interviewees made no comment regarding the degree of understanding needed by farmers in selecting electric appliances.

Servicing and repairing electric appliances. A high proportion of each group of respondents expressed a similarity of opinion concerning the degree of understanding needed by farmers in the servicing and repairing of electric appliances. Table LXI shows that 90.8 percent

TABLE LXI

DEGREE OF UNDERSTANDING NEEDED BY FARMERS IN SERVICING
AND REPAIRING ELECTRIC APPLIANCES

Degree of Understanding	Opinions Expressed by			Combined Opinions
	Teachers*	Young Farmers*	Adult Farmers*	
Extensive and personal	87.5%	92.5%	92.5%	90.8%
When and how to get help	10.0	7.5	2.5	6.7
Little or none	0.0	0.0	0.0	0.0
No comment	2.5	0.0	5.0	2.5

*Number interviewed: 40 teachers, 40 young farmers, 40 adult farmers

of the interviewees expressed the opinion that farmers need an extensive and personal understanding in servicing and repairing electric appliances. Only 6.7 percent of those interviewed expressed the opinion that farmers need to understand only when and how to get help, and only 2.5 percent of the interviewees made no comment regarding the degree of understanding needed by farmers in the servicing and repairing of electric appliances.

Selecting electric lighting equipment. Table LXII shows that 74.2 percent of the interviewees expressed the opinion that farmers need an

TABLE LXII

DEGREE OF UNDERSTANDING NEEDED BY FARMERS IN
SELECTING ELECTRIC LIGHTING EQUIPMENT

Degree of Understanding	Opinions Expressed by			Combined Opinions
	Teachers*	Young Farmers*	Adult Farmers*	
Extensive and personal	52.5%	92.5%	77.5%	74.2%
When and how to get help	42.5	5.0	22.5	23.3
Little or none	0.0	0.0	0.0	0.0
No comment	5.0	2.5	0.0	2.5

*Number interviewed: 40 teachers, 40 young farmers, 40 adult farmers

extensive and personal understanding in selecting electric lighting equipment. Only 23.3 percent of those interviewed expressed the opinion that farmers need to understand only when and how to get help, and only 2.5 percent made no comment regarding the degree of understanding needed by farmers in the selection of electric lighting equipment.

Servicing and repairing lighting equipment. A high proportion of each group of respondents agreed that farmers need an extensive and personal understanding in servicing and repairing lighting equipment. Table LXIII shows that 94.2 percent of the interviewees concurred in this opinion. Only 4.2 percent of those interviewed expressed the opinion that farmers need to understand only when and how to get help, and only 1.7 percent of the interviewees made no comment regarding the degree of understanding which farmers need in the servicing and repairing of lighting equipment used on farms.

TABLE LXIII

DEGREE OF UNDERSTANDING NEEDED BY FARMERS IN
SERVICING AND REPAIRING LIGHTING EQUIPMENT

Degree of Understanding	Opinions Expressed by			Combined Opinions
	Teachers*	Young Farmers*	Adult Farmers*	
Extensive and personal	90.0%	92.5%	100.0%	94.2%
When and how to get help	7.5	5.0	0.0	4.2
Little or none	0.0	0.0	0.0	0.0
No comment	2.5	2.5	0.0	1.7

*Number interviewed: 40 teachers, 40 young farmers, 40 adult farmers

Selecting electric heating equipment. The three groups of interviewees were divided in the opinions expressed by them concerning the degree of understanding needed by farmers in the selection of electric heating equipment. Table LXIV shows that of the total number interviewed

TABLE LXIV

DEGREE OF UNDERSTANDING NEEDED BY FARMERS IN
SELECTING ELECTRIC HEATING EQUIPMENT

Degree of Understanding	Opinions Expressed by			Combined Opinions
	Teachers*	Young Farmers*	Adult Farmers*	
Extensive and personal	30.0%	42.5%	47.5%	40.0%
When and how to get help	57.5	55.0	45.0	52.5
Little or none	0.0	0.0	0.0	0.0
No comment	12.5	2.5	7.5	7.5

*Number interviewed: 40 teachers, 40 young farmers, 40 adult farmers

a relatively small majority, 52.5 percent, expressed the opinion that farmers need to understand only when and how to get help in selecting electric heating equipment. Forty percent of the interviewees expressed the opinion that farmers need an extensive and personal understanding in

the selection of electric heating equipment, and 7.5 percent of those interviewed made no comment regarding the degree of understanding needed by farmers in selecting electric heating equipment.

Servicing and repairing electric heating equipment. A high proportion of each group of respondents agreed that farmers need an extensive and personal understanding in the servicing and repairing of electric heating equipment. Table LXV shows that 82.5 percent of the

TABLE LXV

DEGREE OF UNDERSTANDING NEEDED BY FARMERS IN SERVICING
AND REPAIRING ELECTRIC HEATING EQUIPMENT

Degree of Understanding	Opinions Expressed by			Combined Opinions
	Teachers*	Young Farmers*	Adult Farmers*	
Extensive and personal	77.5%	85.0%	85.0%	82.5%
When and how to get help	15.0	12.5	7.5	11.7
Little or none	0.0	0.0	0.0	0.0
No comment	7.5	2.5	7.5	5.8

*Number interviewed: 40 teachers, 40 young farmers, 40 adult farmers

interviewees expressed the opinion that farmers need an extensive and personal understanding in the servicing and repairing of electric heating equipment. Only 11.7 percent of those interviewed expressed the opinion that farmers need to understand only when and how to get help, and only 5.8 percent made no comment regarding the degree of understanding needed by farmers in the servicing and repairing of electric heating equipment.

Summary of opinions expressed concerning the degree of understanding needed by farmers in seventeen farm electrification competencies. A majority of the respondents agreed that farmers need an extensive and

personal understanding in estimating the cost of electric wiring, in installing electric wiring, in repairing electric wiring, in estimating electric power demand, in estimating electric power cost, in servicing electric motors, in servicing electric overload protectors, in selecting electric appliances, in servicing and repairing electric appliances, in selecting electric lighting equipment, in servicing and repairing lighting equipment, and in servicing and repairing electric heating equipment.

A majority of the respondents agreed that farmers need to understand only when and how to get help in planning electric wiring systems, in selecting electric motors, in planning electric switching systems, in selecting electric overload protectors, and in selecting electric heating equipment.

Soil and Water Management Competencies

Proper management of soil and water resources is necessary to derive the maximum net return from a farming business. To manage the soil and water resources on a farm requires a knowledge of certain competencies. Some of these soil and water management competencies are mechanical in nature and are widely recognized as constituting one of the five major areas in farm mechanics.

The selected young farmers and the selected adult farmers who were interviewed expressed interest in soil and water management. All of these selected interviewees reported that the conservation and efficient utilization of soil and water resources constitutes one of the most important problems which must receive constant attention from the modern farmer.

The selected vocational agriculture teachers who were interviewed

expressed the general opinion that proper soil and water management is an important part of modern farming. Each of these teachers reported that farmers had requested information that would be useful in solving problems relating to soil and water management.

Tables LXVI through XCIV are arranged to show the opinions expressed by the selected interviewees concerning the degree of understanding needed by farmers in certain mechanical competencies relating to soil and water management.

Estimating irrigation costs. Table LXVI shows that only 8.3 percent

TABLE LXVI
DEGREE OF UNDERSTANDING NEEDED BY FARMERS
IN ESTIMATING IRRIGATION COSTS

Degree of Understanding	Opinions Expressed by			Combined Opinions
	Teachers*	Young Farmers*	Adult Farmers*	
Extensive and personal	2.5%	12.5%	10.0%	8.3%
When and how to get help	82.5	65.0	70.0	72.5
Little or none	0.0	0.0	0.0	0.0
No comment	15.0	22.5	20.0	19.2

*Number interviewed: 40 teachers, 40 young farmers, 40 adult farmers

of the interviewees expressed the opinion that farmers need an extensive and personal understanding in estimating irrigation costs while 72.5 percent expressed the opinion that farmers need to understand only when and how to get help in estimating irrigation costs. Of those interviewed 19.2 percent made no comment regarding the degree of understanding needed by farmers. Several of the interviewees in this latter group indicated that they did not wish to comment upon the degree of understanding needed by farmers in estimating irrigation costs because they were not familiar

with the problems involved in irrigation.

Estimating water application needs. Table LXVII shows that only

TABLE LXVII

DEGREE OF UNDERSTANDING NEEDED BY FARMERS
IN ESTIMATING WATER APPLICATION NEEDS

Degree of Understanding	Opinions Expressed by			Combined Opinions
	Teachers*	Young Farmers*	Adult Farmers*	
Extensive and personal	25.0%	17.5%	10.0%	17.5%
When and how to get help	60.0	60.0	70.0	63.4
Little or none	2.5	0.0	0.0	0.8
No comment	12.5	22.5	20.0	18.3

*Number interviewed: 40 teachers, 40 young farmers, 40 adult farmers

17.5 percent of the interviewees expressed the opinion that farmers need an extensive and personal understanding in the estimation of water application needs while 63.4 percent of those interviewed expressed the opinion that farmers need to understand only when and how to get help in estimating water application needs. Several of the interviewees included in the 18.3 percent who made no comment regarding the degree of understanding needed by farmers were observed to reside in communities where there was no evidence of irrigation farming.

Planning an irrigation well. Table LXVIII shows that only 8.3 percent of the interviewees expressed the opinion that farmers need an extensive and personal understanding in the planning of an irrigation well while 73.4 percent of those interviewed expressed the opinion that farmers need to understand only when and how to get help. Several of the interviewees included in the 18.3 percent who made no comment regarding the degree of understanding needed by farmers in planning an irriga-

tion well were observed to reside in communities where there was no evidence of irrigation farming.

TABLE LXVIII

DEGREE OF UNDERSTANDING NEEDED BY FARMERS
IN PLANNING AN IRRIGATION WELL

Degree of Understanding	Opinions Expressed by			Combined Opinions
	Teachers*	Young Farmers*	Adult Farmers*	
Extensive and personal	5.0%	12.5%	7.5%	8.3%
When and how to get help	82.5	65.0	72.5	73.4
Little or none	0.0	0.0	0.0	0.0
No comment	12.5	22.5	20.0	18.3

*Number interviewed: 40 teachers, 40 young farmers, 40 adult farmers

Selecting irrigation pump and power unit. Table LXIX shows that only 21.6 percent of the interviewees expressed the opinion that farmers

TABLE LXIX

DEGREE OF UNDERSTANDING NEEDED BY FARMERS IN SELECTING
AN IRRIGATION PUMP AND POWER UNIT

Degree of Understanding	Opinions Expressed by			Combined Opinions
	Teachers*	Young Farmers*	Adult Farmers*	
Extensive and personal	37.5%	17.5%	10.0%	21.6%
When and how to get help	50.0	60.0	67.5	59.2
Little or none	0.0	0.0	0.0	0.0
No comment	12.5	22.5	22.5	19.2

*Number interviewed: 40 teachers, 40 young farmers, 40 adult farmers

need an extensive and personal understanding of the characteristics to be considered in selecting an irrigation pump and power unit while 59.2 percent of those interviewed expressed the opinion that farmers need to understand only when and how to get help. Several of the interviewees

included in the 19.2 percent who made no comment regarding the degree of understanding needed by farmers in selecting an irrigation pump and power unit were observed to reside in communities where there was no evidence of irrigation water being obtained from wells.

Servicing irrigation pump and power unit. Table LXX shows that

TABLE LXX

DEGREE OF UNDERSTANDING NEEDED BY FARMERS IN SERVICING
AN IRRIGATION PUMP AND POWER UNIT

Degree of Understanding	Opinions Expressed by			Combined Opinions
	Teachers*	Young Farmers*	Adult Farmers*	
Extensive and personal	82.5%	75.0%	72.5%	76.7%
When and how to get help	5.0	5.0	7.5	5.8
Little or none	0.0	0.0	0.0	0.0
No comment	12.5	20.0	20.0	17.5

*Number interviewed: 40 teachers, 40 young farmers, 40 adult farmers

76.7 percent of the interviewees expressed the opinion that farmers need an extensive and personal understanding in the servicing of an irrigation pump and power unit. Only 5.8 percent of those interviewed expressed the opinion that farmers need to understand only when and how to get help. Several of the interviewees included in the 17.5 percent who made no comment regarding the degree of understanding needed by farmers in the servicing of an irrigation pump and power unit were observed to reside in communities where there was no evidence of irrigation being practiced.

Smoothing or grading land. Table LXXI shows that 71.7 percent of the interviewees expressed the opinion that farmers need an extensive and personal understanding in smoothing or grading land. Only 10.8 Percent of those interviewed expressed the opinion that farmers need to under-

stand only when and how to get help in smoothing or grading land. There were 17.5 percent of the interviewees who made no comment regarding the degree of understanding needed by farmers in smoothing or grading land.

TABLE LXXI
DEGREE OF UNDERSTANDING NEEDED BY FARMERS
IN SMOOTHING OR GRADING LAND

Degree of Understanding	Opinions Expressed by			Combined Opinions
	Teachers*	Young Farmers*	Adult Farmers*	
Extensive and personal	80.0%	65.0%	70.0%	71.7%
When and how to get help	5.0	15.0	12.5	10.8
Little or none	0.0	0.0	0.0	0.0
No comment	15.0	20.0	17.5	17.5

*Number interviewed: 40 teachers, 40 young farmers, 40 adult farmers

Planning irrigation ditch systems. Table LXXII shows that only 8.3 percent of the interviewees expressed the opinion that farmers need an

TABLE LXXII
DEGREE OF UNDERSTANDING NEEDED BY FARMERS
IN PLANNING IRRIGATION DITCH SYSTEMS

Degree of Understanding	Opinions Expressed by			Combined Opinions
	Teachers*	Young Farmers*	Adult Farmers*	
Extensive and personal	5.0%	12.5%	7.5%	8.3%
When and how to get help	80.0	62.5	62.5	68.3
Little or none	0.0	0.0	0.0	0.0
No comment	15.0	25.0	30.0	23.4

*Number interviewed: 40 teachers, 40 young farmers, 40 adult farmers

extensive and personal understanding in planning irrigation ditch systems while 68.3 percent of those interviewed expressed the opinion that farmers need to understand only when and how to get help. Several of

the interviewees included in the 23.4 percent who made no comment regarding the degree of understanding needed by farmers in planning irrigation ditch systems were observed to reside in communities where there was no evidence of flood irrigation being practiced.

Building and maintaining irrigation ditches. Table LXXIII shows

TABLE LXXIII

DEGREE OF UNDERSTANDING NEEDED BY FARMERS IN BUILDING
AND MAINTAINING IRRIGATION DITCHES

Degree of Understanding	Opinions Expressed by			Combined Opinions
	Teachers*	Young Farmers*	Adult Farmers*	
Extensive and personal	80.0%	67.5%	65.0%	70.8%
When and how to get help	2.5	5.0	5.0	4.2
Little or none	0.0	0.0	0.0	0.0
No comment	17.5	27.5	30.0	25.0

*Number interviewed: 40 teachers, 40 young farmers, 40 adult farmers

that 70.8 percent of the interviewees expressed the opinion that farmers need an extensive and personal understanding in the building and maintaining of irrigation ditches while only 4.2 percent of those interviewed expressed the opinion that farmers need to understand only when and how to get help. Several of the interviewees included in the 25.0 percent that made no comment regarding the degree of understanding needed by farmers were observed to reside in communities where there was no evidence of flood irrigation being practiced.

Planning water lines. Table LXXIV shows that only 4.2 percent of the interviewees expressed the opinion that farmers need an extensive and personal understanding in planning water lines while 79.2 percent of those interviewed expressed the opinion that farmers need to understand

only when and how to get help. Several of the interviewees included in the 16.6 percent who made no comment regarding the degree of understanding needed by farmers in planning water lines were observed to reside in communities where there was no evidence of water lines being used to deliver irrigation water.

TABLE LXXIV
DEGREE OF UNDERSTANDING NEEDED BY FARMERS
IN PLANNING WATER LINES

Degree of Understanding	Opinions Expressed by			Combined Opinions
	Teachers*	Young Farmers*	Adult Farmers*	
Extensive and personal	2.5%	7.5%	2.5%	4.2%
When and how to get help	85.0	72.5	80.0	79.2
Little or none	0.0	0.0	0.0	0.0
No comment	12.5	20.0	17.5	16.6

*Number interviewed: 40 teachers, 40 young farmers, 40 adult farmers

Installing water lines. Table LXXV shows that 85.8 percent of the interviewees expressed the opinion that farmers need an extensive and personal understanding in installing water lines. Only 1.7 percent of

TABLE LXXV
DEGREE OF UNDERSTANDING NEEDED BY FARMERS
IN INSTALLING WATER LINES

Degree of Understanding	Opinions Expressed by			Combined Opinions
	Teachers*	Young Farmers*	Adult Farmers*	
Extensive and personal	90.0%	82.5%	85.0%	85.8%
When and how to get help	0.0	2.5	2.5	1.7
Little or none	0.0	0.0	0.0	0.0
No comment	10.0	15.0	12.5	12.5

*Number interviewed: 40 teachers, 40 young farmers, 40 adult farmers

those interviewed expressed the opinion that farmers need to understand only when and how to get help in the installation of water lines used to deliver irrigation water. Several of the interviewees included in the 12.5 percent who made no comment regarding the degree of understanding needed by farmers in installing water lines were observed to reside in communities where there was no evidence of water lines being used in connection with irrigation farming.

Maintaining water lines. Table LXXVI shows that 90.0 percent of

TABLE LXXVI

DEGREE OF UNDERSTANDING NEEDED BY FARMERS
IN MAINTAINING WATER LINES

Degree of Understanding	Opinions Expressed by			Combined Opinions
	Teachers*	Young Farmers*	Adult Farmers*	
Extensive and personal	95.0%	85.0%	90.0%	90.0%
When and how to get help	0.0	0.0	0.0	0.0
Little or none	0.0	0.0	0.0	0.0
No comment	5.0	15.0	10.0	10.0

*Number interviewed: 40 teachers, 40 young farmers, 40 adult farmers

the interviewees expressed the opinion that farmers need an extensive and personal understanding in maintaining water lines. Several of the interviewees included in the 10.0 percent that made no comment regarding the degree of understanding needed by farmers in maintaining water lines were observed to reside in communities where there was no evidence of irrigation water lines being used.

Planning flood irrigation systems. Table LXXVII shows that only 17.5 percent of the interviewees expressed the opinion that farmers need an extensive and personal understanding in the planning of flood

irrigation systems while 58.3 percent of those interviewed expressed the opinion that farmers need to understand only when and how to get help. Several of the interviewees included in the 24.2 percent who made no comment regarding the degree of understanding needed by farmers in the planning of flood irrigation systems were observed to reside in communities where there was no evidence of flood irrigation being used in farming operations.

TABLE LXXVII

DEGREE OF UNDERSTANDING NEEDED BY FARMERS
IN PLANNING FLOOD IRRIGATION SYSTEMS

Degree of Understanding	Opinions Expressed by			Combined Opinions
	Teachers*	Young Farmers*	Adult Farmers*	
Extensive and personal	25.0%	20.0%	7.5%	17.5%
When and how to get help	57.5	55.0	62.5	58.3
Little or none	0.0	0.0	0.0	0.0
No comment	17.5	25.0	30.0	24.2

*Number interviewed: 40 teachers, 40 young farmers, 40 adult farmers

Building and maintaining flood irrigation systems. A large proportion of each group of respondents were in agreement concerning the degree of understanding needed by farmers in building and maintaining flood irrigation systems. Table LXXVIII shows that 80.0 percent of those interviewed expressed the opinion that farmers need an extensive and personal understanding in building and maintaining flood irrigation systems. Several of the interviewees included in the 20.0 percent who made no comment regarding the degree of understanding needed by farmers were observed to reside in communities where there was no evidence of flood irrigation being practiced.

TABLE LXXVIII

DEGREE OF UNDERSTANDING NEEDED BY FARMERS IN BUILDING
AND MAINTAINING FLOOD IRRIGATION SYSTEMS

Degree of Understanding	Opinions Expressed by			Combined Opinions
	Teachers*	Young Farmers*	Adult Farmers*	
Extensive and personal	95.0%	75.0%	70.0%	80.0%
When and how to get help	0.0	0.0	0.0	0.0
Little or none	0.0	0.0	0.0	0.0
No comment	5.0	25.0	30.0	20.0

*Number interviewed: 40 teachers, 40 young farmers, 40 adult farmers

Planning sprinkler irrigation systems. Table LXXIX shows that only 2.5 percent of the interviewees expressed the opinion that farmers need

TABLE LXXIX

DEGREE OF UNDERSTANDING NEEDED BY FARMERS IN
PLANNING SPRINKLER IRRIGATION SYSTEMS

Degree of Understanding	Opinions Expressed by			Combined Opinions
	Teachers*	Young Farmers*	Adult Farmers*	
Extensive and personal	0.0%	5.0%	2.5%	2.5%
When and how to get help	87.5	67.5	72.5	75.8
Little or none	0.0	0.0	0.0	0.0
No comment	12.5	27.5	25.0	21.7

*Number interviewed: 40 teachers, 40 young farmers, 40 adult farmers

an extensive and personal understanding in the planning of sprinkler irrigation systems while 75.8 percent of those interviewed expressed the opinion that farmers need to understand only when and how to get help in solving this problem. Several of the interviewees included in the 21.7 percent who made no comment regarding the degree of understanding needed by farmers in the planning of sprinkler irrigation systems were observed

to reside in communities where there was no evidence of sprinkler irrigation being practiced.

Servicing and repairing sprinkler equipment. Table LXXX shows that

TABLE LXXX

DEGREE OF UNDERSTANDING NEEDED BY FARMERS IN SERVICING
AND REPAIRING SPRINKLER EQUIPMENT

Degree of Understanding	Opinions Expressed by			Combined Opinions
	Teachers*	Young Farmers*	Adult Farmers*	
Extensive and personal	77.5%	57.5%	70.0%	68.3%
When and how to get help	10.0	15.0	5.0	10.0
Little or none	0.0	0.0	0.0	0.0
No comment	12.5	27.5	25.0	21.7

*Number interviewed: 40 teachers, 40 young farmers, 40 adult farmers

68.3 percent of the interviewees expressed the opinion that farmers need an extensive and personal understanding in the servicing and repairing of sprinkler irrigation equipment. Only 10.0 percent of those interviewed expressed the opinion that farmers need to understand only when and how to get help in servicing sprinkler equipment. Several of the interviewees included in the 21.7 percent that made no comment regarding the degree of understanding needed by farmers in servicing sprinkler equipment were observed to reside in communities where there was no evidence of sprinkler irrigation being practiced.

Planning terrace systems. Table LXXXI shows that only 31.7 percent of the interviewees expressed the opinion that farmers need an extensive and personal understanding in the planning of terrace systems while 68.3 percent of those interviewed expressed the opinion that farmers need to understand only when and how to get help in planning terrace systems.

TABLE LXXXI

DEGREE OF UNDERSTANDING NEEDED BY FARMERS
IN PLANNING TERRACE SYSTEMS

Degree of Understanding	Opinions Expressed by			Combined Opinions
	Teachers*	Young Farmers*	Adult Farmers*	
Extensive and personal	22.5%	35.0%	37.5%	31.7%
When and how to get help	77.5	65.0	62.5	68.3
Little or none	0.0	0.0	0.0	0.0
No comment	0.0	0.0	0.0	0.0

*Number interviewed: 40 teachers, 40 young farmers, 40 adult farmers

Estimating cost of terracing. Table LXXXII shows that 42.5 percent of the interviewees expressed the opinion that farmers need an extensive

TABLE LXXXII

DEGREE OF UNDERSTANDING NEEDED BY FARMERS
IN ESTIMATING COST OF TERRACING

Degree of Understanding	Opinions Expressed by			Combined Opinions
	Teachers*	Young Farmers*	Adult Farmers*	
Extensive and personal	45.0%	35.0%	47.5%	42.5%
When and how to get help	55.0	65.0	52.8	57.5
Little or none	0.0	0.0	0.0	0.0
No comment	0.0	0.0	0.0	0.0

*Number interviewed: 40 teachers, 40 young farmers, 40 adult farmers

and personal understanding in estimating the cost of terracing, and 57.5 percent of those interviewed expressed the opinion that farmers need to understand only when and how to get help in estimating the cost of terracing.

Building and maintaining terraces. A high proportion of each group of respondents expressed agreement concerning the degree of understanding

needed by farmers in building and maintaining terraces. Table LXXXIII shows that 90.0 percent of the interviewees expressed the opinion that

TABLE LXXXIII

DEGREE OF UNDERSTANDING NEEDED BY FARMERS
IN BUILDING AND MAINTAINING TERRACES

Degree of Understanding	Opinions Expressed by			Combined Opinions
	Teachers*	Young Farmers*	Adult Farmers*	
Extensive and personal	92.5%	97.5%	80.0%	90.0%
When and how to get help	7.5	2.5	20.0	10.0
Little or none	0.0	0.0	0.0	0.0
No comment	0.0	0.0	0.0	0.0

*Number interviewed: 40 teachers, 40 young farmers, 40 adult farmers

farmers need an extensive and personal understanding in building and maintaining terraces while only 10.0 percent expressed the opinion that farmers need to understand only when and how to get help in building and maintaining terraces.

Planning drainage systems. Table LXXXIV shows that only 6.7 percent of the interviewees expressed the opinion that farmers need an extensive

TABLE LXXXIV

DEGREE OF UNDERSTANDING NEEDED BY FARMERS
IN PLANNING DRAINAGE SYSTEMS

Degree of Understanding	Opinions Expressed by			Combined Opinions
	Teachers*	Young Farmers*	Adult Farmers*	
Extensive and personal	2.5%	7.5%	10.0%	6.7%
When and how to get help	95.0	87.5	90.0	90.8
Little or none	0.0	2.5	0.0	0.8
No comment	2.5	2.5	0.0	1.7

*Number interviewed: 40 teachers, 40 young farmers, 40 adult farmers

and personal understanding in the planning of drainage systems while 90.8 percent of those interviewed expressed the opinion that farmers need to understand only when and how to get help in planning drainage systems. Only 1.7 percent of those interviewed made no comment regarding the degree of understanding needed by farmers in the planning of drainage systems.

Building and maintaining drainage systems. Table LXXXV shows that

TABLE LXXXV

DEGREE OF UNDERSTANDING NEEDED BY FARMERS IN
BUILDING AND MAINTAINING DRAINAGE SYSTEMS

Degree of Understanding	Opinions Expressed by			Combined Opinions
	Teachers*	Young Farmers*	Adult Farmers*	
Extensive and personal	97.5%	87.5%	90.0%	91.7%
When and how to get help	2.5	5.0	0.0	2.5
Little or none	0.0	0.0	0.0	0.0
No comment	0.0	7.5	10.0	5.8

*Number interviewed: 40 teachers, 40 young farmers, 40 adult farmers

91.7 percent of the interviewees expressed the opinion that farmers need an extensive and personal understanding in the building and maintaining of drainage systems. Only 2.5 percent of those interviewed expressed the opinion that farmers need to understand only when and how to get help, and only 5.8 percent made no comment regarding the degree of understanding needed by farmers in building and maintaining drainage systems.

Estimating farm pond storage needs. Table LXXXVI shows that only 9.2 percent of the respondents expressed the opinion that farmers need an extensive and personal understanding in estimating farm pond storage

needs while 90.8 percent of those interviewed expressed the opinion that farmers need to understand only when and how to get help in estimating farm pond storage needs.

TABLE LXXXVI

DEGREE OF UNDERSTANDING NEEDED BY FARMERS
IN ESTIMATING FARM POND STORAGE NEEDS

Degree of Understanding	Opinions Expressed by			Combined Opinions
	Teachers*	Young Farmers*	Adult Farmers*	
Extensive and personal	5.0%	10.0%	12.5%	9.2%
When and how to get help	95.0	90.0	87.5	90.8
Little or none	0.0	0.0	0.0	0.0
No comment	0.0	0.0	0.0	0.0

*Number interviewed: 40 teachers, 40 young farmers, 40 adult farmers

Planning farm ponds. Table LXXXVII shows that only 2.5 percent of the interviewees expressed the opinion that farmers need an extensive

TABLE LXXXVII

DEGREE OF UNDERSTANDING NEEDED BY FARMERS
IN PLANNING FARM PONDS

Degree of Understanding	Opinions Expressed by			Combined Opinions
	Teachers*	Young Farmers*	Adult Farmers*	
Extensive and personal	0.0%	5.0%	2.5%	2.5%
When and how to get help	100.0	95.0	97.5	97.5
Little or none	0.0	0.0	0.0	0.0
No comment	0.0	0.0	0.0	0.0

*Number interviewed: 40 teachers, 40 young farmers, 40 adult farmers

and personal understanding in planning farm ponds while 97.5 percent of those interviewed expressed the opinion that farmers need to understand only when and how to get help in planning farm ponds.

Building pond dams. Table LXXXVIII shows that only 1.7 percent of the interviewees expressed the opinion that farmers need an extensive

TABLE LXXXVIII

DEGREE OF UNDERSTANDING NEEDED BY FARMERS
IN BUILDING POND DAMS

Degree of Understanding	Opinions Expressed by			Combined Opinions
	Teachers*	Young Farmers*	Adult Farmers*	
Extensive and personal	0.0%	2.5%	2.5%	1.7%
When and how to get help	100.0	97.5	97.5	98.3
Little or none	0.0	0.0	0.0	0.0
No comment	0.0	0.0	0.0	0.0

*Number interviewed: 40 teachers, 40 young farmers, 40 adult farmers

and personal understanding in building pond dams while 98.3 percent of those interviewed expressed the opinion that farmers need to understand only when and how to get help in building pond dams.

Maintaining pond dams and spillways. Table LXXXIX shows that all of the respondents agreed that farmers need an extensive and personal understanding in maintaining pond dams and spillways.

TABLE LXXXIX

DEGREE OF UNDERSTANDING NEEDED BY FARMERS
IN MAINTAINING POND DAMS AND SPILLWAYS

Degree of Understanding	Opinions Expressed by			Combined Opinions
	Teachers*	Young Farmers*	Adult Farmers*	
Extensive and personal	100.0%	100.0%	100.0%	100.0%
When and how to get help	0.0	0.0	0.0	0.0
Little or none	0.0	0.0	0.0	0.0
No comment	0.0	0.0	0.0	0.0

*Number interviewed: 40 teachers, 40 young farmers, 40 adult farmers

Making contour maps. Table XC shows that only 2.5 percent of those interviewed expressed the opinion that farmers need an extensive and

TABLE XC
DEGREE OF UNDERSTANDING NEEDED BY FARMERS
IN MAKING CONTOUR MAPS

Degree of Understanding	Opinions Expressed by			Combined Opinions
	Teachers*	Young Farmers*	Adult Farmers*	
Extensive and personal	7.5%	0.0%	0.0%	2.5%
When and how to get help	92.5	95.0	97.5	95.0
Little or none	0.0	0.0	0.0	0.0
No comment	0.0	5.0	2.5	2.5

*Number interviewed: 40 teachers, 40 young farmers, 40 adult farmers

personal understanding in making contour maps while 95.0 percent of the interviewees expressed the opinion that farmers need to understand only when and how to get help. Only 2.5 percent of the interviewees made no comment regarding the degree of understanding needed by farmers in making contour maps.

Planning contour strip systems. Table XCI shows that 70.8 percent

TABLE XCI
DEGREE OF UNDERSTANDING NEEDED BY FARMERS
IN PLANNING CONTOUR STRIP SYSTEMS

Degree of Understanding	Opinions Expressed by			Combined Opinions
	Teachers*	Young Farmers*	Adult Farmers*	
Extensive and personal	67.5%	77.5%	67.5%	70.8%
When and how to get help	25.0	17.5	32.5	25.0
Little or none	0.0	2.5	0.0	0.8
No comment	7.5	2.5	0.0	3.4

*Number interviewed: 40 teachers, 40 young farmers, 40 adult farmers

of the interviewees expressed the opinion that farmers need an extensive and personal understanding in the planning of contour strip systems. Only 25.0 percent of those interviewed expressed the opinion that farmers need to understand only when and how to get help, and only 3.4 percent made no comment regarding the degree of understanding needed by farmers in planning contour strip systems.

Interpreting aerial photographs. Table XCII shows that 43.3 percent

TABLE XCII

DEGREE OF UNDERSTANDING NEEDED BY FARMERS
IN INTERPRETING AERIAL PHOTOGRAPHS

Degree of Understanding	Opinions Expressed by			Combined Opinions
	Teachers*	Young Farmers*	Adult Farmers*	
Extensive and personal	35.0%	45.0%	50.0%	43.3%
When and how to get help	60.0	50.0	47.5	52.5
Little or none	0.0	2.5	2.5	1.7
No comment	5.0	2.5	0.0	2.5

*Number interviewed: 40 teachers, 40 young farmers, 40 adult farmers

of the interviewees expressed the opinion that farmers need an extensive and personal understanding in interpreting aerial photographs while 52.5 percent of those interviewed expressed the opinion that farmers need to understand only when and how to get help. Only 1.7 percent of the interviewees expressed the opinion that farmers need little or no understanding, and only 2.5 percent of those interviewed made no comment regarding the degree of understanding needed by farmers in interpreting aerial photographs.

Measuring land and calculating acreage. Table XCIII shows that all respondents agreed that farmers need an extensive and personal understanding in measuring land and calculating acreage.

TABLE XCIII

DEGREE OF UNDERSTANDING NEEDED BY FARMERS IN
MEASURING LAND AND CALCULATING ACREAGE

Degree of Understanding	Opinions Expressed by			Combined Opinions
	Teachers*	Young Farmers*	Adult Farmers*	
Extensive and personal	100.0%	100.0%	100.0%	100.0%
When and how to get help	0.0	0.0	0.0	0.0
Little or none	0.0	0.0	0.0	0.0
No comment	0.0	0.0	0.0	0.0

*Number interviewed: 40 teachers, 40 young farmers, 40 adult farmers

Surveying land as per legal description. Table XCIV shows that 100.0 percent of the interviewees expressed the opinion that farmers

TABLE XCIV

DEGREE OF UNDERSTANDING NEEDED BY FARMERS IN
SURVEYING LAND AS PER LEGAL DESCRIPTION

Degree of Understanding	Opinions Expressed by			Combined Opinions
	Teachers*	Young Farmers*	Adult Farmers*	
Extensive and personal	0.0%	0.0%	0.0%	0.0%
When and how to get help	100.0	100.0	100.0	100.0
Little or none	0.0	0.0	0.0	0.0
No comment	0.0	0.0	0.0	0.0

*Number interviewed: 40 teachers, 40 young farmers, 40 adult farmers

need to understand only when and how to get help in surveying land in accordance with legal descriptions.

Summary of opinions expressed concerning the degree of understanding needed by farmers in twenty-nine soil and water management competencies. All of the respondents agreed that farmers need an extensive and personal understanding in maintaining pond dams and spillways, and in measuring

land and calculating acreage.

A majority of the respondents agreed that farmers need an extensive and personal understanding in servicing an irrigation pump and power unit, in smoothing or grading land, in building and maintaining irrigation ditches, in installing water lines, in maintaining water lines, in building and maintaining flood irrigation systems, in servicing and repairing sprinkler equipment, in building and maintaining terraces, in building and maintaining drainage systems, and in planning contour strip systems.

All of the respondents agreed that farmers need to understand only when and how to get help in surveying land as per legal descriptions.

A majority of the respondents agreed that farmers need to understand only when and how to get help in estimating irrigation costs, in estimating water application needs, in planning an irrigation well, in selecting an irrigation pump and power unit, in planning irrigation ditch systems, in planning water lines, in planning flood irrigation systems, in planning sprinkler irrigation systems, in planning terrace systems, in estimating cost of terracing, in planning drainage systems, in estimating farm pond storage needs, in planning farm ponds, in building pond dams, in making contour maps, and in interpreting aerial photographs.

Farm Shop Competencies

Some kind of farm shop was observed on the farms of all of the young farmers and on all of the farms of the adult farmers. These shops were equipped with hand tools and, with only one exception, power tools. The number of power tools reported per shop ranged from zero to nine with a mean of four. Electric welders, which were considered to be

power tools, were found in fifty-three of the eighty shops located on farms operated by the selected young farmers and selected adult farmers. Twenty-three of the young farmers and twenty-six of the adult farmers reported owning and using oxygen-acetylene equipment. Several of those who did not own welding equipment indicated that they thought a welder would be a wise investment if they only knew how to weld.

There was a farm shop located in each of the schools where the selected teachers taught vocational agriculture. All of these shops were equipped with hand tools and power tools. Each of these teachers taught farm shop as a part of vocational agriculture. Each teacher interviewed reported that farmers were interested in attending classes in welding and other farm shop work.

Tables XCV through CXV are arranged to show the opinions expressed by the selected interviewees concerning the degree of understanding needed by farmers in certain farm shop competencies.

Planning farm shop facilities. Table XCV shows that 89.2 percent of the interviewees expressed the opinion that farmers need an extensive

TABLE XCV

DEGREE OF UNDERSTANDING NEEDED BY FARMERS
IN PLANNING FARM SHOP FACILITIES

Degree of Understanding	Opinions Expressed by			Combined Opinions
	Teachers*	Young Farmers*	Adult Farmers*	
Extensive and personal	80.0%	92.5%	95.0%	89.2%
When and how to get help	20.0	7.5	5.0	10.8
Little or none	0.0	0.0	0.0	0.0
No comment	0.0	0.0	0.0	0.0

*Number interviewed: 40 teachers, 40 young farmers, 40 adult farmers

and personal understanding in the planning of farm shop facilities. Only 10.8 percent of those interviewed expressed the opinion that farmers need to understand only when and how to get help in planning farm shop facilities.

Selecting power tools. Table XCVI shows that 100.0 percent of the

TABLE XCVI
DEGREE OF UNDERSTANDING NEEDED BY FARMERS
IN SELECTING POWER TOOLS

Degree of Understanding	Opinions Expressed by			Combined Opinions
	Teachers*	Young Farmers*	Adult Farmers*	
Extensive and personal	100.0%	100.0%	100.0%	100.0%
When and how to get help	0.0	0.0	0.0	0.0
Little or none	0.0	0.0	0.0	0.0
No comment	0.0	0.0	0.0	0.0

*Number interviewed: 40 teachers, 40 young farmers, 40 adult farmers

interviewees expressed the opinion that farmers need an extensive and personal understanding in selecting power tools for the farm shop.

Using power tools. Table XCVII shows that all of the respondents

TABLE XCVII
DEGREE OF UNDERSTANDING NEEDED BY FARMERS
IN USING POWER TOOLS

Degree of Understanding	Opinions Expressed by			Combined Opinions
	Teachers*	Young Farmers*	Adult Farmers*	
Extensive and personal	100.0%	100.0%	100.0%	100.0%
When and how to get help	0.0	0.0	0.0	0.0
Little or none	0.0	0.0	0.0	0.0
No comment	0.0	0.0	0.0	0.0

*Number interviewed: 40 teachers, 40 young farmers, 40 adult farmers

agreed that farmers need an extensive and personal understanding in using power tools.

Selecting hand tools. Table XCVIII shows that 100.0 percent of the

TABLE XCVIII

DEGREE OF UNDERSTANDING NEEDED BY FARMERS
IN SELECTING HAND TOOLS

Degree of Understanding	Opinions Expressed by			Combined Opinions
	Teachers*	Young Farmers*	Adult Farmers*	
Extensive and personal	100.0%	100.0%	100.0%	100.0%
When and how to get help	0.0	0.0	0.0	0.0
Little or none	0.0	0.0	0.0	0.0
No comment	0.0	0.0	0.0	0.0

*Number interviewed: 40 teachers, 40 young farmers, 40 adult farmers

interviewees expressed the opinion that farmers need an extensive and personal understanding in selecting hand tools.

Using hand tools. Table XCIX shows that all of the respondents

TABLE XCIX

DEGREE OF UNDERSTANDING NEEDED BY FARMERS
IN USING HAND TOOLS

Degree of Understanding	Opinions Expressed by			Combined Opinions
	Teachers*	Young Farmers*	Adult Farmers*	
Extensive and personal	100.0%	100.0%	100.0%	100.0%
When and how to get help	0.0	0.0	0.0	0.0
Little or none	0.0	0.0	0.0	0.0
No comment	0.0	0.0	0.0	0.0

*Number interviewed: 40 teachers, 40 young farmers, 40 adult farmers

agreed that farmers need an extensive and personal understanding in the use of hand tools in farm shopwork.

Conditioning tools. Table C shows that 100.0 percent of the interviewees expressed the opinion that farmers need an extensive and

TABLE C
DEGREE OF UNDERSTANDING NEEDED BY FARMERS
IN CONDITIONING TOOLS

Degree of Understanding	Opinions Expressed by			Combined Opinions
	Teachers*	Young Farmers*	Adult Farmers*	
Extensive and personal	100.0%	100.0%	100.0%	100.0%
When and how to get help	0.0	0.0	0.0	0.0
Little or none	0.0	0.0	0.0	0.0
No comment	0.0	0.0	0.0	0.0

*Number interviewed: 40 teachers, 40 young farmers, 40 adult farmers

personal understanding in the conditioning of tools.

Annealing and tempering metal. Table CI shows that 82.5 percent of

TABLE CI
DEGREE OF UNDERSTANDING NEEDED BY FARMERS
IN ANNEALING AND TEMPERING METAL

Degree of Understanding	Opinions Expressed by			Combined Opinions
	Teachers*	Young Farmers*	Adult Farmers*	
Extensive and personal	90.0%	85.0%	72.5%	82.5%
When and how to get help	10.0	10.0	17.5	12.5
Little or none	0.0	0.0	0.0	0.0
No comment	0.0	5.0	10.0	5.0

*Number interviewed: 40 teachers, 40 young farmers, 40 adult farmers

the interviewees expressed the opinion that farmers need an extensive and personal understanding in annealing and tempering metal while only 12.5 percent of those interviewed expressed the opinion that farmers need to understand only when and how to get help in annealing and

tempering metal. Only 5.0 percent of those interviewed made no comment regarding the degree of understanding needed by farmers in annealing and tempering metal.

Using electric arc equipment. Table CII shows that 90.0 percent of

TABLE CII
DEGREE OF UNDERSTANDING NEEDED BY FARMERS
IN USING ELECTRIC ARC EQUIPMENT

Degree of Understanding	Opinions Expressed by			Combined Opinions
	Teachers*	Young Farmers*	Adult Farmers*	
Extensive and personal	100.0%	90.0%	80.0%	90.0%
When and how to get help	0.0	7.5	15.0	7.5
Little or none	0.0	0.0	0.0	0.0
No comment	0.0	2.5	5.0	2.5

*Number interviewed: 40 teachers, 40 young farmers, 40 adult farmers

the interviewees expressed the opinion that farmers need an extensive and personal understanding in using electric arc equipment. Only 7.5 percent of those interviewed expressed the opinion that farmers need to understand only when and how to get help, and only 2.5 percent of the interviewees made no comment regarding the degree of understanding needed by farmers in using electric arc equipment.

Using oxygen-acetylene equipment. Table CIII shows that 86.7 percent of the interviewees expressed the opinion that farmers need an extensive and personal understanding in the use of oxygen-acetylene equipment. Only 6.7 percent of those interviewed expressed the opinion that farmers need to understand only when and how to get help, and only 6.6 percent of the interviewees made no comment regarding the degree of understanding needed by farmers in using oxygen-acetylene equipment.

TABLE CIII

DEGREE OF UNDERSTANDING NEEDED BY FARMERS
IN USING OXYGEN-ACETYLENE EQUIPMENT

Degree of Understanding	Opinions Expressed by			Combined Opinions
	Teachers*	Young Farmers*	Adult Farmers*	
Extensive and personal	100.0%	87.5%	72.5%	86.7%
When and how to get help	0.0	7.5	12.5	6.7
Little or none	0.0	0.0	0.0	0.0
No comment	0.0	5.0	15.0	6.6

*Number interviewed: 40 teachers, 40 young farmers, 40 adult farmers

Cutting and threading pipe. Table CIV shows that 92.5 percent of the interviewees expressed the opinion that farmers need an extensive

TABLE CIV

DEGREE OF UNDERSTANDING NEEDED BY FARMERS
IN CUTTING AND THREADING PIPE

Degree of Understanding	Opinions Expressed by			Combined Opinions
	Teachers*	Young Farmers*	Adult Farmers*	
Extensive and personal	97.5%	87.5%	92.5%	92.5%
When and how to get help	0.0	10.0	2.5	4.1
Little or none	0.0	2.5	2.5	1.7
No comment	2.5	0.0	2.5	1.7

*Number interviewed: 40 teachers, 40 young farmers, 40 adult farmers

and personal understanding in cutting and threading pipe. Only 4.1 percent of those interviewed expressed the opinion that farmers need to understand only when and how to get help, and only 1.7 percent expressed the opinion that farmers need little or no understanding in cutting and threading pipe. Only 1.7 percent of those interviewed made no comment regarding the degree of understanding needed by farmers in cutting and

threading pipe.

Cutting and threading bolts. Table CV shows that 90.0 percent of

TABLE CV
DEGREE OF UNDERSTANDING NEEDED BY FARMERS
IN CUTTING AND THREADING BOLTS

Degree of Understanding	Opinions Expressed by			Combined Opinions
	Teachers*	Young Farmers*	Adult Farmers*	
Extensive and personal	90.0%	87.5%	92.5%	90.0%
When and how to get help	7.5	10.0	2.5	6.6
Little or none	0.0	2.5	2.5	1.7
No comment	2.5	0.0	2.5	1.7

*Number interviewed: 40 teachers, 40 young farmers, 40 adult farmers

the interviewees expressed the opinion that farmers need an extensive and personal understanding in cutting and threading bolts while only 6.6 percent of those interviewed expressed the opinion that farmers need to understand only when and how to get help in cutting and threading bolts. Only 1.7 percent of the interviewees expressed the opinion that farmers need little or no understanding, and only 1.7 percent of those interviewed made no comment regarding the degree of understanding needed by farmers in cutting and threading bolts.

Using nails and screws. Nails and screws have been used for many years in the construction and repair of many things used on the farm. Table CVI shows that 100.0 percent of the interviewees expressed the opinion that farmers need to have an extensive and personal understanding in the use of nails and screws in the construction and repair of things used on the farm.

TABLE CVI
DEGREE OF UNDERSTANDING NEEDED BY FARMERS
IN USING NAILS AND SCREWS

Degree of Understanding	Opinions Expressed by			Combined Opinions
	Teachers*	Young Farmers*	Adult Farmers*	
Extensive and personal	100.0%	100.0%	100.0%	100.0%
When and how to get help	0.0	0.0	0.0	0.0
Little or none	0.0	0.0	0.0	0.0
No comment	0.0	0.0	0.0	0.0

*Number interviewed: 40 teachers, 40 young farmers, 40 adult farmers

Using bolts, keys, and pins. Table CVII shows that 100.0 percent of the interviewees expressed the opinion that farmers need an extensive

TABLE CVII
DEGREE OF UNDERSTANDING NEEDED BY FARMERS
IN USING BOLTS, KEYS, AND PINS

Degree of Understanding	Opinions Expressed by			Combined Opinions
	Teachers*	Young Farmers*	Adult Farmers*	
Extensive and personal	100.0%	100.0%	100.0%	100.0%
When and how to get help	0.0	0.0	0.0	0.0
Little or none	0.0	0.0	0.0	0.0
No comment	0.0	0.0	0.0	0.0

*Number interviewed: 40 teachers, 40 young farmers, 40 adult farmers

and personal understanding in the use of bolts, keys, and pins.

Selecting power transmission belts. Belts are used to transmit power to machinery and equipment used in many different kinds of farming operations. Table CVIII shows that all of the respondents agreed that farmers need an extensive and personal understanding in the selection of power transmission belts.

TABLE CVIII

DEGREE OF UNDERSTANDING NEEDED BY FARMERS
IN SELECTING POWER TRANSMISSION BELTS

Degree of Understanding	Opinions Expressed by			Combined Opinions
	Teachers*	Young Farmers*	Adult Farmers*	
Extensive and personal	100.0%	100.0%	100.0%	100.0%
When and how to get help	0.0	0.0	0.0	0.0
Little or none	0.0	0.0	0.0	0.0
No comment	0.0	0.0	0.0	0.0

*Number interviewed: 40 teachers, 40 young farmers, 40 adult farmers

Repairing power transmission belts. Table CIX shows that 65.8 percent of the interviewees expressed the opinion that farmers need an

TABLE CIX

DEGREE OF UNDERSTANDING NEEDED BY FARMERS
IN REPAIRING POWER TRANSMISSION BELTS

Degree of Understanding	Opinions Expressed by			Combined Opinions
	Teachers*	Young Farmers*	Adult Farmers*	
Extensive and personal	100.0%	30.0%	67.5%	65.8%
When and how to get help	0.0	42.5	22.5	21.7
Little or none	0.0	25.0	7.5	10.8
No comment	0.0	2.5	2.5	1.7

*Number interviewed: 40 teachers, 40 young farmers, 40 adult farmers

extensive and personal understanding in the repairing of power transmission belts while 21.7 percent of those interviewed expressed the opinion that farmers need to understand only when and how to get help in repairing power transmission belts. Several of the interviewees included in the 10.8 percent who expressed the opinion that farmers need little or no understanding in repairing power transmission belts remarked

that a farmer should usually obtain a new belt rather than try to repair an old belt. Only 1.7 percent of those interviewed made no comment regarding the degree of understanding needed by farmers in repairing power transmission belts.

Making rope. Table CX shows that only 5.8 percent of the inter-

TABLE CX
DEGREE OF UNDERSTANDING NEEDED BY FARMERS
IN MAKING ROPE

Degree of Understanding	Opinions Expressed by			Combined Opinions
	Teachers*	Young Farmers*	Adult Farmers*	
Extensive and personal	7.5%	5.0%	5.0%	5.8%
When and how to get help	0.0	0.0	0.0	0.0
Little or none	82.5	95.0	85.0	87.5
No comment	10.0	0.0	10.0	6.7

*Number interviewed: 40 teachers, 40 young farmers, 40 adult farmers

viewees expressed the opinion that farmers need an extensive and personal understanding in making rope while 87.5 percent of those interviewed expressed the opinion that farmers need little or no personal understanding in making rope. Only 6.7 percent of the interviewees made no comment regarding the degree of understanding needed by farmers in making rope.

Splicing rope. Table GXI shows that 93.3 percent of the interviewees expressed the opinion that farmers need an extensive and personal understanding in splicing rope. Only 4.2 percent of those interviewed expressed the opinion that farmers need little or no personal understanding of how to splice rope, and only 2.5 percent of the interviewees made no comment regarding the degree of understanding needed by farmers

in splicing rope.

TABLE CXI
DEGREE OF UNDERSTANDING NEEDED BY FARMERS
IN SPLICING ROPE

Degree of Understanding	Opinions Expressed by			Combined Opinions
	Teachers*	Young Farmers*	Adult Farmers*	
Extensive and personal	95.0%	87.5%	97.5%	93.3%
When and how to get help	0.0	0.0	0.0	0.0
Little or none	2.5	7.5	2.5	4.2
No comment	2.5	5.0	0.0	2.5

*Number interviewed: 40 teachers, 40 young farmers, 40 adult farmers

Repairing harness. Table CXII shows that only 0.8 percent of the interviewees expressed the opinion that farmers need to understand when

TABLE CXII
DEGREE OF UNDERSTANDING NEEDED BY FARMERS
IN REPAIRING HARNESS

Degree of Understanding	Opinions Expressed by			Combined Opinions
	Teachers*	Young Farmers*	Adult Farmers*	
Extensive and personal	0.0%	0.0%	0.0%	0.0%
When and how to get help	0.0	0.0	2.5	0.8
Little or none	100.0	97.5	95.0	97.5
No comment	0.0	2.5	2.5	1.7

*Number interviewed: 40 teachers, 40 young farmers, 40 adult farmers

and how to get help in repairing harness while 97.5 percent of those interviewed expressed the opinion that farmers need little or no personal understanding in repairing harness. Only 1.7 percent of the interviewees made no comment regarding the degree of understanding needed by farmers in repairing harness.

Soldering. Table CXIII shows that 99.2 percent of the interviewees expressed the opinion that farmers need an extensive and personal under-

TABLE CXIII
DEGREE OF UNDERSTANDING NEEDED BY FARMERS
IN SOLDERING

Degree of Understanding	Opinions Expressed by			Combined Opinions
	Teachers*	Young Farmers*	Adult Farmers*	
Extensive and personal	100.0%	100.0%	97.5%	99.2%
When and how to get help	0.0	0.0	0.0	0.0
Little or none	0.0	0.0	0.0	0.0
No comment	0.0	0.0	2.5	0.8

*Number interviewed: 40 teachers, 40 young farmers, 40 adult farmers

standing in soldering while only 0.8 percent of those interviewed made no comment regarding the degree of understanding needed by farmers in soldering.

Painting. Table CXIV shows that 100.0 percent of the interviewees expressed the opinion that farmers need an extensive and personal

TABLE CXIV
DEGREE OF UNDERSTANDING NEEDED BY FARMERS
IN PAINTING

Degree of Understanding	Opinions Expressed by			Combined Opinions
	Teachers*	Young Farmers*	Adult Farmers*	
Extensive and personal	100.0%	100.0%	100.0%	100.0%
When and how to get help	0.0	0.0	0.0	0.0
Little or none	0.0	0.0	0.0	0.0
No comment	0.0	0.0	0.0	0.0

*Number interviewed: 40 teachers, 40 young farmers, 40 adult farmers

understanding in painting.

Using a framing square. Table CXV shows that 100.0 percent of the

TABLE CXV
DEGREE OF UNDERSTANDING NEEDED BY FARMERS
IN USING A FRAMING SQUARE

Degree of Understanding	Opinions Expressed by			Combined Opinions
	Teachers*	Young Farmers*	Adult Farmers*	
Extensive and personal	100.0%	100.0%	100.0%	100.0%
When and how to get help	0.0	0.0	0.0	0.0
Little or none	0.0	0.0	0.0	0.0
No comment	0.0	0.0	0.0	0.0

*Number interviewed: 40 teachers, 40 young farmers, 40 adult farmers

interviewees expressed the opinion that farmers need an extensive and personal understanding in the use of a framing square.

Summary of opinions expressed concerning the degree of understanding needed by farmers in twenty-one farm shop competencies. All of the respondents agreed that farmers need an extensive and personal understanding in selecting power tools; in using power tools; in selecting hand tools; in using hand tools; in conditioning tools; in using nails and screws; in using bolts, keys, and pins; in selecting power transmission belts; in painting; and in using a framing square.

A majority of the respondents agreed that farmers need an extensive and personal understanding in planning farm shop facilities; in annealing and tempering metal; in using electric arc equipment; in cutting and threading pipe; in cutting and threading bolts; in repairing power transmission belts; in splicing rope; and in soldering.

A majority of the respondents agreed that farmers need little or no personal understanding in repairing harness and in making rope.

CHAPTER III

SUMMARY, CONCLUSIONS, AND RECOMMENDATIONS

In this chapter is presented a summary of the study and of the findings, conclusions based upon the findings, and recommendations relating to future research needed in the field of farm mechanics.

Summary

Each of the five district supervisors of vocational agriculture in Oklahoma identified eight vocational agriculture teachers who had developed better than average total programs of vocational education in agriculture and who had in operation better than average educational programs in farm mechanics. Each of these forty selected vocational agriculture teachers named one young farmer who was not more than thirty-four years old on January 1, 1955, who had developed a better than average farming program for the community in which he resided, and who obtained at least eighty percent of his family income from the sale of agricultural products grown on the farm he operated. Each selected teacher also named one adult farmer who was more than thirty-four years old on January 1, 1955, who had developed a better than average farming program for the community in which he resided, and who obtained at least eighty percent of his family income from the sale of agricultural products grown on the farm he operated.

In interviews, conducted in accordance with the prepared interview schedules shown in Appendix A, with the forty selected vocational agriculture teachers, with the forty selected young farmers, and with the forty selected adult farmers an attempt was made to secure opinions regarding the degree of understanding needed by farmers in certain mechanical competencies. A summary of the opinions expressed by these interviewees follows.

Farm power and machinery competencies. The interviewees were asked to express opinions regarding the degree of understanding needed by farmers in twenty mechanical competencies relating to farm power and machinery. All of 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 and repairing farm machinery.

A majority of the interviewees expressed the opinion that farmers need an extensive and personal understanding in the following mechanical competencies:

1. Selecting farm trucks.
2. Selecting stationary engines.
3. Servicing engine fuel systems.
4. Servicing engine ignition systems.
5. Servicing engine cooling systems.
6. Replacing and adjusting clutches.
7. Repairing and adjusting brakes.
8. Servicing transmissions.
9. Servicing final drives.

A majority of the interviewees expressed the opinion that farmers need to understand only when and how to get help in the following mechanical competencies:

1. Converting engines to use butane, propane, or natural gas.
2. Reboring an engine block.
3. Replacing engine sleeves.
4. Replacing engine pistons and rings.
5. Grinding engine valves.
6. Adjusting engine valves.
7. Adjusting crankshaft bearings.

Farm buildings and conveniences competencies. The interviewees were asked to express opinions regarding the degree of understanding needed by farmers in twenty-eight mechanical competencies relating to farm buildings and conveniences. All of the interviewees expressed the opinion that farmers need an extensive and personal understanding in the following mechanical competencies:

1. Building with concrete.
2. Building with lumber.
3. Building with metal.
4. Repairing farm buildings.
5. Planning livestock and poultry equipment.
6. Building livestock and poultry equipment.
7. Repairing livestock and poultry equipment.
8. Planning fence arrangements.
9. Repairing fences.

A majority of the interviewees expressed the opinion that farmers need an extensive and personal understanding in the following mechanical competencies:

1. Making sketches to scale.
2. Planning farm buildings.
3. Estimating building costs.
4. Building with pre-fabricated materials.
5. Building fences.
6. Planning sewage disposal systems.
7. Installing sewage disposal systems.
8. Servicing sewage disposal systems.
9. Planning farm water systems.
10. Installing farm water system plumbing.
11. Servicing and repairing farm water systems.
12. Selecting water pump, motor, and pressure tank.
13. Installing water pump, motor, and pressure tank.
14. Servicing water pump, motor, and pressure tank.
15. Filtering and treating water.
16. Servicing and repairing heating systems.

A majority of the interviewees expressed the opinion that farmers need to understand only when and how to get help in the following mechanical competencies:

1. Planning heating systems for farm buildings.
2. Installing heating equipment.

A majority of the interviewees expressed the opinion that farmers need little or no understanding in the following mechanical competency:

1. Making engineering drawings.

Farm electrification competencies. The interviewees were asked to express opinions regarding the degree of understanding needed by farmers in seventeen mechanical competencies relating to farm electrification. A majority of the interviewees expressed the opinion that farmers need an extensive and personal understanding in the following mechanical competencies:

1. Estimating cost of electric wiring.
2. Installing electric wiring.
3. Repairing electric wiring.
4. Estimating electric power demand.
5. Estimating electric power cost.
6. Servicing electric motors.
7. Servicing electric overload protectors.
8. Selecting electric appliances.
9. Servicing and repairing electric appliances.
10. Selecting electric lighting equipment.
11. Servicing and repairing lighting equipment.
12. Servicing and repairing electric heating equipment.

A majority of the interviewees expressed the opinion that farmers need to understand only when and how to get help in the following mechanical competencies:

1. Planning electric wiring systems.
2. Selecting electric motors.
3. Planning electric switching systems.
4. Selecting electric overload protectors.
5. Selecting electric heating equipment.

Soil and water management competencies. The interviewees were asked to express opinions regarding the degree of understanding needed by farmers in twenty-nine mechanical competencies relating to soil and water management. All of the interviewees expressed the opinion that farmers need an extensive and personal understanding in the following mechanical competencies:

1. Maintaining pond dams and spillways.
2. Measuring land and calculating acreage.

A majority of the interviewees expressed the opinion that farmers need an extensive and personal understanding in the following mechanical competencies:

1. Servicing irrigation pump and power unit.
2. Smoothing or grading land.
3. Building and maintaining irrigation ditches.
4. Installing water lines.
5. Maintaining water lines.
6. Building and maintaining flood irrigation systems.
7. Servicing and repairing sprinkler equipment.
8. Building and maintaining terraces.
9. Building and maintaining drainage systems.
10. Planning contour strip systems.

All of the interviewees expressed the opinion that farmers need to understand only when and how to get help in the following mechanical competency:

1. Surveying land as per legal description.

A majority of the interviewees expressed the opinion that farmers need to understand only when and how to get help in the following mechanical competencies:

1. Estimating irrigation costs.
2. Estimating water application needs.
3. Planning an irrigation well.
4. Selecting an irrigation pump and power unit.
5. Planning irrigation ditch systems.
6. Planning water lines.
7. Planning flood irrigation systems.

8. Planning sprinkler irrigation systems.
9. Planning terrace systems.
10. Estimating cost of terracing.
11. Planning drainage systems.
12. Estimating farm pond storage needs.
13. Planning farm ponds.
14. Building pond dams.
15. Making contour maps.
16. Interpreting aerial photographs.

Farm shop competencies. The interviewees were asked to express opinions regarding the degree of understanding needed by farmers in twenty-one mechanical competencies relating to farm shop work. All of the interviewees expressed the opinion that farmers need an extensive and personal understanding in the following mechanical competencies:

1. Selecting power tools.
2. Using power tools.
3. Selecting hand tools.
4. Using hand tools.
5. Conditioning tools.
6. Using nails and screws.
7. Using bolts, keys, and pins.
8. Selecting power transmission belts.
9. Painting.
10. Using a framing square.

A majority of the interviewees expressed the opinion that farmers need an extensive and personal understanding in the following mechanical competencies:

1. Planning farm shop facilities.
2. Annealing and tempering metal.
3. Using electric arc equipment.
4. Using oxygen-acetylene equipment.
5. Cutting and threading pipe.
6. Cutting and threading bolts.
7. Repairing power transmission belts.
8. Splicing rope.
9. Soldering.

A majority of the interviewees expressed the opinion that farmers need little or no personal understanding in the following competencies:

1. Repairing harness.
2. Making rope.

Conclusions

The question that has been considered in this thesis is, "What are the mechanical competencies needed by vocational agriculture teachers?" To help answer this question forty vocational agriculture teachers, forty young farmers, and forty adult farmers were asked to express opinions concerning the degree of understanding needed by farmers in one-hundred-fifteen mechanical competencies. The previous summary of the opinions expressed by these selected interviewees shows that farmers need some degree of understanding in one-hundred-twelve of these mechanical competencies. In eighty-one of these mechanical competencies a majority of the interviewees agreed that farmers need an extensive and personal understanding. A majority of the respondents agreed that farmers need to understand only when and how to get help in thirty-one of these mechanical competencies.

In the training of farmers and prospective farmers instruction should be provided that will enable them to acquire the degree of understanding which is needed in each of these mechanical competencies. Vocational agriculture teachers are responsible for providing such instruction in farm mechanics as a part of the total program of vocational education in agriculture. One may conclude, therefore, that vocational agriculture teachers must possess sufficient understanding in each of these one-hundred-twelve mechanical competencies to be able to provide training in educational programs implemented by them that will enable farmers and prospective farmers to acquire the degree of understanding needed in each of these competencies.

Those who are concerned with teacher education in vocational

agriculture should provide in the technical training courses offered for vocational agriculture teachers instruction that will enable them to acquire the degree of understanding which they should possess in each of the one-hundred-twelve mechanical competencies that have been identified as being needed by them.

Recommendations

In addition to acquiring the degree of understanding needed in the one-hundred-twelve mechanical competencies identified in this thesis as being needed by vocational agriculture teachers there may be other mechanical competencies in which vocational agriculture teachers need some degree of understanding. There is a need for additional research to ascertain the degree of understanding needed in farm mechanics competencies which may have been omitted from this thesis.

To implement effective educational programs in vocational agriculture which include adequate instruction in farm mechanics there are evidently certain facilities which should be provided for the teaching of farm mechanics. Buildings which house vocational agriculture departments should be designed to provide adequate space for the storage and use of equipment used in farm mechanics instruction. Safety features should be given special consideration in the design of such buildings. Buildings which are too small or which are improperly designed may create safety hazards while those that are too large may be too expensive. There is need for research to ascertain the optimum facilities needed for vocational education in agriculture which includes the teaching of farm mechanics.

The teaching of farm mechanics as a part of the total educational

program in vocational agriculture requires the use of certain methods in teaching which are appropriate for use in teaching mechanical skills, abilities, and understandings to high school students, young farmers, and adult farmers. Additional research dealing with teaching methods in farm mechanics is needed.

There are certain mechanical competencies which may be more appropriately taught to different age groups. Certain competencies involving the use of hand tools should be taught to the younger high school students while certain competencies involving the use of power machinery and equipment should be taught to high school juniors and seniors. If the practices taught in farm mechanics classes are to be used on the farms soon after being taught there are certain mechanical competencies relating to farm buildings and conveniences as well as to other areas in farm mechanics which should be taught to young farmers and adult farmers. Research is needed to ascertain the mechanical competencies that may be appropriately included in the instructional programs for each age group of students enrolled in vocational agriculture in high school and in classes of young farmers and in classes of adult farmers.

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. Opinions expressed by successful farmers and successful teachers concerning the degree of understanding needed by farmers in certain mechanical competencies were presented in this thesis, but no attempt was made to

ascertain the farm mechanics practices which are actually being used by successful farmers. To supplement the information presented in this thesis research is needed to ascertain the farm mechanics practices being used by successful farmers. To assist with the planning of pre-service courses and of in-service courses for vocational agriculture teachers there is a need for research to ascertain the farm mechanics competencies which are being included by successful vocational agriculture teachers in instructional programs conducted by them for high school students, young farmers, and adult farmers.

The time that is devoted to the teaching of farm mechanics varies considerably from one community to another. There has been no recent research reported in Oklahoma which deals specifically with the time that should be devoted each year to the teaching of farm mechanics to high school students, to young farmers, and to adult farmers. Research in this area is needed.

One may aver that farm mechanics instruction is a vital part of the total vocational education program in agriculture. To develop instructional programs in farm mechanics which will help prepare students to become successful farmers research is needed to ascertain (1) the degree of understanding needed by farmers in farm mechanics competencies which may have been omitted from this thesis, (2) the facilities that are necessary for developing and carrying out effective educational programs in farm mechanics, (3) the methods that should be used in teaching farm mechanics skills, abilities, and understandings, (4) the age groups to which certain farm mechanics competencies should be taught, (5) the farm mechanics practices being used by successful farmers, (6) the farm mechanics competencies being taught by successful

vocational agriculture teachers, and (7) the amount of time that should be devoted to the teaching of farm mechanics to high school students, to young farmers, and to adult farmers.

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APPENDIXES

Name of interviewee_____.

Address_____.

Age January 1, 1955_____. Years farming_____, teaching_____.

Acres owned_____, rented_____. Type farming_____.

Date interview scheduled_____, hour_____, place_____.

Date interview held_____, time required_____.

Remarks_____

CODE FOR MARKING INTERVIEW SCHEDULES

- | <u>Code</u> | <u>Degree of Understanding Needed by Farmers</u> |
|-------------|---|
| 1 | Farmers need an extensive and personal understanding in this competency. |
| 2 | Farmers need to understand only when and how to get help in this competency. |
| 3 | Farmers need little or no personal understanding in this competency. |
| 4 | No comment made regarding the degree of understanding needed by farmers in this competency. |

Name of interviewee _____

Code Farm Power and Machinery Competencies

- _____ 1. Selecting farm trucks.
- _____ 2. Selecting farm tractors.
- _____ 3. Selecting stationary engines.
- _____ 4. Lubricating engines and farm machinery.
- _____ 5. Converting engines to use butane, propane, or natural gas.
- _____ 6. Servicing engine fuel systems.
- _____ 7. Reboring an engine block.
- _____ 8. Replacing engine sleeves.
- _____ 9. Replacing engine pistons and rings.
- _____ 10. Grinding engine valves.
- _____ 11. Adjusting engine valves.
- _____ 12. Adjusting crankshaft bearings.
- _____ 13. Servicing engine ignition systems.
- _____ 14. Servicing engine cooling systems.
- _____ 15. Replacing and adjusting clutches.
- _____ 16. Repairing and adjusting brakes.
- _____ 17. Servicing transmissions.
- _____ 18. Servicing final drives.
- _____ 19. Selecting farm machinery.
- _____ 20. Servicing and repairing farm machinery.
- _____ 21. _____

Farm Buildings and Conveniences Competencies

- _____ 1. Making engineering drawings.
- _____ 2. Making sketches to scale.
- _____ 3. Planning farm buildings.
- _____ 4. Estimating building costs.
- _____ 5. Building with concrete.
- _____ 6. Building with lumber.
- _____ 7. Building with pre-fabricated materials.
- _____ 8. Building with metal.
- _____ 9. Repairing farm buildings.
- _____ 10. Planning livestock and poultry equipment.
- _____ 11. Building livestock and poultry equipment.
- _____ 12. Repairing livestock and poultry equipment.

continued on next page

Name of interviewee _____

Code Farm Buildings and Conveniences Competencies: continued

- _____ 13. Planning fence arrangements.
- _____ 14. Building fences.
- _____ 15. Repairing fences.

- _____ 16. Planning sewage disposal systems.
- _____ 17. Installing sewage disposal systems.
- _____ 18. Servicing sewage disposal systems.

- _____ 19. Planning farm water systems.
- _____ 20. Installing farm water system plumbing.
- _____ 21. Servicing and repairing farm water systems.

- _____ 22. Selecting water pump, motor, and pressure tank.
- _____ 23. Installing water pump, motor, and pressure tank.
- _____ 24. Servicing water pump, motor, and pressure tank.

- _____ 25. Filtering and treating water.
- _____ 26. Planning heating systems for farm buildings.
- _____ 27. Installing heating equipment.

- _____ 28. Servicing and repairing heating equipment.
- _____ 29. _____
- _____ 30. _____

Farm Electrification Competencies

- _____ 1. Planning electric wiring systems.
- _____ 2. Estimating cost of electric wiring.
- _____ 3. Installing electric wiring.

- _____ 4. Repairing electric wiring.
- _____ 5. Estimating electric power demand.
- _____ 6. Estimating electric power cost.

- _____ 7. Selecting electric motors.
- _____ 8. Servicing electric motors.
- _____ 9. Planning electric switching systems.

- _____ 10. Selecting electric overload protectors.
- _____ 11. Servicing electric overload protectors.
- _____ 12. Selecting electric appliances.

- _____ 13. Repairing electric appliances.
- _____ 14. Selecting electric lighting equipment.
- _____ 15. Servicing and repairing lighting equipment.

continued on next page

Name of interviewee _____

Code Farm Electrification Competencies: continued

- _____ 16. Selecting electric heating equipment.
- _____ 17. Servicing and repairing electric heating equipment.
- _____ 18. _____

Soil and Water Management Competencies

- _____ 1. Estimating irrigation costs.
- _____ 2. Estimating water application needs.
- _____ 3. Planning an irrigation well.
- _____ 4. Selecting an irrigation pump and power unit.
- _____ 5. Servicing an irrigation pump and power unit.
- _____ 6. Smoothing or grading land.
- _____ 7. Planning irrigation ditch systems.
- _____ 8. Maintaining irrigation ditches.
- _____ 9. Planning water lines.
- _____ 10. Installing water lines.
- _____ 11. Maintaining water lines.
- _____ 12. Planning flood irrigation systems.
- _____ 13. Maintaining flood irrigation systems.
- _____ 14. Planning sprinkler irrigation systems.
- _____ 15. Servicing and repairing sprinkler equipment.
- _____ 16. Planning terrace systems.
- _____ 17. Estimating cost of terracing.
- _____ 18. Building and maintaining terraces.
- _____ 19. Planning drainage systems.
- _____ 20. Building and maintaining drainage systems.
- _____ 21. Estimating farm pond storage needs.
- _____ 22. Planning farm ponds.
- _____ 23. Building pond dams.
- _____ 24. Maintaining pond dams and spillways.
- _____ 25. Making contour maps.
- _____ 26. Planning contour strip systems.
- _____ 27. Interpreting aerial photographs.
- _____ 28. Measuring land and calculating acreage.
- _____ 29. Surveying land as per legal description.
- _____ 30. _____

Name of interviewee _____

Code Farm Shop Competencies

- | | |
|-------|---|
| _____ | 1. Planning farm shop facilities. |
| _____ | 2. Selecting power tools. |
| _____ | 3. Using power tools. |
| _____ | 4. Selecting hand tools. |
| _____ | 5. Using hand tools. |
| _____ | 6. Conditioning tools. |
| _____ | 7. Annealing and tempering metal. |
| _____ | 8. Using electric arc equipment. |
| _____ | 9. Using oxygen-acetylene equipment. |
| _____ | 10. Cutting and threading pipe. |
| _____ | 11. Cutting and threading bolts. |
| _____ | 12. Using nails and screws. |
| _____ | 13. Using bolts, keys, and pins. |
| _____ | 14. Selecting power transmission belts. |
| _____ | 15. Repairing power transmission belts. |
| _____ | 16. Making rope. |
| _____ | 17. Splicing rope. |
| _____ | 18. Repairing harness. |
| _____ | 19. Soldering. |
| _____ | 20. Painting. |
| _____ | 21. Using a framing square. |
| _____ | 22. _____ |
| _____ | 23. _____ |
| _____ | 24. _____ |

Data Tabulation Form

Competencies tabulated _____
(indicate area of farm mechanics)

[illegible]

*Number must correspond to number shown on interview schedule form.

VITA

Roy Wesley Dugger

Candidate for the Degree of
Doctor of Education

Thesis: MECHANICAL COMPETENCIES NEEDED BY VOCATIONAL AGRICULTURE
TEACHERS IN OKLAHOMA

Major Field: Higher Education

Biographical:

Personal data: Born near Waxahachie, Texas, January 22, 1925, the son of William Warren and Arra Mae Dugger.

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Experiences: Served on active duty and advanced through the ranks from Apprentice Seaman to Chief Electronics Technician in the United States Naval Reserve from 1943 to 1946; served on active duty from 1950 to 1952, and advanced to Lieutenant Junior Grade in the United States Naval Reserve in 1955; taught in the Washington County Veterans Vocational School at Burton, Texas, 1947-1948; served as head teacher of vocational agriculture at Hearne, Texas, 1948-1953; Assistant Professor in the Agricultural Education Department at the Agricultural and Mechanical College of Texas, 1953-1954; graduate assistant in the Agricultural Engineering Department at the Oklahoma Agricultural and Mechanical College, 1954; graduate assistant in the Agricultural Education Department at the Oklahoma Agricultural and Mechanical College, 1954-1955; Assistant Professor in the Agricultural Education Department at the Oklahoma Agricultural and Mechanical College since September, 1955.

THESES TITLE: MECHANICAL COMPETENCIES NEEDED BY VOCATIONAL
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