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no.22
1967

Ag. Ed. Research Publication No. 22



**COMPETENCIES IN FARM MACHINERY PROGRAM PLANNING
NEEDED BY FARMERS**

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DEPARTMENT OF PUBLIC INSTRUCTION

Department of Education

and

Iowa Agriculture and Home Economics Experiment Station
Iowa State University of Science and Technology
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in cooperation with

Vocational Agriculture Section
Division of Vocational Education
State Department of Public Instruction
Des Moines, Iowa
1967

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This is an abstract of a thesis submitted' to Iowa State University of Science and Technology by Wayne Albert Kordick in partial fulfillment of the requirements for the degree of Master of Science in August of 1967.

The study is one of a series conducted by the Department of Education of Iowa State University of Science and Technology with the assistance of graduate students in agricultural education in cooperation with the Iowa Agriculture and Home Economics Experiment Station and the Vocational Agriculture Section, Division of Vocational Education, State Department of Public Instruction.

The study was conducted under the direction of Professor C. E. Bundy.

COMPETENCIES IN FARM MACHINERY PROGRAM PLANNING NEEDED BY FARMERS

by

Wayne Albert Kordick

Purpose of Study

The objectives of this study were: (1) to determine the competencies in farm machinery program planning needed by farmers, (2) to determine the competencies in farm machinery program planning possessed by the average farmer, (3) to determine the competencies in farm machinery program planning possessed by a selected group of farmers, (4) to determine what competencies in farm machinery program planning should be taught by vocational agriculture instructors, (5) to determine the relationship of selected factors (such as farming experience, educational attainment and value of machinery owned) to the degree competence was needed and possessed by farmers.

This study is one of a series of studies conducted by graduate students in agricultural education at Iowa State University of Science and Technology in cooperation with the Vocational Agriculture Section, Division of Vocational Education, State Department of Public Instruction, as a part of the Iowa Agricultural and Home Economics Experiment Station Project No. 1253.

Method of Procedure

A panel of experts composed of farmers, agricultural engineers, economists and agronomists developed a list of competencies in farm machinery program planning needed by farmers. The final list included 51 competencies in farm machinery program planning. These were included in a questionnaire which was sent to 180 select farmers and 301 random sample farmers in a nine county area of Southwest Iowa. These farmers were asked to evaluate the degree of competence they needed in farm machinery program planning and the degree they presently possessed in each competency. Rating of degree of competence was made on a five point scale (0 to 4). Other personal information was requested for use in classifying the respondents.

Usable questionnaires were received from 100 select farmers and 66 random sample farmers. One reason for a lower percentage returned was probably due to the fact that some of the questions were rather personal. Also, some of the farmers with less formal education probably thought the questionnaire was too difficult to complete.

Findings

Fifteen of the 51 competencies selected were understandings and 36 were abilities. Degree of competence needed mean scores of 3.0 or higher (much competence needed) were indicated by selected farmers and random sample farmers for the understandings of finance charges and how they can affect fixed cost of ownership; investment credit and how it can affect fixed cost of ownership; annual use and how it affects average cost of ownership; and how soil type and topography of land may affect farm machinery program planning.

Abilities needed with scores of 3.0 or higher by both selected farmers and random sample farmers were: to determine machine capacity per hour or day; to compare cost of a used machine with a new machine; to purchase a machine that can be used on more than one crop or one job; to determine skill as an operator of a machine; to determine capital limitations as related to machinery planning; to evaluate possibilities for group ownership of some seasonal equipment with neighbors or relatives; to buy a good used machine to save on interest and depreciate costs; to determine probable machine changes in the next five years; to determine whether your investment in machinery will increase your operating efficiency by making better use of land and labor than you could otherwise; to determine whether you will be able to produce as good or better products than you could without investing in additional machinery; and to be prepared for maximum effort during weather breaks in unusual years.

In the majority of cases, respondents indicated that they possessed a lower degree of competence than was needed for adequate farm machinery program planning. The difference between overall mean scores for competence needed and possessed was .3 for the select farmers and .4 for the random sample farmers. These differences are revealed in Table 1.

Comparisons among groups indicated the following differences between total overall mean scores for competence needed and possessed. (1) Select farmers had a slightly narrower difference than random sample farmers. (2) Farmers with less years of experience had nearly the same scores as those with more experience. (3) Those farmers operating a larger number of acres had wider differences than those with smaller acreages. (4) Farmers with a higher machinery investment had narrower differences than those with a lower machinery investment. (5) Partnership operations had a more consistent difference than owner, owner-renters, and renters. (6) Those farmers participating in adult classes had a wider difference than those who were nonparticipants.

In Table 2 selected farmers were classified according to educational attainment. The overall mean score for competence in understandings needed was highest (3.1) for the less than 12 year group followed rather closely by the lowest score (2.9) for the 12 year group. The highest overall mean score for competence in understandings possessed was 2.7 for the 12 year and over 12 year groups, and 2.5 for the other group. The widest difference between understandings needed and possessed was .6 for the less than 12 years group and lowest (.2) for the 12 years group.

The overall mean scores for competence in abilities needed indicated

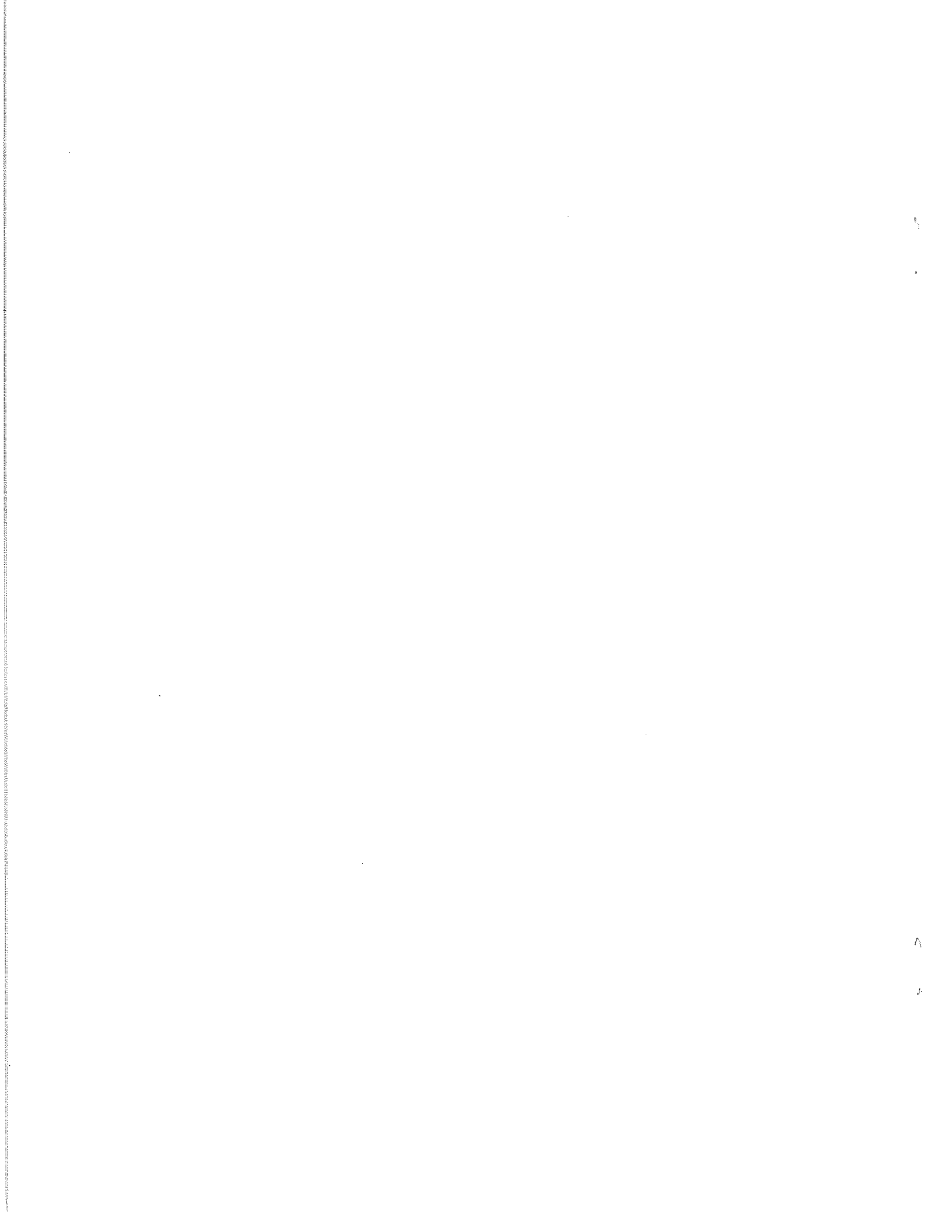


Table 1. Degree farm machinery program planning competencies were needed and possessed by select and random sample farmers

Competencies	Mean scores			
	Selected N = 100		Random N = 66	
	Needed ^a	Possessed ^b	Needed ^a	Possessed ^b
<u>Understanding of:</u>				
1. Various methods of figuring depreciation on farm machinery	3.0	2.4	2.7	2.3
2. Taxes and how they affect fixed cost of ownership	2.9	2.5	2.8	2.4
3. Insurance and how it can affect fixed cost of ownership	2.5	2.3	2.6	2.3
4. Obsolescence and how it can affect fixed cost of ownership	2.8	2.4	2.7	2.3
5. Finance charges and how they can affect fixed cost of ownership	3.2	2.8	3.2	2.6
6. Investment credit and how it can affect fixed cost of ownership	3.2	2.7	3.2	2.5
7. Annual use and how it affects average cost of operation	3.1	2.9	3.0	2.6
8. Oil, fuel, lubrication, and repairs used and how they affect variable cost of operation	2.9	2.9	2.8	2.7
9. How the purchase of one machine might require the purchase of another	2.9	2.9	2.8	2.7
10. Various tillage methods and their effect on machinery purchased	2.9	2.5	2.8	2.5
11. How the Nebraska Tractor Testing Service rates tractors	3.1	2.6	2.9	2.3
12. How government programs affect farm machinery program planning	2.8	2.6	2.7	2.2
13. Weather patterns and how they affect farm machinery program planning	2.9	2.9	2.9	2.7
14. Advantages and disadvantages of custom hiring farm equipment	3.1	2.8	2.9	2.5
15. How soil type and topography of land may affect farm machinery program planning	3.2	2.8	3.0	2.5
Overall mean score for understandings	3.0	2.6	2.9	2.5

^a 4 = very much competence needed, 3 = much competence needed, 2 = some competence needed, 1 = little competence needed, 0 = no competence needed.

^b 4 = possess very much competence, 3 = much competence possessed, 2 = some competence possessed, 1 = little competence possessed, 0 = no competence possessed.

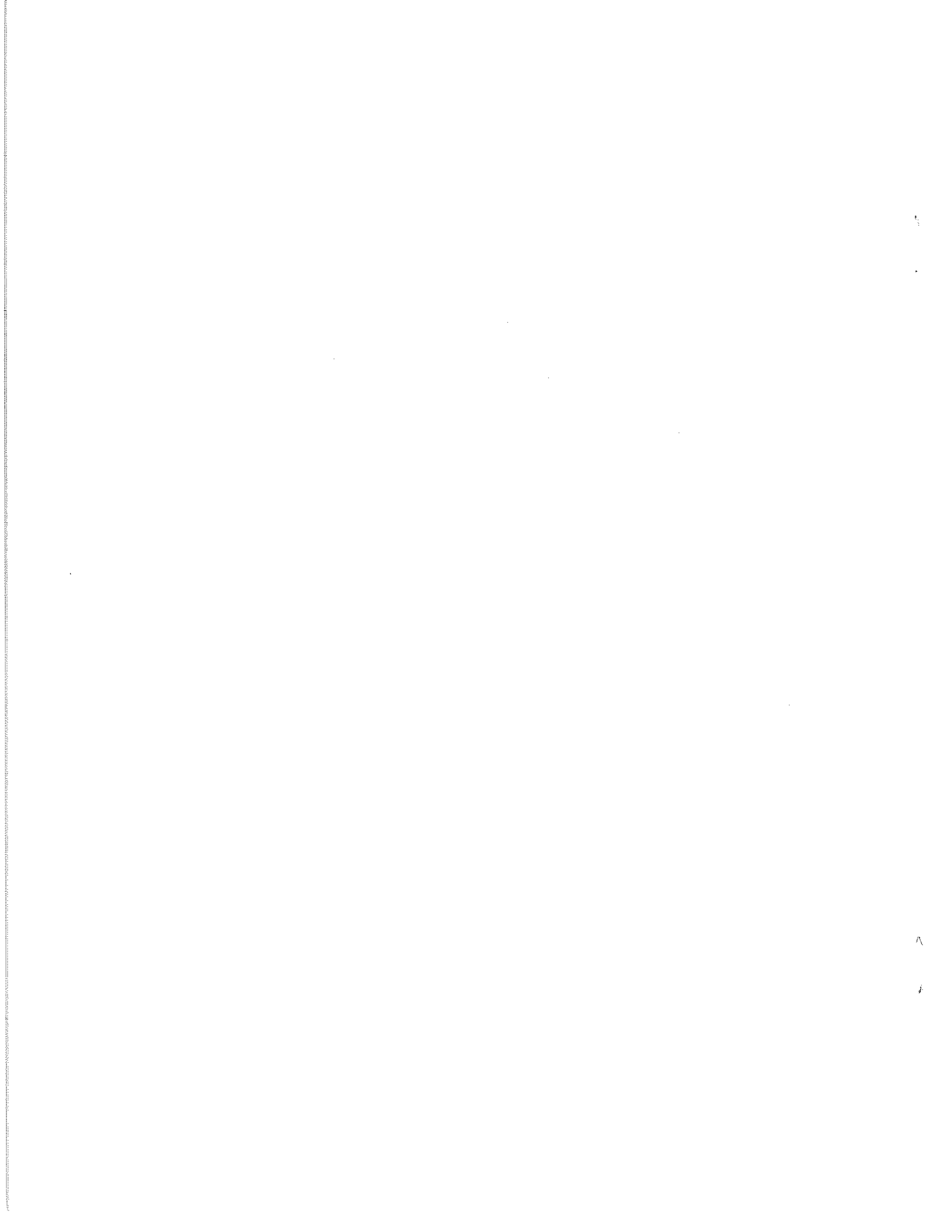


Table 1. continued.

Competencies	Mean scores			
	Selected N = 100		Random N = 66	
	Needed ^a	Possessed ^b	Needed ^a	Possessed ^b
<u>Ability to:</u>				
16. Select a machine that is easy to operate	2.6	2.1	2.5	2.0
17. Select a machine that is easy to adjust	3.0	2.8	2.8	2.5
18. Select a machine that is adjustable to work and conditions	3.1	2.9	2.9	2.7
19. Select a machine that takes a minimum of time and labor to change units	3.1	3.0	2.9	2.7
20. Select a machine that has maneuverability	3.1	2.8	2.9	2.3
21. Select power equipment that gives a comfortable ride	2.4	2.3	2.4	2.1
22. Select a machine that has the latest and best safety features	2.6	2.5	2.6	2.4
23. Compare returns received with money invested in machinery with equal amount invested in land or crops or livestock	2.5	2.2	2.5	2.3
24. Make an annual plan to determine optimum time when machine will need to be replaced	3.0	2.8	2.9	2.7
25. Determine whether additional machinery will increase net profit	2.9	2.7	2.8	2.7
26. Determine which part of crop production or processing should be mechanized	2.7	3.0	2.8	2.7
27. Figure machinery cost per acre	2.9	3.0	2.9	2.8
28. Determine machine capacity per hour or day	3.0	2.9	3.0	2.7
29. Match the implement to the power unit	2.9	2.8	2.9	2.6
30. Evaluate the relative merit of custom operation to performing the operation with your own equipment	2.7	2.8	2.9	2.6
31. Profitably substitute machinery for labor	2.8	2.5	2.6	2.3
32. Estimate probable breakdown time	3.1	2.8	2.9	2.4
33. Select necessary attachments for a machine when purchased	3.0	2.9	2.9	2.6
34. Compare cost of a used machine with a new machine	3.2	2.7	3.1	2.5
35. Purchase a machine that can be used on more than one crop or one job	3.1	3.0	3.0	2.8
36. Plan for peak demand on labor and machine	2.9	2.7	2.8	2.5

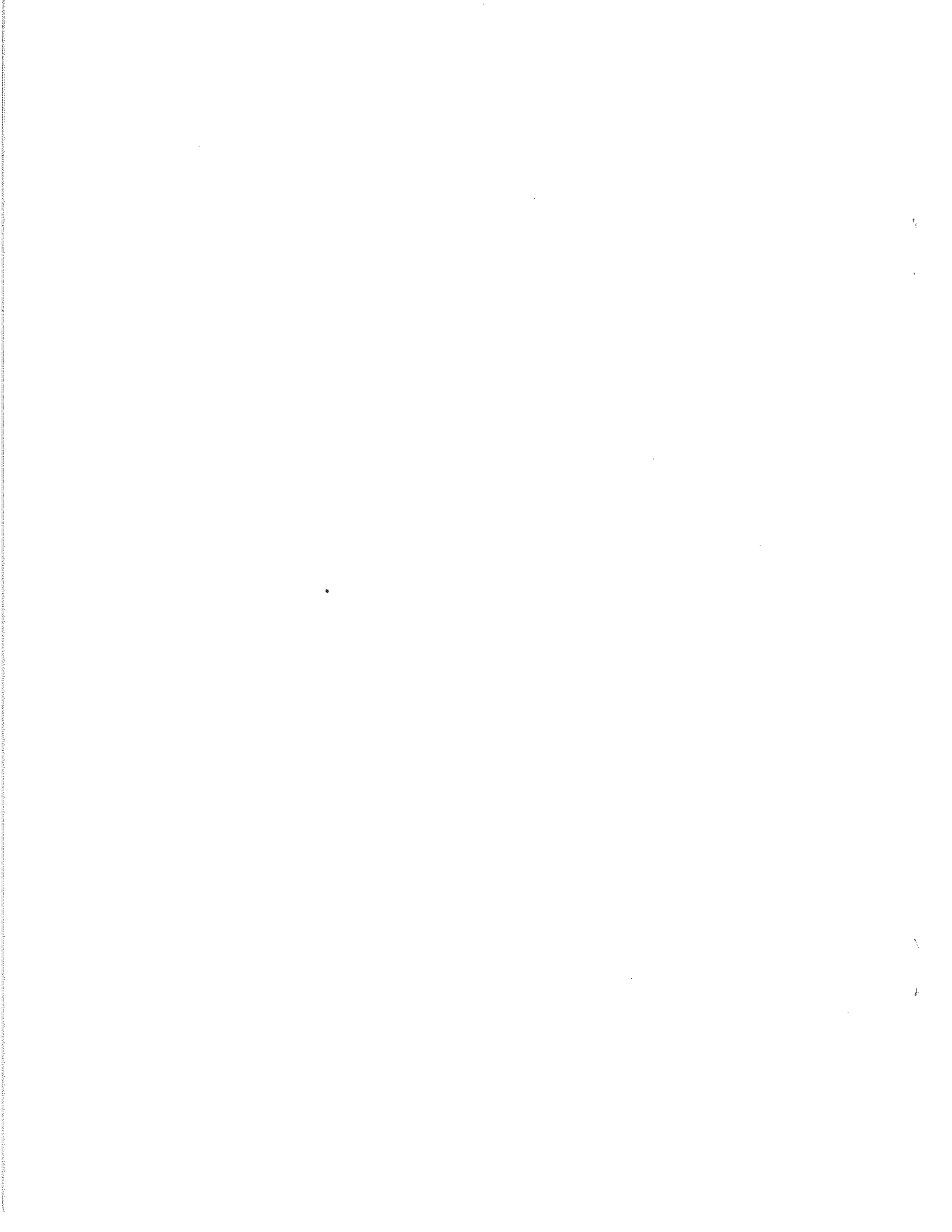


Table 1 continued.

Competencies	Mean scores			
	Selected N = 100		Random N = 66	
	Needed ^a	Possessed ^b	Needed ^a	Possessed ^b
<u>Ability to:</u>				
37. Compare various fuels in cost of operation	2.9	2.3	2.6	2.3
38. Compare various methods of harvest	3.2	2.7	3.0	2.3
39. Determine your skill as an operator of a machine	3.0	2.7	3.0	2.6
40. Determine capital limitations as related to machinery planning	3.3	2.3	3.1	2.2
41. Determine the service you can expect from the dealer, including his stock of replacement parts in case of breakdown	2.6	2.8	2.5	2.5
42. Determine the value of machinery storage in terms of reduced maintenance, increased machinery life, ease of adjustment of bolts, nuts, etc.	2.9	2.7	2.9	2.5
43. Evaluate possibilities for group ownership of some seasonal equipment with neighbors or relatives	3.4	2.6	3.2	2.5
44. Know when to lease or rent equipment which is needed but is unprofitable to own	2.9	2.3	2.7	2.2
45. Buy a good used machine to save on interest and depreciation costs	3.3	2.7	3.1	2.5
46. Determine probable machine changes in the next five years	3.0	2.6	3.0	2.5
47. Determine the availability of additional land to rent if machinery is purchased	2.9	2.7	3.0	2.5
48. Determine whether you will be able to produce as good or better products than you could without investing in additional machinery	3.2	2.7	3.1	2.6
49. Determine whether your investment in machinery will increase your operating efficiency by making better use of land and labor than you could otherwise	3.3	2.8	3.1	2.6
50. Determine the optimum time needed to plant a crop	3.2	3.0	2.9	2.7
51. Be prepared for maximum effort during weather breaks in unusual years	3.2	3.0	3.0	2.8
Overall mean score for abilities	3.0	2.7	2.9	2.5
Total overall mean score	3.0	2.7	2.9	2.5

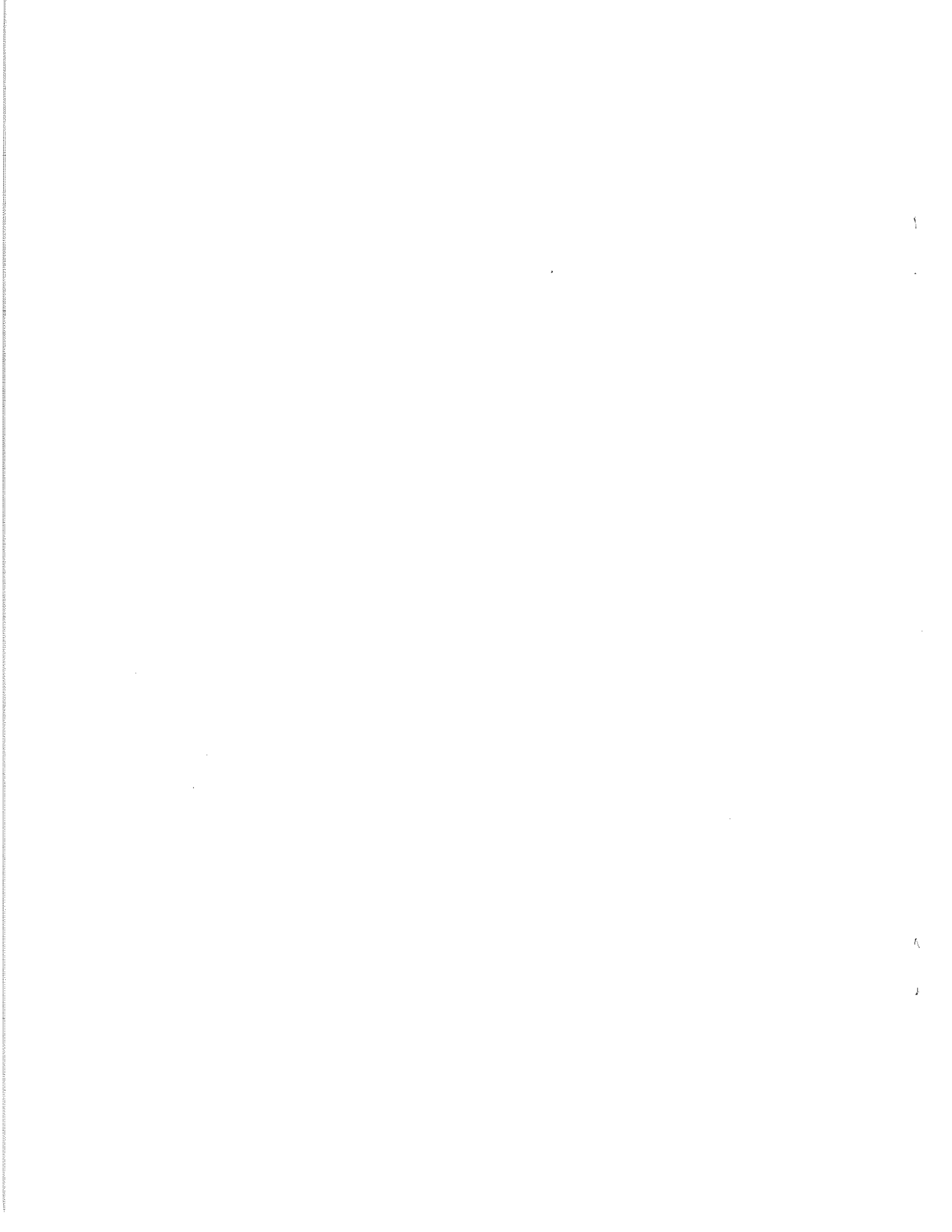
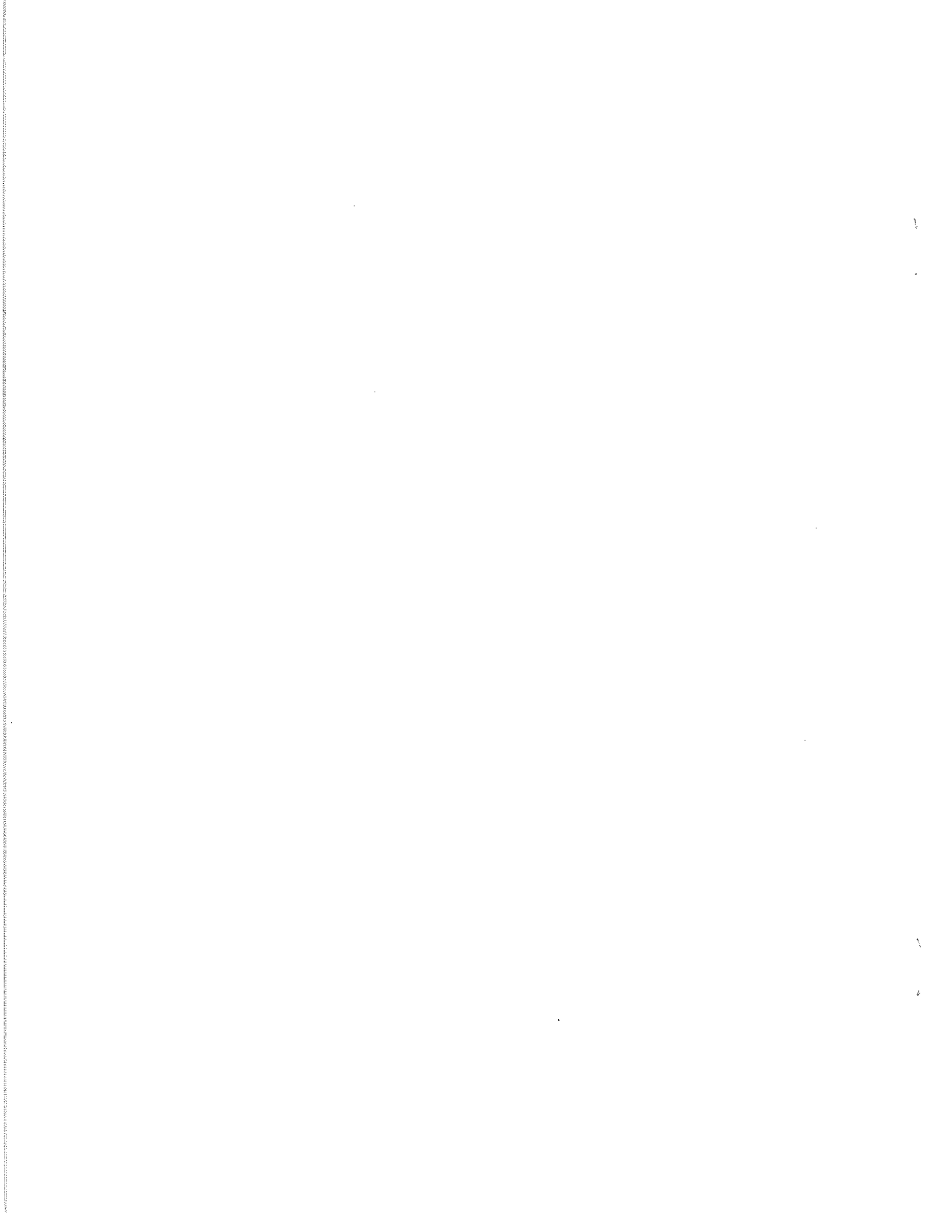


Table 2. Degree selected farm machinery program planning competencies (those with degree needed mean scores of 3.0 or higher for both groups in Table 1) were needed and possessed by farmers by educational attainment level

Competencies ^a	Mean scores					
	Less than 12 years		12 years		More than 12 years	
	Needed	Possessed	Needed	Possessed	Needed	Possessed
<u>Selected Farmers</u>	N = 19		N = 50		N = 29	
Understanding of:						
5	3.3	2.4	3.1	2.8	3.2	3.0
6	3.3	2.4	3.2	2.8	3.2	2.8
7	3.3	2.5	2.9	2.9	3.3	2.9
15	3.1	2.5	3.1	2.9	3.3	2.8
Overall mean	3.1	2.5	2.9	2.7	3.0	2.7
Ability to:						
28	3.3	3.1	3.0	3.0	2.9	2.9
34	3.1	2.4	3.2	2.7	3.5	3.0
35	3.0	2.9	3.0	3.2	3.2	2.9
39	3.1	2.5	2.9	2.7	3.2	2.6
40	3.3	2.3	3.3	2.3	3.3	2.3
43	3.5	2.5	3.4	2.7	3.5	2.6
45	3.2	2.5	3.4	2.7	3.5	2.9
46	3.2	2.5	3.1	2.8	2.8	2.4
48	3.1	2.4	3.2	2.7	3.4	3.0
49	3.3	2.7	3.3	2.9	3.4	2.9
51	3.0	3.0	3.1	3.0	3.5	3.3
Overall mean	3.0	2.6	2.9	2.8	3.0	2.7
Total overall mean	3.1	2.5	2.9	2.8	3.0	2.7
<u>Random Farmers</u>	N = 16		N = 34		N = 16	
Understanding of:						
5	3.3	2.4	3.3	2.7	2.8	2.8
6	3.2	2.7	3.4	2.3	2.6	2.6
7	3.2	2.6	3.1	2.6	2.5	2.6
15	2.9	2.4	3.1	2.5	2.7	2.4
Overall mean	2.8	2.4	3.0	2.4	2.6	2.5
Ability to:						
28	2.9	2.6	3.2	2.8	2.9	2.6
34	2.8	2.4	2.9	2.7	2.8	2.7
35	2.9	2.8	3.2	2.9	2.8	2.5
39	2.9	2.6	3.2	2.6	2.9	2.4
40	3.1	2.7	3.2	2.3	2.8	2.2
43	2.8	2.8	3.5	2.4	2.9	2.4
45	2.9	2.7	3.4	2.4	2.8	2.7
46	2.8	2.4	3.1	2.4	2.8	2.6
48	2.9	2.4	3.2	2.6	2.9	2.9
49	3.0	2.8	3.2	2.5	2.9	2.8
51	2.9	2.9	3.2	2.7	2.7	2.6
Overall mean	2.8	2.6	3.0	2.5	2.6	2.5
Total overall mean	2.8	2.5	3.0	2.5	2.6	2.5

^aCompetencies are numbered the same as in Table 1.



less difference with the 12 years group the lowest (2.9) and the remaining two groups having scores of 3.0. Abilities possessed were also rather close. The largest difference between competence in abilities needed and possessed was .4 for the less than 12 years group and lowest (.2) for the 12 years group.

The total overall mean score for competence needed was highest (3.1) for the less than 12 years group. This group was lowest (2.5) for competence possessed. The remaining groups had total overall mean scores identical to those for abilities needed and possessed.

The responses of random sample farmers on selected competencies grouped by educational attainment level are also presented in Table 2. The more than 12 years group was found to have the lowest overall mean score for competence needed in understandings (2.6), whereas the highest needed score (3.0) was for the 12 years group. The overall mean scores for competence in understandings possessed was close for all three groups with the two groups with less education having scores of 2.4, whereas the more than 12 years group had a score of 2.5. The widest difference between understandings needed and possessed was .6 for the 12 years group, whereas the narrowest difference was .1 for the more than 12 years group.

The overall mean score for competence in abilities needed was highest (3.0) for the 12 years group and lowest (2.6) for the more than 12 years group. The lowest overall mean score for abilities possessed was 2.5 for both of the more educated groups and highest (2.6) for the less than 12 years group.

The smallest difference in the degree competence in abilities were needed and possessed was .1 for the more than 12 years group and largest (.5) for the 12 years group.

Data in Table 3 reveals the degree competence in understandings and abilities were needed and possessed for both groups of farmers classified by years of vocational agriculture instruction in high school. The overall mean scores for competence needed in understandings were close with those with none and those with 3 or 4 years having mean scores of 3.0 and the lowest (2.9) for those with 1 or 2 years vocational agriculture. The overall mean scores for understandings possessed were lowest (2.6) for the group with none and 1 or 2 years and 2.8 for the other group. The widest difference between overall mean scores for competence in understandings needed and possessed was largest (.4) for the none group and lowest (.2) for the 3 or 4 years group.

The overall mean score for competence in abilities needed was highest (3.2) for the 3 or 4 years group and lowest (2.9) for those with no vocational agriculture. The overall scores for abilities possessed were close with the none and the 1 or 2 years groups having the lowest scores (2.7), whereas the 3 or 4 years group had a score of 2.8. The difference between overall mean scores for abilities needed and possessed was highest (.4) for the 3 or 4 years group and lowest (.2) for the group with no vocational agriculture.

Total overall mean scores were similar to those for the competence in abilities needed and possessed. Differences between total overall mean scores

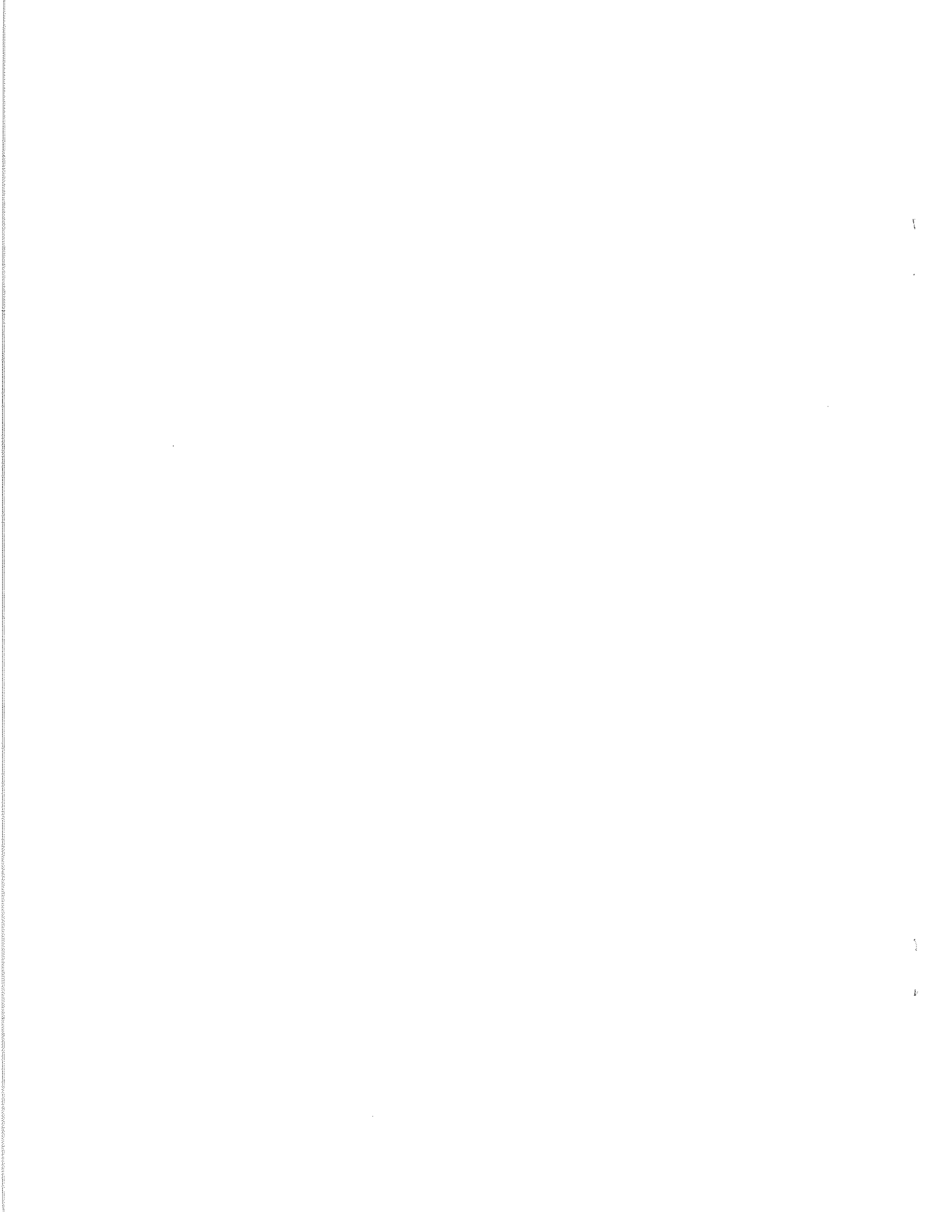
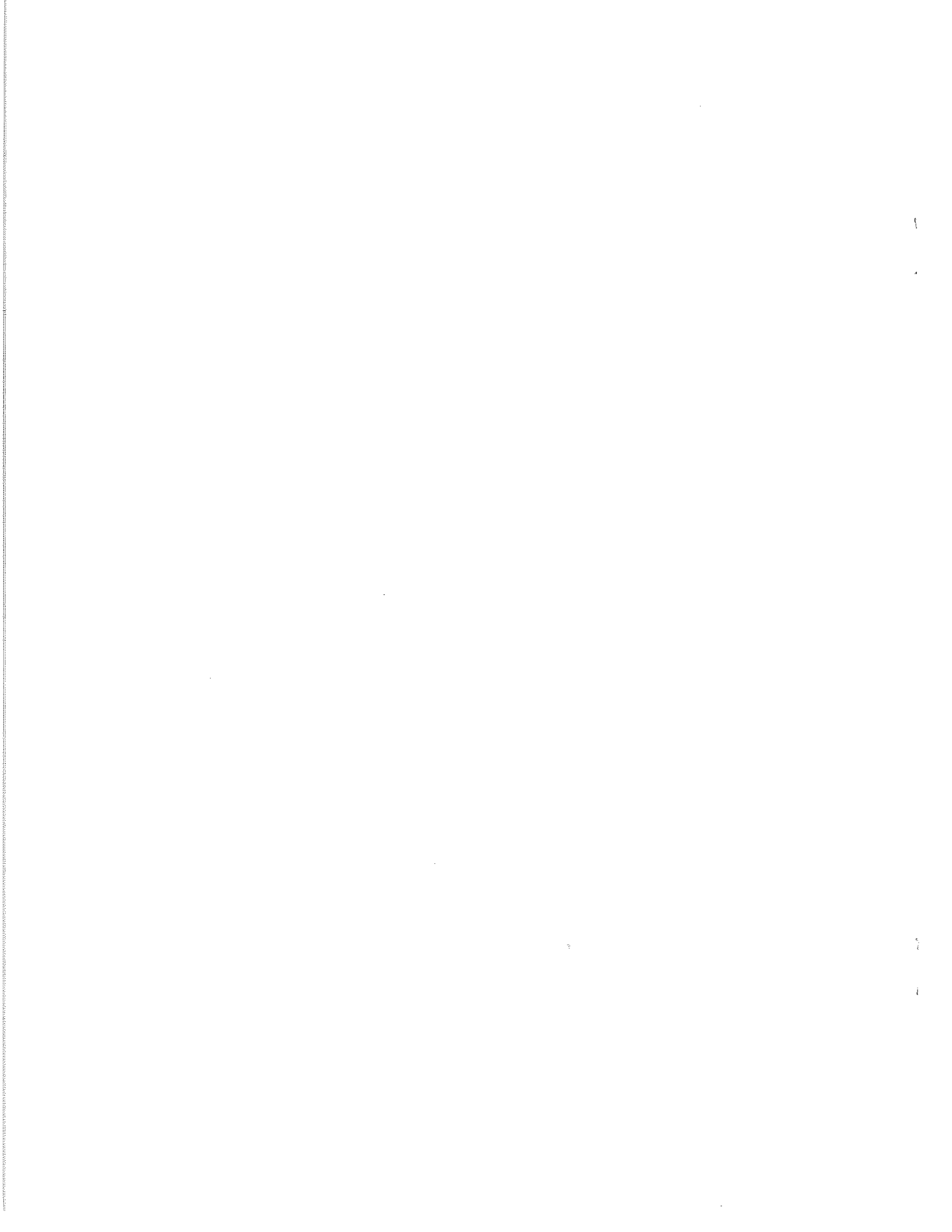


Table 3. Degree selected farm machinery program planning competencies (those with degree needed mean scores of 3.0 or higher for both groups in Table 1) were needed and possessed by farmers by years of vocational agriculture.

Competencies ^a	Mean scores					
	None		1 or 2 years		3 or 4 years	
	Needed	Possessed	Needed	Possessed	Needed	Possessed
<u>Selected Farmers</u>	N = 59		N = 19		N = 22	
Understanding of:						
5	3.3	2.7	3.1	2.9	2.9	3.0
6	3.2	2.6	3.3	2.8	3.1	2.9
7	3.1	2.8	3.1	2.7	3.3	3.0
15	3.1	2.7	3.3	2.9	3.2	2.9
Overall mean	3.0	2.6	2.9	2.6	3.0	2.8
Ability to:						
28	2.9	2.9	3.0	2.9	3.3	3.0
34	3.1	2.6	3.4	2.8	3.5	2.9
35	2.9	3.0	3.1	2.9	3.4	3.1
39	2.9	2.6	3.7	2.7	3.2	2.7
40	3.2	2.2	3.2	2.9	3.6	2.3
43	3.5	2.7	3.2	2.6	3.5	2.6
45	3.2	2.7	3.4	2.9	3.5	2.5
46	2.9	2.6	2.9	2.4	3.4	2.9
48	3.1	2.7	3.4	2.8	3.4	2.8
49	3.2	2.8	3.5	2.9	3.4	2.9
51	3.0	3.1	3.4	3.0	3.5	3.0
Overall mean	2.9	2.7	3.0	2.7	3.2	2.8
Total overall mean	2.9	2.7	3.0	2.7	3.1	2.8
<u>Random Farmers</u>	N = 37		N = 16		N = 13	
Understanding of:						
5	3.2	2.7	2.8	2.4	3.5	3.1
6	3.2	2.5	2.6	2.3	3.4	2.5
7	3.1	2.5	2.8	2.8	2.9	2.7
15	3.0	2.7	2.3	2.1	3.2	2.8
Overall mean	2.8	2.4	2.5	2.2	3.1	2.7
Ability to:						
28	3.0	2.7	3.1	2.5	3.0	2.8
34	3.2	2.6	2.4	1.9	3.4	2.6
35	2.9	2.7	3.4	2.3	3.5	2.9
39	3.0	2.4	2.3	2.3	3.6	2.7
40	3.1	2.2	2.4	1.8	3.4	3.6
43	3.2	2.6	3.2	2.3	3.4	2.4
45	3.1	2.5	3.0	2.3	3.5	2.8
46	3.0	2.5	2.8	2.3	3.2	2.5
48	3.1	2.6	2.6	2.4	3.6	2.9
49	3.1	2.7	2.8	2.5	3.3	2.6
51	3.0	2.7	2.9	2.6	3.1	3.1
Overall mean	2.9	2.5	2.5	2.3	3.1	2.8
Total overall mean	2.9	2.4	2.5	2.2	3.1	2.8

^aCompetencies are numbered the same as in Table 1.



needed and possessed was .2 for the no vocational agriculture group and .3 for the other two groups. The preceding findings were observed for the selected farmer group.

For the random sample farmers, the highest overall mean score for competence in understandings needed was found to be 3.1 for the 3 or 4 years group and lowest, 2.5, for the 1 or 2 years group. The same pattern was revealed for the competence in understandings possessed with scores of 2.7 and 2.2 respectively. The mean differences in overall mean scores for understandings needed and possessed were highest (.4) for the group with no vocational agriculture and the 3 or 4 years group and the lowest (.3) for the 1 or 2 years group.

When overall mean scores for competence in abilities needed were compared, the highest (3.1) was found for the 3 or 4 years group and the lowest (2.5) for the 1 or 2 years group. Overall mean scores for competence in abilities possessed followed the same pattern as abilities needed with scores of 2.8 and 2.3 respectively. Differences between overall mean scores for abilities was highest (.4) for the no vocational agriculture group and lowest (.2) for the 1 or 2 years group.

The total overall mean score difference was highest (.4) for the no vocational agriculture group with the other two groups having a difference of .3.

Significant correlations were found between farm size and value of machinery (+), farm size and vocational agriculture (+), educational attainment and farming experience (-), and age of farmers and farming experience (+), for both select and random sample farmers.

The ability needed to buy a good used machine to save on interest and depreciation cost was significant at the five percent level when correlated with farm size (.23) for select farmers.

When degree of competence needed scores for the six selected competencies were correlated with the competence possessed score for the same six competencies, five were found to be significant at the one percent level for both selected and random sample farmers. The remaining competency was found significant at the five percent level for the random sample farmers.

The highest correlations among selected competencies were between the ability needed to compare cost of a used machine with a new machine, and the ability needed to buy a good used machine to save on interest and depreciation costs (.57 for select farmers), and the ability needed to compare various methods of harvest, and the ability needed to determine capital limitations as related to machinery planning (.75 for random sample farmers).

Implications

These findings have implications for future educational programs in farm machinery program planning. Some factors that should be considered in



program planning are: (1) all competencies are important since they were rated as 2.0 or higher (some competence needed); (2) competencies with the widest differences between needed and possessed scores should be given special attention since this reveals a need for additional education through in-service training for farmers; (3) older farmers should be involved in educational programs since years of farming experience and age were negatively correlated with most of the selected variables; (4) the value of adult classes in farm machinery program planning should be stressed because of the high investment in mechanization.

There appears to be a need for more vocational agriculture departments and vocational agriculture instructors in the nine county area of southwest Iowa to help close the gap between competence needed and competence possessed in farm machinery program planning.





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