

AGRICULTURAL CHEMICAL COMPETENCIES' WHICH ARE IMPORTANT FOR
EMPLOYMENT IN' AGRICULTURAL CHEMICAL DEALERSHIPS'
AND IN PRODUCTION AGRICULTURE

by

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B. S., Kansas State University, 1967

9984

A MASTER'S REPORT

submitted in partial fulfillment of the
requirements for the degree

MASTER OF SCIENCE

College of Education

KANSAS STATE UNIVERSITY
Manhattan, Kansas

1972

Approved by:

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Chapter copy 2

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Chapter I

INTRODUCTION

In 1917, the Congress of the United States, passed the Smith-Hughes Act which established vocational agriculture in the high school curriculum. The main purpose of vocational agriculture at that time was for the education of students for production agriculture. In recent years, Congress again focused its attention on vocational education by passing both the Vocational Education Acts of 1963 and 1968. Both bills stressed the need for more agricultural related occupational training.

Some of the reasons for the change from production agriculture to related occupations occurred as the farm population in the United States declined from 26 million in 1940 to 10 million in 1970 (1). As the number of farms decreased farmers demanded more services from agricultural related businesses and industries. A Michigan study indicated that in 1960, the aggregate sales of agricultural supplies in the U. S. totaled \$40 billion with an average of \$500,000 gross per agricultural supply business in 1960 and is expected to reach \$1 million by 1980 (2).

In Kansas the trend was the same as the number of farms declined from 159,000 in 1940 to 86,000 in 1970. The size of farms increased from an average of 303 acres per

farm in 1940 to 581 acres per farm in 1970. Fertilizer sales in Kansas have also followed the increased trend by going from the sale of 18,000 tons in 1940 to 1,207,000 tons in 1970 (3) with the big increase coming from the irrigation area of western Kansas (4).

To emphasize the need for vocational training, Gunderson stressed the importance of increased agricultural output due to the advances in farm technology. Enough food is being produced to fulfill domestic and foreign needs. The agricultural worker no longer can be one with below-average educational attainment. In the need for more vocational training, Gunderson also noted that:

Employees of agricultural supplies stores are in quite a different situation than in the meat packing industry and other highly unionized industries. Employees have responsibilities that are quite different in the several occupational titles and usually have some decision-making responsibilities.

Employees of these stores deal directly with farmers and must be able to give sound management advice when selling the various products and services. They must have a thorough agricultural background and general understanding of approved farm practices in their local area (5).

Dr. C. Dellifield stated that vocational agriculture should become more relevant to a larger group of students. By becoming more relevant the vocational agriculture curriculum must reflect an increased emphasis on agricultural related occupations and up-to-date technology in production agriculture. The curriculum should broaden the students outlook as the future agri-businessman will be

confronted with people in his own occupation as well as businessmen and the general public (6).

In a study from Oklahoma, Richardson found an expected increase in fertilizer employment of 5 per cent from 1965-1970. Richardson advised that instructors of vocational agriculture become more aware of the importance of present training in agricultural related occupations (7). Other studies in Oklahoma (8) and Pennsylvania (9) showed an increase in number of employees required in agricultural chemicals over the next five years of 34 per cent and 14 per cent respectively.

Following a class conducted by Dr. James Albracht, on the development of an Agricultural Career Experience program, thought was given on how to make the vocational agricultural training at Claflin more meaningful to the students. After conferring with Dr. Albracht several times, it was determined that it might be possible to improve the crops and soils class by conducting a survey to find what competencies would be required in agricultural chemicals in the Claflin area.

It was decided that a survey of the fathers of the vocational agricultural students and the farm chemical dealerships would be very helpful in providing information for vocational agriculture curriculum development. Iverson, of North Dakota, agreed that a local study was essential for agricultural program planning (10).

I. THE PROBLEM

Statement of the problem. The purpose of this study was to determine the importance of selected competencies in agricultural chemicals for employment in the agricultural chemical supply businesses and in production agriculture.

II. DEFINITIONS OF TERMS USED

The following terms used in this study may vary somewhat from common usage and are defined. The Dictionary of Agricultural and Applied Terms (11) and the Dictionary of Education (12) were very useful in defining the terms.

Soil fertility. The soil quality that enables it to provide the proper compounds in the proper amount and in the proper balance for the growth of specified plants, when other factors e.g. light, temperature and physical conditions of the soil are favorable.

Agribusiness. Non-farm agricultural businesses which provide sales and services to farmers.

Agricultural chemicals. Agricultural chemicals include fertilizers and fertilizer-herbicide mixtures.

Micronutrients. Nutrients essential to plants or animals but needed in only very small amounts.

Tillage. Practice of working the soil to bring about more favorable conditions for plant growth.

Fixed costs. Costs which do not change with volume of production, e.g. taxes.

Variable costs. Expenses which change with output, e.g. hired labor, tractor fuel, fertilizer, seed.

Soil acidity. Excess of hydrogen ions (H) over hydroxyl ion concentration in the soil. Is an important factor in the growth of plants both under agricultural and natural conditions.

Soil testing. Various laboratory and field examinations of soil samples to determine the amounts, kinds, and availability of plant nutrients.

Herbicides. Chemicals used in controlling weeds and unwanted grasses.

Competencies. Understandings and abilities required for the performance of agricultural chemical activities on the farm and in agricultural chemical businesses.

Understandings. Knowledge of essential principles and techniques of a particular subject matter field.

Abilities. Applying the practical and essential principles and techniques of a particular subject matter field.

Weighted averages. Scores which were determined by giving essential, four points; very important, three points; important, two points; and little or no importance, one point.

Sum averages. Scores which were determined by adding the weighted averages of the ten chemical dealers and the twelve farmers and dividing by two.

Essential competencies. Those competencies which received sum averages between 3.6 and 4.0.

Very important competencies. Those competencies which received sum averages between 2.9 and 3.5.

Important competencies. Those competencies which received sum averages between 2.2 and 2.8.

Little importance competencies. Those competencies which received sum averages between 1.5 and 2.1.

No importance competencies. Those competencies which received sum averages between 0.0 and 1.5.

III. LIMITATIONS

The competencies which were identified in this study were responded to by dealers in agricultural chemicals and by farmers. The results for production agriculture are limited to the responses of the twelve farmers who were fathers of the twelve students enrolled in the Claflin vocational agricultural department. The results for agricultural chemical supplies are limited to the ten businesses in Barton County, Kansas which sell agricultural chemicals for production agricultural purposes.

FOOTNOTES

1. Kansas State Board of Agriculture, 53rd Annual Report of Kansas Agriculture, 1970, p. 17.
2. John N. Ferris, "Project '80 Rural Michigan Now and in 1980, Highlights and Summary," Michigan State University, East Lansing, Agricultural Experiment Station, 1966 (ERIC #ED-023-834), p. 3.
3. Kansas State Board of Agriculture, op. cit., p. 144.
4. Ibid., p. 165.
5. Orley D. Gunderson and Others, "An Analysis of Occupational Titles and Competencies Needed in Off-Farm Agricultural Supplies Businesses," Pennsylvania State Department of Public Instructions, Harrisburg, 1966 (ERIC #ED-023-810), p. 4.
6. Calvin Dellifield, "The Articulation of Agriculture Into the Total School Program," Agricultural Education, June, 1971, p. 291.
7. B. B. Richardson, "Determining the Training for Selected Farm Related Occupations in Four Counties in Oklahoma (Unpublished Master's thesis, Oklahoma State University, Stillwater, 1962).
8. William W. Stevenson, "A Study of Employment Opportunities and Training Needs in Off-Farm Agricultural Occupations in Oklahoma," Oklahoma State Board of Vocational Education, Stillwater, December, 1965 (ERIC #ED-012-744), p. 3.
9. Norman K. Hoover and Others, "Off-Farm Agricultural Occupations in Pennsylvania, Employment Opportunities and Technical Education Needs," Pennsylvania State University, University Park, 1966 (ERIC #ED-012-310), p. 7.
10. Maynard J. Iverson, "Studies of Local Areas are Essential for Program Planning in Vocational Agriculture," Agricultural Education, May, 1969, p. 179.
11. John N. Winburne, Dictionary of Agricultural and Applied Terminology, Michigan State University Press, 1962.
12. Carter V. Good, Dictionary of Education, 2nd Ed., McGraw-Hill, 1959.

Chapter II

REVIEW OF LITERATURE

In reviewing the literature prior to conducting this study, the author surveyed the research information which discussed agricultural chemicals for production agriculture and the agricultural chemical supply business. Much has been written relative to studies in this area including texts, Ph.D. dissertations, master's reports, pamphlets, magazines, and other published and unpublished materials.

The study by Van Loh in the field of fertilizer employee competencies tested 29 competencies in the managerial, sales and service area. These needed competencies were determined by a panel including twelve outstanding fertilizer dealers. Of these 29 competencies, 26 were rated as much needed by managers, 17 by sales employees, and 14 by service employees. In summarizing the competencies needed, it was determined that manager and sales employees indicated more competencies were needed in the decision making areas of the business while the service employees indicated a higher rating for understanding and abilities involving operations of equipment and plant operations (1).

The ten most needed competencies as reported by Van Loh were:

1. Amounts of fertilizer required for various levels of crop production.
2. Seed quality and plant population relative to fertilizer response.
3. Weed and insect problems and their control.
4. Interpreting a soil test report.
5. Identifying fertilizer materials and evaluating formulas.
6. Making proper recommendations regarding fertilizer use and help individual customers keep a fertilization history on his farm.
7. Recognize good new fertilizer practices and recommend their use.
8. Recognize plant food deficiency in growing crops.
9. Making recommendations in absence of a soil test report.
10. Determining an individual financial situation and management level (1).

Binkley developed a study listing the competencies required in the fertilizer business. His study indicated twelve competencies which were rated very helpful by 75 per cent of the employees. These competencies were similar to those found by Van Loh (2).

The degree of competency required by the chemical worker varied depending on his job according to Gunderson (3). His study indicated that a low degree of competencies were required by the service worker, but it was medium for both the manager and salesman (4). However, Gunderson's study did indicate that to advance, the service worker required a high degree of competence (5), which also agreed with a study by Vice (6).

In a study from Michigan, by Christensen, he noted that some competencies rating high were basic skills in testing agricultural chemical materials, understanding and interpreting federal and state health regulations regarding labeling and assisting farmers in planning programs. He went on to indicate that salesmanship, human relations and business management were competencies needed by all employees but in varying degrees (7).

Hoover, who did a study in Pennsylvania, agreed with Christensen's study in that salesmanship, human relations, and business management competencies were needed by all employees. However, his study did indicate that 57 per cent of the employers wanted employees with a high school education; but 14 per cent wanted employees with technical education and 10 per cent wanted college graduates. Only 11 per cent had jobs for employees without a high school education (8). A high school education is sufficient for many agribusiness jobs according to Stevenson, provided that their education was directed toward occupational placement and some work experience (9).

Agan noted in a Kansas Study that general agricultural knowledge (current), was of major importance for employees. His study also indicated that the ability to perform other skills in the business was of importance for public relation purposes (10).

Education and training in agriculture was indicated essential by Christensen, for almost one-half of the people in off-farm agricultural business, which paralleled the findings of Agan. The competencies needed; however, were closely identified with the products being sold (11).

Peterson and Horner, of Nebraska, designed a study to determine the best approach in training students for agricultural related occupations. They divided the students into four groups; related instruction, directed work experiences, a combination of related instruction and directed work experience, and a control group. They found that the students with a combination of work experience and related instruction were being employed at a higher rate than any other group (12).

In a summary by Taylor, he obtained the following information:

1. The agricultural competencies needed by workers in the non-farm business are determined primarily by the products handled by the business.
2. Competencies related to salesmanship, human relations and business management are needed by employees in the non-farm business.
3. Much of the agricultural content taught persons who are preparing for work in production agriculture is needed by persons who are preparing to enter the non-farm agricultural occupations (13).

Taylor also cited two reports in curriculum planning stating that the starting point in curriculum planning for vocational education in agriculture is the selection of

abilities required for farming, then to identify and apply these abilities to occupations other than farming (14).

In a study from Alabama, Lewis agreed with Taylor in that agribusiness employees need agricultural training, but for another reason and that was because several of the employees were part-time farmers (15). Anderson, when doing a study in Colorado, noted that the level of mechanical competencies required in agricultural sales and services were low (16).

Bjoraker and Pumper, initiated a study in Wisconsin to find what subject matter should be taught in vocational agriculture. Data was received from vocational agriculture instructors and agricultural education experts. They summarized that over 5 and 1/2 million men were employed on the farm and in agribusinesses in the Midwest. Of these over one-half were employed in off-farm occupations, therefore more agricultural related occupational subject matter should be taught (17).

Some of these areas included service department operating procedures, merchandising, advertising, salesmanship, and marketing. However, they did state that a strong production agriculture curriculum still needs to be maintained as the Midwest states supplies 85 per cent of the corn, 55 per cent of the wheat, 82 per cent of the hogs, 51 per cent of the milk and 60 per cent of the livestock for the United States (17).

In summarizing the literature, the study by Van Loh could be the major reference to use in determining the agricultural chemical competencies required for an employee in the agricultural chemical business. However, a local study should be conducted to identify the competencies which are of greatest importance for that area.

The level of attainment required for each competency was considered lower for the beginning employee than that required to advance in the agricultural chemical business. Competencies such as salesmanship, human relations, and business management are needed by all employees, but in varying degrees. The competencies required by employees in crop production and in agricultural chemical sales are similar and if presented properly can be included into the same vocational agricultural curriculum.

FOOTNOTES

1. Ferderick A. Van Loh and Clarence E. Bundy, "Competencies Needed by Fertilizer Retailers," Agricultural Education, January, 1965, p. 180.
2. Harold Binkley, "Competencies Needed in Agricultural Supply Business," Agricultural Education, August, 1966, p. 34.
3. Gunderson, loc. cit., p. 13.
4. Ibid., p. 57.
5. Ibid., p. 60.
6. Billy J. Vice, "An Image of Agricultural Experience in Vocational Education," Agricultural Education, January, 1971, p. 169.
7. Maynard Christensen and Raymond M. Clark, "Vocational Competencies Needed for Employment in the Agricultural Chemical Industry in Michigan," Michigan State University, East Lansing, 1965 (ERIC #ED-016-820), p. 37.
8. Hoover, loc. cit., p. 15.
9. William Stevenson, "Characteristics and Competencies Desired by Employees in Agricultural Related Businesses," Agricultural Education, April, 1966, p. 236.
10. Raymond J. Agan, "Kansas Studies Agriculture Non-Farm Occupations," Agricultural Education, July, 1964, p. 16.
11. Christensen, op. cit., p. 35.
12. Roland L. Peterson and James T. Horner, "Preparing Students for Off-Farm Occupations and Assessing Approaches to Teaching," Agricultural Education, November, 1970, p. 116.
13. Robert E. Taylor, "Preparing Agricultural Technicians, Report of a National Seminar on Agricultural Education," Ohio State University, Columbus, 1964 (ERIC #ED-011-918), p. 32.
14. Ibid., p. 28.

15. J. J. Lewis, "Curriculum for Agricultural Occupations Should Include Farming," Agricultural Education, November, 1966, p. 107.
16. Harold Anderson and James Y. Iha, "Mechanical Competencies Needed in Agricultural Occupations," Agricultural Education, September, 1969, p. 72.
17. Walter T. Bjoraker and Fred J. Pumper, "What Should We Teach?" Agricultural Education, June, 1971, p. 295.

Chapter III

PROCEDURE OF INVESTIGATION

In order to develop a more meaningful program in crops and soils management, it was decided to survey the local farms and agricultural chemical dealers to determine the competencies which were needed by workers in production agriculture and the agricultural chemical business.

Source of Data

The survey was limited to the farmers of vocational agriculture students in the Claflin High School and to the dealers in Barton County, Kansas, who supplied agricultural chemicals to the farmers.

The list of agricultural chemical dealers was obtained from the Barton County Extension Agent and the yellow pages of the local telephone directories.

Description of the Instrument

A questionnaire was developed to obtain the competencies required for entry into crop farming and into the agricultural chemical business. The questionnaire was based on previous studies such as those by Van Loh (1), Gunderson (2), Christensen (3), Stevenson (4), Binkley (5), and Hoover (6). Other references used were a course outline developed at Kansas State University (7) and one at

Virginia (8) and the text "Our Soils and Their Management" (9).

The questionnaire was reviewed by Dr. Albracht for corrections and additions. The questionnaire containing sixteen understandings and eighteen abilities was presented to a local farmer and a local fertilizer dealer for further comments. From them two more understanding items and two more ability items were added to the questionnaire.

The completed questionnaire was divided into three areas containing general information from both the farmer and chemical dealer, an area containing eighteen understanding competencies, and an area containing 20 ability competencies.

Method of Administrrating the Questionnaire

The survey was made by sending the questionnaire home with the vocational agriculture students who had fathers farming. The questionnaire was reviewed with the students so they could help their fathers in completing the form.

The questionnaire which the agricultural chemical dealers filled out was taken personally by the author to each dealer and assistance was provided in the completion of the questionnaire.

Results

There were thirteen students in the vocational agricultural classes whose fathers farmed and replies from twelve were received for a 92 per cent return. There were ten agricultural chemical dealers in Barton County and a questionnaire was completed by all ten for 100 per cent return.

Tabulation

A weighted average of the twelve farmers and ten agricultural chemical businessmen was determined for each of the competencies. The weighted average scores were determined by giving essential, four points; very important, three points; important, two points; and little or no importance, one point. A total sum average was obtained by adding the weighted averages of each competency for the chemical dealers and farmers and this total was divided by two.

The weighted averages were listed in tabular form, and comparisons were made. The findings were analyzed and conclusions and recommendations were made.

FOOTNOTES

1. Van Loh, loc. cit.
2. Gunderson, loc. cit.
3. Christensen, loc. cit.
4. Stevenson, loc. cit.
5. Binkley, loc. cit.
6. Hoover, loc. cit.
7. Howard Bradley, A Suggested Program of Instruction in Crops and Soils Including Some Selected Lesson Plans in Crops and Soils for Eastern Kansas Vocational Agriculture No. 11 Students, Kansas State University, Manhattan, 1962.
8. State Department of Education, A Curriculum Guide for Agricultural Education, Richmond, Virginia, May, 1969.
9. Donahue, "Our Soils and Their Management," Interstate, 1970.

Chapter IV

PRESENTATION OF DATA

The results of this study was to determine the agricultural chemical competencies which could be included in the vocational agricultural curriculum at Claflin High School. There were two types of competencies included in the study, one for understandings and the other abilities. There were ten chemical dealers and twelve farmers who returned usable questionnaires as related in Table I.

TABLE I
PER CENT RETURNS OF AGRICULTURAL
CHEMICAL QUESTIONNAIRE

RESPONDENTS	QUESTIONNAIRES		
	NUMBER SENT	NUMBER RETURNED	PER CENT RETURNED
Dealers	10	10	100
Farmers	13	12	92
TOTALS	23	22	96

Understanding Competencies

One type of competency was devoted to determining the understandings of agricultural chemicals which were required for employment in the agricultural chemical

business and in production agriculture. Information in Table II included the importance rating for each competency at the understanding level as indicated by both the ten agricultural chemical dealers and the twelve farmers.

The importance ratings were indicated by weighted average scales. The ten dealers and twelve farmers indicated the importance of each competency by selecting one of the following responses: essential, very important, important, and little or no importance. The weighted averages were determined by assigning four points to essential, three points to very important, two points to important, and one point to little or no importance.

The understanding competencies which were rated as very important are given in Table II. The sum average score for each competency was obtained by adding the weighted average scores for the ten chemical dealers and the twelve farmers and then dividing by two.

Six of the eighteen understanding competencies were considered to be very important with a combined sum average of 2.9 or higher. The competencies were grouped for importance by the sum averages as follows: those competencies with sum averages between 3.6 - 4.0 were essential; 2.9 - 3.5 were very important; 2.2 - 2.8 were important; 1.5 - 2.1 were little importance; and 0.0 - 1.4 were no importance.

TABLE II
 UNDERSTANDINGS IN AGRICULTURAL CHEMICALS WHICH WERE
 RATED VERY IMPORTANT* BY TEN CHEMICAL DEALERS
 AND TWELVE FARMERS

UNDERSTANDINGS	10 DEALERS WT. AVE.**	12 FARMERS WT. AVE.	TOTAL SUM AVE.
Characteristics of different fertilizer materials before and after they are incorporated in the soil	3.0	2.9	2.95
Physical and chemical properties of the soil in relation to plant growth and potential yield	2.9	2.9	2.9
Timeliness of operation in relation to crop yield	3.0	3.3	3.15
Effects of weather on plant food utilization	2.9	3.3	3.1
Fertilizer needs for various levels of production	3.2	2.9	3.05
Weed chemicals and their characteristics	3.3	2.8	3.05

* Combined sum average rating exceeded 2.9 and was obtained by adding the weighted average scores for the ten dealers and the twelve farmers and dividing the sum by 2.

** The weighted averages were determined by adding the scores of the respondents as follows: essential, 4 points; very important, 3 points; important, 2 points; and little or no importance, 1 point.

"Timeliness of operation in relation to crop yield," was the only understanding in which both the chemical dealers and the farmers agreed that the weighted average was above 3.0. However, three other competencies had a sum average over 3.0. Those being: effects of weather on plant food utilization; fertilizer needs for various levels of production; and weed chemicals and their characteristics.

There were some competencies which although not rating high, the chemical dealers and farmers did agree upon the level of competency. These were "characteristics of different fertilizer materials before and after they are incorporated in the soil" and "physical and chemical properties of the soil in relation to plant growth and potential yield."

The understanding competency which was rated the highest by the chemical dealers was "weed chemicals and their characteristics" with a weighted average of 3.3. The highest for the farmers was "timeliness of operation in relation to crop yield," rating 3.15.

The understanding competencies which were rated important are given in Table III. Several of the competencies which were rated important by the chemical dealers and farmers, had a weighted average above 3.0.

The farmers rated "farm credit procedures" and "seed quality and plant population in relation to fertilizer response" as 3.2. The chemical dealers rated: the major

TABLE III
 UNDERSTANDINGS IN AGRICULTURAL CHEMICALS WHICH WERE
 RATED IMPORTANT BY TEN CHEMICAL DEALERS
 AND TWELVE FARMERS

UNDERSTANDINGS	10 DEALERS WT. AVE.	12 FARMERS WT. AVE.	TOTAL SUM AVE.
Fertilizer plant operations	3.2	2.1	2.65
Farm credit procedures	2.4	3.2	2.8
Governmental agricultural programs and their effect on fertilizer usage	2.8	2.5	2.65
Cropping plan for specific soil types	2.4	2.5	2.45
Seed quality and plant population in relation to fertilizer response	2.4	3.2	2.8
Soil acidity and how to maintain it at its most productive level for crops in this area	2.5	2.9	2.7
Importance of fertilizers in modern farming	2.7	2.7	2.7
The different methods used to determine the fertility needs of soils	2.5	2.5	2.5
Why customers stay with or change dealers	2.7	1.9	2.3
The major plant nutrients and how they affect plant growth	3.2	2.4	2.8
The persistency of herbicides	3.2	2.5	2.85

plant nutrients and how they affect plant growth, the persistency of herbicides, and fertilizer plant operations all as 3.2. The competency receiving the lowest weighted average in the importance table was the farmers where they rated "why customers stay with or change dealers" as 1.9.

There was one understanding competency which was not tabulated and received a sum average rating of little importance by the combined groups. The understanding "micronutrients and their effect on crops in this area," had a weighted average of 2.2 by the dealers and 2.0 by the farmers.

Ability Competencies

The second type of competencies used in this study was to determine the abilities required in agricultural chemicals. The abilities which were considered very important by the chemical dealers and farmers are found in Table IV. Of the twenty abilities listed in the questionnaire, six were rated to be very important. To "apply fertilizer to the soil properly and accurately," was the only ability which received a weighted average above 3.0 by both the dealers and farmers.

The abilities receiving the highest weighted averages were by the chemical dealers which include "operate, calibrate, and maintain fertilizer equipment" and "apply fertilizer to the soil properly and accurately" both receiving a rating of 3.7. These two abilities not only

TABLE IV

ABILITIES IN AGRICULTURAL CHEMICALS WHICH WERE
RATED VERY IMPORTANT BY TEN CHEMICAL
DEALERS AND TWELVE FARMERS

ABILITIES	10 DEALERS WT. AVE.	12 FARMERS WT. AVE.	TOTAL SUM AVE.
Take an accurate soil sample	3.1	2.9	3.0
Operate, calibrate, and maintain fertilizer equipment	3.7	2.8	3.25
Apply fertilizer to the soil properly and accurately	3.7	3.1	3.4
Know what is involved in "fixed cost" and what increased fertilizer (variable cost) will mean in additional yields and profit	3.4	2.8	3.1
Interpret a soil test report	3.1	2.7	2.9
Compute the ratio to use in a fertilizer- herbicide mixture	3.5	2.8	3.15
Determine which herbicides can be mixed with fertilizers	3.4	2.9	3.15
Identify weeds	2.9	2.9	2.9
Select the proper herbicides	3.2	2.6	2.9

received the highest weighted average by the dealers, but also received the highest sum average in the study.

The highest rated ability in the very important table by the farmers was "apply fertilizer to the soil properly and accurately" and received a weighted average of 3.1. All of the ability competencies which rated very important received a weighted average score above 3.0 by the dealers, while only one of the competencies was rated above 3.0 by the farmers.

There were only two abilities which rated important and had a weighted average of 3.0 or more as listed on Table V. They were "identify various fertilizer materials and evaluate fertilizer formulas" by the dealers and "determine proper tillage conditions for fertilizer application" by the farmers. They had a weighted average score of 3.0 and 3.1 respectively.

The abilities on the important chart having the lowest weighted average by the dealers was "select proper fertilizer applying equipment" with a rating of 2.2. For the farmers the lowest ability was "estimate potential demand for various plant food nutrients" with a rating of 2.1.

There was only one ability which rated little importance and that was "develop a fertilizer promotion and marketing program" with a sum average of 1.95 and had a weighted average of 2.2 by the dealers and 1.7 by the farmers.

TABLE V
 ABILITIES IN AGRICULTURAL CHEMICALS WHICH WERE
 RATED IMPORTANT BY TEN CHEMICAL DEALERS
 AND TWELVE FARMERS

ABILITIES	10 DEALERS WT. AVE.	12 FARMERS WT. AVE.	TOTAL SUM AVE.
Identify various fertilizer materials and evaluate fertilizer formulas	3.0	2.6	2.8
Make recommendations regarding proper use of fertilizers and keeping a fertilizer history	2.9	2.6	2.75
Recognize good new fertilizer practices and recommend their use	2.5	2.5	2.5
Recognize plant food deficiencies in growing crops	2.8	2.9	2.85
Sell landowners on sound fertilizer programs	2.5	2.4	2.45
Make recommendations regarding amount of fertilizer to apply in absence of a soil test report	2.7	2.4	2.55
Estimate potential demand for various plant food nutrients	2.5	2.1	2.3
Select proper fertilizer applying equipment	2.2	2.8	2.5
Determine proper tillage conditions for fertilizer application	2.6	3.1	2.85
Analyze your credit potential and when to extend credit	2.5	2.8	2.65

There was a close comparison between the understanding and ability competencies as shown in Table VI. By adding the weighted averages of the very important understandings and dividing by the total number of competencies which were rated very important, a sum average of 3.03 was obtained. Using the same process on the abilities a sum average of 3.08 was obtained.

However, there was a difference of .5 between the very important abilities as rated by the dealers and the farmers. There was no difference in the important abilities.

TABLE VI

A SUMMARY OF THE IMPORTANCE OF THE COMPETENCIES AS RATED
BY TEN CHEMICAL DEALERS AND TWELVE FARMERS

COMPETENCIES	NUMBER OF COMPETENCIES	IMPORTANCE RATINGS		
		10 DEALERS SUM AVE.	12 FARMERS SUM AVE.	TOTAL SUM AVE.
<u>Understandings</u>				
Very important	6	3.05	3.01	3.03
Important	11	2.72	2.58	2.65
Little importance	1	2.2	2.0	2.1
<u>Abilities</u>				
Very important	9	3.3	2.8	3.08
Important	10	2.62	2.62	2.62
Little importance	1	2.2	1.7	1.95

There were six of the eighteen understandings which were rated very important by the dealers and farmers and eleven which were rated important. When considering the abilities, there were nine considered very important and eleven important.

The highest rated competencies in the study were two abilities by the dealers and they were "operate, calibrate, and maintain fertilizer equipment" and "apply fertilizer to the soil properly and accurately."

There were only two competencies, one understanding and one ability, which were rated of little importance by the dealers and farmers in the study. However, it was noted that comparing this study with previous studies the level of importance ratings were lower as no competencies received a sum average above 3.5, to be considered as essential for employment.

The results of the study identified the seventeen understandings which were rated as very important and important by the agricultural chemical dealers and farmers. Also identified were the twenty abilities which were rated very important and important by the chemical dealers and farmers. There were six very important understandings and eleven important and nine abilities which were rated very important and ten important abilities in the study. All 36 understandings and abilities which were rated as very

important or important will be given priority in developing the course of study in vocational agriculture at Claflin High School.

Chapter V

SUMMARY, CONCLUSIONS, AND RECOMMENDATIONS

With the number of farms decreasing in the United States and the size increasing, the need for more agricultural services and agribusiness employees have become apparent. Congress helped meet this need by passing the Vocational Education Acts of 1963 and 1968 allowing funds to be used in conducting education in the agricultural related occupations. The need for more employees in the agricultural chemical field has been indicated by the rapid increase in the use of fertilizer during recent years. The increase in amount of fertilizer sold along with the new understandings and abilities needed, much education is needed to meet the expanding employment opportunities in the agricultural chemical business.

The purpose of this study was to determine the level of competencies required by employees for entry into the agricultural chemical industry and into crop farming. These competencies which were rated to be very important and important were to be included in the vocational agricultural curriculum at Claflin High School.

A review of the literature indicated that much had been written on the competencies required by fertilizer employees. However, none had been written comparing the

competencies required by chemical employees and farmers. The major study dealing with fertilizer competencies was done by Van Loh of Iowa.

A questionnaire was developed by the author with the help of Dr. Albracht. A local chemical dealer and farmer reviewed the questionnaire and four competencies were added. The questionnaire was sent home with the students in vocational agriculture at Claflin High School who had fathers engaged in farming. The author personally took the questionnaire to all the agricultural chemical dealers in Barton County.

The questionnaire was divided into three areas, general information, understanding competencies, and ability competencies. Twelve of the thirteen questionnaires were turned in by the students for a 92 per cent return and a questionnaire was completed by all the agricultural chemical dealers in Barton County for 100 per cent return.

The importance for each competency in agricultural chemicals was determined by having the dealers and fathers respond to a rating of essential, very important, important, and little or no importance. A weighted average was then determined by assigning four points to essential, three points to very important, two points to important, and one point to little or no importance. Sum averages were determined by adding the weighted averages of the dealers and farmers for each competency and dividing by two.

The ability to perform various functions in agricultural chemicals were determined to be of the most importance. The ability to "operate, calibrate, and maintain fertilizer equipment" and "apply fertilizer to the soil properly and accurately" received a sum average rating of 3.25 and 3.4 respectively. The other abilities rating very important were: take an accurate soil sample; know what is involved in "fixed cost" and what increased fertilizer (variable cost) will mean in additional yields and profit; interpret a soil test report; compute the ratio to use in a fertilizer-herbicide mixture; determine which herbicides can be mixed with fertilizers; identify weeds; and select the proper herbicides.

The understandings in agricultural chemicals which were rated very important were: characteristics of different fertilizer materials before and after they are incorporated in the soil; physical and chemical properties of the soil in relation to plant growth and potential yield; timeliness of operation in relation to crop yield; effects of weather on plant food utilization; fertilizer needs for various levels of production; and weed chemicals and their characteristics.

It was concluded that although the level of understanding was the same between the chemical dealer and farmer, there was a higher level of ability required for

the employee of the chemical dealer than for the employee going into crop farming.

Of the thirty-eight competencies in the questionnaire, only two were rated little importance and they were "micronutrients and their effect on crops in this area" and "develop a fertilizer promotion and marketing program."

In addition to the six very important understandings and the single understanding which rated as having little importance there were eleven competencies which were considered important. In addition to the nine very important abilities and a single ability, which was classified as having little importance there were ten competencies which were rated important.

In conclusion, the results of the study will be used to further develop the crops and soils curriculum for the Claflin vocational agriculture department. Because of the increased importance of agricultural related occupations, it is recommended that future surveys be made by other instructors in their local areas to determine what competencies are required for other agricultural related occupations.

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APPENDIX

QUESTIONNAIRE PARTICIPANTS

The agricultural chemical businesses interviewed for this study were as follows: Great Bend Co-op, Walnut Creek Milling Co., Beaver Grain, Inc., Ellinwood Co-op, Galatia Co-op, Hitschmann Co-op, Farmers Grain of Pawnee Rock, Barton County Flour Mill of Great Bend, Claflin Grain Co., and Claflin Co-op.

The farmers responding to the questionnaire were: James Homolka, Harold Dobrinski, Robert Hickel, Ed Dolechek, Herb Besthorn, Floyd Riemann, Anthony Hoffman, John Christians, Vernon Krier, Al Prusa, A. J. Zink, and Robert Kaiser.

According to the Kansas Agriculture 54th Annual Report, there are 50 million acres in Kansas farms. If there are 92,439 farms in Kansas this gives an average of 541 acres per farm. The average farm size of the farmers responding to the questionnaire was 685 acres per farm. The range was from 1,600 acres to 320 acres. The number of acres fertilized in 1971 ranged from 0 to 400, with an average of 144 acres.

NAME _____

NUMBER OF EMPLOYEES:

Full time in Agricultural Chemicals _____
 Half time in Agricultural Chemicals _____
 One-fourth time or less in Agricultural Chemicals _____

EXPANSION:

Number of anticipated employees needed for fertilizer sales in the next five years (Check one)

None _____ 1-2 _____ 3 or more _____

Would you be interested in hiring a vocational agriculture student with agricultural chemicals training as a part-time employee in a learning capacity? (Check one)

Yes _____ Maybe _____ No _____

ESSENTIAL - Required for performance
 VERY IMPORTANT - Very helpful
 IMPORTANT - Helpful
 LITTLE OR NO IMPORTANCE - Slightly helpful, but not required.

UNDERSTANDING OF:	ESSENTIAL	VERY IMPORTANT	IMPORTANT	LITTLE OR NO IMPORTANCE
1. Fertilizer plant operations.				
2. Farm credit procedures.				
3. Governmental agricultural programs & their effect on fertilizer usage.				
4. Characteristics of different fertilizer materials before & after they are incorporated in the soil.				
5. Physical & chemical properties of the soil in relation to plant growth & potential yield.				
6. Cropping plan for specific soil types.				
7. Timeliness of operations in relation to crop yield.				

ESSENTIAL - Required for performance
 VERY IMPORTANT - Very helpful
 IMPORTANT - Helpful
 LITTLE OR NO IMPORTANCE - Slightly helpful, but not required.

	ESSENTIAL	VERY IMPORTANT	IMPORTANT	LITTLE OR NO IMPORTANCE
8. Effects of weather on plant food utilization.				
9. Fertility needs for various levels of production.				
10. Seed quality & plant population in relation to fertilizer response.				
11. Soil acidity & how to maintain it at its most productive level for crops in this area.				
12. Micronutrients & their effect on crops in this area.				
13. Importance of fertilizers in modern farming.				
14. The different methods used to determine the fertility needs of soils.				
15. Why customers stay with or change dealers.				
16. The major plant nutrients & how they affect plant growth.				
17. Weed chemicals & their characteristics.				
18. The persistency of herbicides.				
ABILITY TO:				
1. Take an accurate soil sample.				
2. Interpret a soil test report.				

ESSENTIAL - Required for performance
 VERY IMPORTANT - Very helpful
 IMPORTANT - Helpful
 LITTLE OR NO IMPORTANCE - Slightly
 helpful, but not required.

	ESSENTIAL	VERY IMPORTANT	IMPORTANT	LITTLE OR NO IMPORTANCE
3. Identify various fertilizer materials & evaluate fertilizer formulas.				
4. Make recommendations regarding proper use of fertilizers & keeping a fertilizer history.				
5. Recognize good new fertilizer practices & recommend their uses.				
6. Recognize plant food deficiencies in growing crops.				
7. Sell landowners on sound fertilizer programs.				
8. Operate, calibrate, & maintain fertilizer equipment.				
9. Apply fertilizer to the soil properly & accurately.				
10. Make recommendations regarding amount of fertilizer to apply in absence of a soil test report.				
11. Estimate potential demand for various plant food nutrients.				
12. Select proper fertilizer applying equipment.				
13. Develop a fertilizer promotion & marketing program.				
14. Determine proper tillage conditions for fertilizer application.				

ESSENTIAL - Required for performance
 VERY IMPORTANT - Very helpful
 IMPORTANT - Helpful
 LITTLE OR NO IMPORTANCE - Slightly
 helpful, but not required.

	ESSENTIAL	VERY IMPORTANT	IMPORTANT	LITTLE OR NO IMPORTANCE
15. Analyze your credit potential & when to extend credit.				
16. Know what is involved in "fixed costs" & what increased fertilizer (variable cost) will mean in additional yields & profit.				
17. Compute the ratio to use in a fertilizer-herbicide mixture.				
18. Determine which herbicides can be mixed with fertilizers.				
19. Identify weeds.				
20. Select the proper herbicides.				

NAME _____

SIZE OF OPERATION:

Own _____ acres Rent _____ acres

NUMBER OF EMPLOYEES:

Full time _____ Part time _____

MAJOR ENTERPRISE: (Please check)

Beef _____ Swine _____ Sheep _____ Wheat _____

Grain Sorghum _____ Other (Specify) _____

CROPS GROWN (including small acreage) (Check)

Wheat _____ Alfalfa _____ Grain Sorghum _____

Barley _____ Others (Specify) _____

Acres fertilized last year _____ acres.

ESSENTIAL - Required for performance
 VERY IMPORTANT - Very helpful
 IMPORTANT - Helpful
 LITTLE OR NO IMPORTANCE - Slightly
 helpful, but not required.

UNDERSTANDING OF:	ESSENTIAL	VERY IMPORTANT	IMPORTANT	LITTLE OR NO IMPORTANCE
1. Fertilizer plant operations.				
2. Farm credit procedures.				
3. Governmental agricultural programs & their effect on fertilizer usage.				
4. Characteristics of different fertilizer materials before & after they are incorporated in the soil.				
5. Physical & chemical properties of the soil in relation to plant growth & potential yield.				
6. Cropping plan for specific soil types.				
7. Timeliness of operations in relation to crop yield.				

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	ESSENTIAL	VERY IMPORTANT	IMPORTANT	LITTLE OR NO IMPORTANCE
8. Effects of weather on plant food utilization.				
9. Fertility needs for various levels of production.				
10. Seed quality & plant population in relation to fertilizer response.				
11. Soil acidity & how to maintain it at its most productive level for crops in this area.				
12. Micronutrients & their effect on crops in this area.				
13. Importance of fertilizers in modern farming.				
14. The different methods used to determine the fertility needs of soils.				
15. Why customers stay with or change dealers.				
16. The major plant nutrients & how they affect plant growth.				
17. Weed chemicals & their characteristics.				
18. The persistency of herbicides.				
ABILITY TO:				
1. Take an accurate soil sample.				
2. Interpret a soil test report.				

ESSENTIAL - Required for performance
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3. Identify various fertilizer materials & evaluate fertilizer formulas.				
4. Make recommendations regarding proper use of fertilizers & keeping a fertilizer history.				
5. Recognize good new fertilizer practices & recommend their uses.				
6. Recognize plant food deficiencies in growing crops.				
7. Sell landowners on sound fertilizer programs.				
8. Operate, calibrate, & maintain fertilizer equipment.				
9. Apply fertilizer to the soil properly & accurately.				
10. Make recommendations regarding amount of fertilizer to apply in absence of a soil test report.				
11. Estimate potential demand for various plant food nutrients.				
12. Select proper fertilizer applying equipment.				
13. Develop a fertilizer promotion & marketing program.				
14. Determine proper tillage conditions for fertilizer application.				

ESSENTIAL - Required for performance
 VERY IMPORTANT - Very helpful
 IMPORTANT - Helpful
 LITTLE OR NO IMPORTANCE - Slightly
 helpful, but not required.

	ESSENTIAL	VERY IMPORTANT	IMPORTANT	LITTLE OR NO IMPORTANCE
15. Analyze your credit potential & when to extend credit.				
16. Know what is involved in "fixed costs" & what increased fertilizer (variable cost) will mean in additional yields & profit.				
17. Compute the ratio to use in a fertilizer-herbicide mixture.				
18. Determine which herbicides can be mixed with fertilizers.				
19. Identify weeds.				
20. Select the proper herbicides.				

AGRICULTURAL CHEMICAL COMPETENCIES WHICH ARE IMPORTANT FOR
EMPLOYMENT IN AGRICULTURAL CHEMICAL DEALERSHIPS
AND IN PRODUCTION AGRICULTURE

by

EUGENE ERNEST ALGRIM

B. S., Kansas State University, 1967

AN ABSTRACT OF A MASTER'S REPORT

submitted in partial fulfillment of the

requirements for the degree

MASTER OF SCIENCE

College of Education

KANSAS STATE UNIVERSITY
Manhattan, Kansas

1972

The need for more agricultural services became more apparent as the number of farms in the United States had decreased and the total acres per farm had increased. The U. S. Congress has helped in the change of the vocational agriculture curriculum from one of production agriculture to one which has included agricultural related occupations. Congress passed the Vocational Education Acts of 1963 and 1968 which provided funds for these new programs. More employees were needed in the field of agricultural chemicals as indicated by studies of occupational needs and because of the rapid increase of fertilizer sales in the recent years.

The purpose of this study was to determine the level of competencies required in agricultural chemicals for employment in the agricultural chemical industry and in farming. These competencies which were rated very important and important by the chemical dealers and farmers were to be included in the vocational agricultural curriculum at Claflin High School.

Those who received the questionnaire were asked to respond by rating each competency either essential, very important, important, or little or no importance. A weighted average of the ten chemical dealers and the twelve farmers was determined by giving essential, four points; very important, three points; important, two points; and little or no importance, one point. A total sum average

was obtained by adding the weighted averages of each competency for the chemical dealers and farmers and dividing by two.

Of the thirty-eight competencies in the questionnaire, the ability to "operate, calibrate, and maintain fertilizer equipment" with a sum average of 3.25 and "apply fertilizer to the soil properly and accurately" with a sum average of 3.4 were the two competencies rated the highest in the study. Other abilities which rated very important were: take an accurate soil sample; know what is involved in "fixed cost" and what increased fertilizer (variable cost) will mean in additional yields and profit; interpret a soil test report; compute the ratio to use in a fertilizer-herbicide mixture; determine which herbicides can be mixed with fertilizers; identify weeds; and select the proper herbicides.

The understanding competencies required in agricultural chemicals which were rated very important were: characteristics of different fertilizer materials before and after they are incorporated in the soil; physical and chemical properties of the soil in relation to plant growth and potential yield; timeliness of operation in relation to crop yield; effect of weather on plant food utilization; fertilizer needs for various levels of production; and weed chemicals and their characteristics. Although there was no difference between the level of understanding between the

chemical dealers and farmers, there was a higher degree of ability required in the agricultural chemical business than in farming.

There were thirty-eight competencies included in the questionnaire. Eighteen of the thirty-eight competencies were understandings of which six were considered very important and eleven were considered important. Ability competencies composed the remaining twenty competencies of which nine were rated as very important and ten were rated important. There were two competencies in the questionnaire which had a little importance rating. These competencies were "micronutrients and their effect on crops in this area" and "develop a fertilizer promotion and marketing program."

The results of this study were used to improve the crops and soils curriculum in the vocational agriculture department at the Claflin High School. It is recommended that because of the increased importance of the agribusiness industries in the U. S. and Kansas that other instructors survey their own local areas to determine what competencies are needed for other agricultural related businesses.