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OFF-FARM AGRICULTURAL OCCUPATIONS IN PENNSYLVANIA, EMPLOYMENT OPPORTUNITIES AND TECHNICAL EDUCATION NEEDS.

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OBJECTIVES WERE-- (1) TO IDENTIFY AGRICULTURAL OCCUPATIONS AND JOB TITLES IN PENNSYLVANIA AND TO ESTIMATE THE CURRENT NUMBER OF EMPLOYEES AND ANNUAL ENTRY OPPORTUNITIES, (2) TO LIST COMPETENCIES NEEDED FOR ENTRY AND ADVANCEMENT AND TO DETERMINE JOB CHARACTERISTICS SUCH AS SALARY, REQUIRED EDUCATION AND EXPERIENCE, AND DESIRED RESIDENTIAL BACKGROUND, AND (3) TO GROUP JOB TITLES BY COMPETENCIES. DATA WERE OBTAINED BY INTERVIEWING MANAGEMENT PERSONNEL OF 1,440 BUSINESSES AND SERVICES IN 29 PENNSYLVANIA COUNTIES. SOME FINDINGS WERE-- (1) EMPLOYERS EXPECT A 14 PERCENT INCREASE IN THE NUMBER OF EMPLOYEES NEEDING AGRICULTURAL COMPETENCIES IN THE NEXT 5 YEARS, (2) THREE OCCUPATIONAL AREAS, AGRICULTURAL SUPPLIES AND EQUIPMENT, LIVESTOCK, DAIRY, AND POULTRY PRODUCTS, AND ORNAMENTAL HORTICULTURE, ACCOUNT FOR 74 PERCENT OF THE BUSINESSES, AND (3) TO PROVIDE TRAINED PERSONS, EACH SCHOOL TEACHING AGRICULTURE WILL HAVE TO PROVIDE 12 GRADUATES FOR FULL-TIME EMPLOYMENT AND SIX GRADUATES FOR PART-TIME EMPLOYMENT PER YEAR. TABULAR DATA INCLUDE JOB TITLES BY OCCUPATIONAL FAMILIES, LEVELS OF TRAINING BY COMPETENCY FACTORS NEEDED TO ADVANCE IN THE OCCUPATIONS, PREFERRED RESIDENTIAL BACKGROUND AND EDUCATIONAL LEVEL DESIRED OF NEW EMPLOYEES, AND ANNUAL SALARY BY OCCUPATIONAL LEVEL OF EMPLOYMENT. (PS)

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OFF-FARM AGRICULTURAL OCCUPATIONS IN PENNSYLVANIA

Agricultural
Mechanics

Agricultural
Supplies

Agricultural
Products

Ornamental
Horticulture

Forestry

Agricultural
Resources

Employment Opportunities and Technical Education Needs

Teacher Education Research Series, Volume 7, Number 1, 1966

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FOREWORD

This study of employment opportunities and technical education needs for workers in off-farm agricultural occupations was a cooperative effort by the Department of Agricultural Education, The Pennsylvania State University, and the Division of Agricultural Education, the Pennsylvania State Department of Public Instruction.

The project was initiated by the Department of Agricultural Education, The Pennsylvania State University, as Agricultural Experiment Station Project No. 1483. Project leaders were N. K. Hoover, D. R. McClay, and G. Z. Stevens. A grant was obtained from the Bureau of Technical and Continuing Education, Pennsylvania Department of Public Instruction, to help finance the project. Area Agricultural Education Advisers organized the work at the county level and teachers of agriculture conducted most of the interviews for collecting data.

The project leaders acknowledge assistance given by the following:

Division of Agricultural Education, Pennsylvania Department of Public Instruction.

Bureau of Employment Security, Pennsylvania Department of Labor and Industry.

Area Agricultural Education Advisers and Teachers of Agriculture

Pennsylvania Department of Agriculture

Personnel of the State and Federal Government Agencies who provided data for the study at the State level.

Members of the County Selection Committee for each of the counties who assisted with compiling the list of businesses for their respective counties.

The managers of businesses who gave freely of their time for the interviews.

Graduate Assistants in Agricultural Education, Ivan C. McGee, Robert E. Steffy, E. Lamar Love, Charles W. Smith and William I. Lindley.

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INTRODUCTION

New programs are needed in agricultural education because phenomenal changes have taken place in the agricultural industry in recent years. A multitude of off-farm agricultural businesses and services has emerged to aid farmers and ranchers. Many employees in these businesses and services require knowledge and skills similar to those needed in production agriculture. The rural-urban complex of our society also has undergone phenomenal changes which have implications for employees in ornamental horticulture and agricultural resources who require knowledge and skills in plant, soil, and animal sciences.

Agricultural leaders for a decade have known that agriculture and farming are no longer synonymous. Recognition of this fact was reflected through research, in professional magazine articles, in professional papers presented at conferences, and through other communication media. The concept culminated in the summary report of the President's Panel of Consultants on Vocational Education. It recommended that:

The vocational agriculture program, under Federal reimbursement, should be broadened to include instruction and increased emphasis of management, finance, farm mechanization, conservation, forestry, transportation, processing, marketing the products of the farm, and other similar topics.

Congress, in 1963, recognized that agriculture is more than farming by implementing the recommendation of the President's Panel of Consultants in PL 88-210. The Act states in Section 10b:

Any amounts allotted (or apportioned) under such titles, Act, or Acts for agriculture may be used for vocational education in any occupation involving knowledge and skills in agricultural subjects, whether or not such occupation involves work of the farm or of the farm home, and such education may be provided without directed or supervised practice on a farm.

The Federal legislation needed to develop new programs in agriculture was supplemented by the Pennsylvania State Legislature in 1963. Act 463 provides for further expansion of vocational-technical education through area schools and technical institutes. Act 484, known as the Community College Act, provides for technical education in Community Colleges.

Purpose of the Study

The purpose of the Study was to obtain information for occupational guidance in agriculture and for planning new programs in agricultural education. Specific objectives of the study were:

1. To identify agricultural occupations and job titles in Pennsylvania and to estimate the current number of employees and annual entry opportunities.
2. To list competencies needed for entry and advancement and to determine job characteristics such as salary, required education and experience, desired residential background, and other related information.
3. To group or cluster job titles by competencies for common educational purposes and to determine instructional areas in agriculture.

Procedure

Agricultural occupations may be defined as those occupations in which workers need competencies in one or more of the primary areas of plant science, animal science, agricultural business management and marketing, and agricultural mechanization. Information about these occupations was secured by use of a survey form through personal interviews with qualified persons in businesses and services that have employees who need agricultural competencies.

The following 29 selected Pennsylvania Counties were surveyed in order to obtain the desired data:

Adams	Crawford	Lebanon
Armstrong	Cumberland	Mercer
Berks	Dauphin	Mifflin
Bedford	Erie	Montgomery
Blair	Franklin	Schuylkill
Bucks	Fulton	Snyder
Butler	Indiana	Somerset
Chester	Lancaster	Union
Clarion	Lawrence	Venango
	Lehigh	Westmoreland

A list of all businesses in these counties was obtained from the Bureau of Employment Security, Pennsylvania Department of Labor and Industry. A County Selection Committee in each county made up of representatives from agriculture teachers, Agricultural Extension, County School Office, Chamber of Commerce, County Commissioners, agricultural businesses, non-agricultural businesses, school administrators, guidance counselors, and local Bureau of Employment Security personnel was appointed by the area agricultural education adviser. This committee selected those businesses that were thought to have employees who needed agricultural competencies and added other businesses and services that were not included in the Bureau of Employment Security list.

Businesses and services identified by the County Selection Committee were categorized into occupational families with sub-divisions within the families. For example the Agricultural Supplies family had sub-divisions of: feed and supplies, farm and garden supplies, hardware stores, bulk spreading of lime and fertilizer, gasoline and oil distribution, agricultural chemical manufacturing, and feed manufacturing.

Data were obtained by teachers of agriculture and area advisers who interviewed a random sample by sub-divisions of the businesses and services identified by the County Selection Committee. Additional data were obtained by interviews with persons at the State level who provided information for the following businesses or services for the state as a whole:

State Government

Department of Agriculture
Game Commission
Fish Commission
Department of Justice
Department of Labor and Industry
Department of Forestry and Waters
Department of Public Instruction
Department of Military Affairs
Department of Highways
Department of Property and Supplies
Department of Public Welfare
Department of Health
State Police Commission
Historical and Museum Commission

Agricultural Stabilization and Conservation Service

Soil Conservation Service

United States Department of Agriculture

Private Practicing Veterinarians

Teachers of Vocational Agriculture and Supervisory Staff

College of Agriculture, The Pennsylvania State University

Farm Credit Administration

Pennsylvania Farmers Association

Dairy Laboratory Directors

Pennsylvania Milk Control Commission

Dairy Herd Improvement Association

Pennsylvania Artificial Breeding Cooperatives

Farm Machinery Personnel

(working independently of retail sales and services)

Chemical Company Personnel

(working independently of retail businesses)

Seventeen counties were surveyed in 1964 and a preliminary report was published. The last twelve counties were surveyed in 1965. This publication is a final report of the 29 counties studied and a projection of these data to state estimates. The number of businesses interviewed in the 29 counties varied according to the occupational family and the number of businesses in a family. The number and per cent of businesses surveyed are presented below in tabular form.

<u>Occupational Family</u>	<u>No. Businesses and Services</u>	<u>No. Interviewed</u>	<u>Per Cent Interviewed Within Family</u>
Ag. Supplies and Equipment	1,014	319	32*
Ag. Machinery Sales and Services	386	137	36
Livestock, Dairy and Poultry Products	842	278	33
Fruits, Vegetables, Crops and Forestry Products	391	144	37
Ornamental Horticulture	1,403	427	30
Agricultural Resources	121	62	51
Agricultural Services	258	73	28
Total	4,415	1,440	33

* Percentages have been rounded to the nearest whole number.

PRESENTATION OF DATA

Data for this study were obtained by interviewing management personnel of 1,440 businesses and services in 29 Pennsylvania counties. Additional data were obtained from personnel representing State level agencies and services. All percentages in the report have been rounded to the nearest whole number.

Businesses and services that employ persons needing agricultural competencies were categorized into seven occupational families as shown in Table 1. An analysis of Table 1 shows that there were 4,415 businesses and services employing a total of 75,669 persons. Of these, 34,850, or 46 per cent, needed agricultural competencies to be proficient in their work. Three occupational families -- Ag. Supplies and Equipment, Livestock, Dairy and Poultry Products, and Ornamental Horticulture -- account for 74 per cent of the 4,415 businesses.

Employment, Employment Opportunities and Related Information

In this phase of the study of off-farm agricultural occupations in 29 Pennsylvania Counties, 163 job titles were identified. Specific information obtained about these job titles was:

1. Number of current employees needing agricultural competencies.
2. Number of employees expected five years hence.
3. Number of employees to be hired during the next five years.
4. Salary data by job titles.
5. Preferred residential background.
6. Educational level desired for entry and for advancement.

TABLE 1

NUMBER OF AGRICULTURAL BUSINESSES AND SERVICES,
ESTIMATED PERSONS EMPLOYED BY OCCUPATIONAL FAMILY,
SUMMARY FOR 29 COUNTIES

<u>Occupational Family</u>	<u>No. Businesses and Services</u>	<u>All Persons Employed</u>	<u>Employees Needing</u>	
			<u>Agricultural Number</u>	<u>Competencies Per Cent</u>
Ag. Supplies and Equipment	1,014	13,235	7,111	20
Ag. Machinery Sales and Service	386	5,132	2,626	8
Livestock, Dairy and Poultry Products	842	18,523	9,194	26
Fruits, Vegetables, Crops and Forestry Products	391	10,494	2,901	8
Ornamental Horticulture	1,403	21,391	9,307	27
Agricultural Resources	121	990	1,247	4
Agricultural Services	258	5,904	2,464	7
Totals	4,415	75,669	34,850	100

Employment and Employment Opportunities

The number of current employees, the number expected five years hence, and number of employees to be hired during the next five years are shown in Table 2. A total of 34,850 employees needed agricultural competencies; 27,720, or 80 per cent, were full-time employees and 7,130, or 20 per cent, were part-time employees. These same businesses expected to have a total of 37,795 employees five years hence. This would be an increase of 2,945 employees of which 80 per cent would be full-time employees.

Employers expect to hire an estimated 12,171 employees during the next five years. This number reflects the expected growth in size of business and the turnover. Of the 12,171 persons expected to be hired, 7,880, or 65 per cent, would be full-time employees.

There were 136 departments of vocational agriculture in the 29 counties studied. If persons to be hired during the next five years were to have some technical education in agriculture, each department would have to provide 12 graduates for full-time employment and 6 graduates for part-time employment per year.

Table 2 also shows that three occupational families -- Ag. Supplies and Equipment, Livestock, Dairy and Poultry Products, and Ornamental Horticulture -- account for 25,612, or 73 per cent, of the 34,850 employees who need agricultural competencies, 27,620, or 73 per cent, of the 37,795 anticipated employees five years hence, and 8,582, or 71 per cent, of the 12,171 employees to be hired during the next five years.

TABLE 2

ESTIMATED NUMBER OF EMPLOYEES NEEDING AGRICULTURAL COMPETENCIES,
CURRENT, EXPECTED FIVE YEARS FROM NOW, AND TO BE HIRED IN NEXT FIVE YEARS,
IN AGRICULTURAL BUSINESSES AND SERVICES, BY OCCUPATIONAL FAMILY,
SUMMARY FOR 29 COUNTIES

Occupational Family	Employees Needing Agricultural Competencies					
	Current		Expected 5 Years		To Be Hired	
	Total	Per Cent Full-time	Total	Per Cent Full-time	Total	Per Cent Full-time
Ag. Supplies and Equipment	7,111	91	7,693	90	2,663	88
Ag. Machinery Sales and Service	2,626	92	3,051	94	1,049	93
Livestock, Dairy and Poultry Products	9,194	82	9,354	85	1,708	80
Fruits, Vegetables, Crops and Forestry Products	2,901	91	3,109	88	917	87
Ornamental Horticulture	9,307	62	10,573	63	4,211	28
Agricultural Resources	1,247	76	1,434	72	766	70
Agricultural Services	2,464	76	2,581	75	857	81
Totals	34,850	80	37,795	80	12,171	65

Employees, in addition to being categorized into six occupational families, were further categorized by "level of employment." The levels of employment were: professional, managerial, technical, sales, clerical, and service. "Service," as a term denoting level of employment, is used as the 1965 revision of Dictionary of Occupational Titles uses it; namely, skilled, semi-skilled, and unskilled occupations.

Table 3 shows the number of employees who need agricultural competencies by level of employment. The service level of employment accounted for 60 per cent of all employees in the twenty-nine counties. Managerial level and sales level of employment accounted for an additional 26 per cent of the employees. Professional, technical, and clerical accounted for the remaining 14 per cent. There was approximately 1 professional employee for every 14 full-time employees and 1 manager for every 6 full-time employees.

Median Salaries of New Employees

Employers were asked in the interview to indicate the beginning wage or salary and the highest wage or salary for each job title in their respective businesses. The wages or salaries, whether reported by the hour, week or month, were converted to annual salaries.

Employees in off-farm agricultural occupations had a wide range of annual median salaries. Table 4 shows the median salaries of beginning employees by occupational family and level of employment and Table 5 shows the highest median salaries by occupational family and level of employment.

TABLE 3

ESTIMATED NUMBER OF PERSONS EMPLOYED WHO NEED
AGRICULTURAL COMPETENCIES IN SIX OCCUPATIONAL LEVELS OF EMPLOYMENT,
SUMMARY FOR 29 COUNTIES

Occupational Family	Number of Persons by Occupational Level of Employment						Total
	Profes- sional	Mana- gerial	Tech- nical	Sales	Clerical	Serv- ice	
Ag. Supplies and Equipment	74	1,430	180	1,126	425	3,876	7,111
Ag. Machinery Sales and Service	233	530	18	322	121	1,402	2,626
Livestock, Dairy and Poultry Products	512	1,056	416	1,731	230	5,249	9,194
Fruits, Vegetables, Crops and Forestry Products	194	434	132	201	13	1,927	2,901
Ornamental Horticulture	68	1,181	204	580	61	7,213	9,307
Agricultural Resources	117	204	37	2	16	871	1,247
Agricultural Services	812	164	645	244	51	548	2,464
Totals	2,010	4,999	1,632	4,206	917	21,086	34,850
Per Cent	6	14	5	12	3	60	100

Beginning median salaries ranged from a low of \$2,583 for service level of employment in the Fruits, Vegetables, Crops, and Forestry Products family to a high of \$7,805 for professional level of employment in the Ag. Supplies and Equipment family. These median salaries were reported as the salaries that persons entering jobs, by level of employment and by occupational family, could expect to receive at the time they entered.

The professional level of employment had the highest median salary for employees entering jobs and the clerical and service level of employment had the lowest median salaries. Beginning salaries of managerial, technical, and sales level of employment tended to be higher than clerical and service level of employment.

The median salary range for highest annual salary, Table 5, ranged from \$2,998 for service level of employment in the Fruits, Vegetables, Crops, and Forestry family to \$20,036 for professional employees in the Agricultural Service family. Median salaries were higher for those levels of employment which required more technical education.

Desired Residential Background of New Employees

Residential background, as a factor in employability of persons in off-farm agricultural occupations, was designated as farm, rural non-farm, urban, and no preference.

Table 6 shows the preferred residential background of new employees by employers. Farm reared employees were preferred by 53 per cent of the employers, 14 per cent preferred rural non-farm employees, 1 per cent preferred urban employees, and 32 per cent had no preference for residential background.

TABLE 4

**MEDIAN BEGINNING ANNUAL SALARIES OF EMPLOYEES WHO NEED
AGRICULTURAL COMPETENCIES BY OCCUPATIONAL LEVEL OF EMPLOYMENT,
SUMMARY FOR 29 COUNTIES**

<u>Occupational Family</u>	<u>Median Beginning Annual Salary by Occupational Level of Employment</u>					
	<u>Professional</u>	<u>Managerial</u>	<u>Technical</u>	<u>Sales</u>	<u>Clerical Services</u>	
Ag. Supplies and Equipment	\$7,805 67*	\$4,826 355	\$5,820 47	\$4,276 245	\$2,970 71	\$3,473 953
Ag. Machinery Sales and Service	\$7,428 96	\$4,695 114	\$5,327 21	\$4,196 51	\$3,249 27	\$3,508 361
Livestock, Dairy and Poultry Products	\$5,825 524	\$5,620 248	\$5,044 68	\$4,649 221	\$3,990 34	\$3,513 930
Fruits, Vegetables, Crops and Forestry Products	\$5,321 346	\$5,117 69	\$5,187 9	\$6,163 51	\$2,874 5	\$2,583 496
Ornamental Horticulture	\$6,666 14	\$5,523 414	\$3,482 35	\$4,030 130	\$3,555 28	\$3,765 1809
Agricultural Resources	\$5,262 201	\$4,449 15	0 0	0 0	\$3,249 7	\$3,318 134
Agricultural Service	\$7,041 1656	\$5,695 27	\$2,929 43	\$6,332 34	\$3,249 3	\$3,999 54

* The figures below each median salary are the number of job titles for which employers reported a beginning salary.

TABLE 5

MEDIAN HIGHEST ANNUAL SALARIES OF EMPLOYEES WHO NEED
AGRICULTURAL COMPETENCIES BY OCCUPATIONAL LEVEL OF EMPLOYMENT,
SUMMARY FOR 29 COUNTIES

Occupational Family	Median Highest Annual Salary by Occupational Level of Employment					
	Professional	Managerial	Technical	Sales	Clerical	Services
Ag. Supplies and Equipment	\$12,142 70*	\$6,486 330	\$6,772 42	\$4,488 553	\$3,916 77	\$4,575 622
Ag. Machinery Sales and Service	\$10,202 85	\$6,116 123	\$6,346 18	\$5,500 26	\$4,300 26	\$5,374 367
Livestock, Dairy and Poultry Products	\$10,257 443	\$9,156 283	\$6,316 59	\$5,225 396	\$6,213 37	\$5,633 906
Fruits, Vegetables, Crops and Forestry Products	\$11,950 345	\$7,468 69	\$11,607 11	\$9,338 49	\$6,490 6	\$2,998 445
Ornamental Horticulture	\$9,187 15	\$8,200 380	\$5,833 22	\$5,031 123	\$5,999 18	\$7,971 2122
Agricultural Resources	\$9,780 202	\$8,333 10	0 0	0 0	\$3,812 7	\$5,374 112
Agricultural Service	\$20,036 1789	\$6,428 27	\$4,750 43	\$8,166 38	\$4,374 3	\$5,799 68

* The figures below each median salary are the numbers of job titles for which employers reported a highest salary.

Employers in approximately one-third of the ornamental horticulture and agricultural resources businesses preferred farm reared employees whereas employers in the remaining occupational families had a higher preference for farm reared employees with a range from 51 to 76 per cent. These data indicate that farm and rural non-farm reared youth have a definite advantage over prospective employees from urban areas for those occupations that are farm related.

Employers in 49 per cent of the horticulture businesses had no preference of employee background. This may be explained by the fact that this occupational family, while involving plant science, primarily is not farm related.

Desired Educational Level for New Employees

The employers were asked to indicate the educational level that they desired of new employees for initial employment in their businesses. These data are shown by occupational families in Table 7.

A summary of 29 counties shows that 337, or 11 per cent, of the employers have one or more job titles for which they would employ persons with less than a high school education and 1,561, or 57 per cent, have job titles for which they would employ persons with only a high school education. There were 404, or 14 per cent, employers who wanted some employees with technical education and 304, or 10 per cent, who wanted some employees with a college education. Two hundred and forty, or 9 per cent, of the businesses wanted some employees with at least a bachelors degree for initial employment.

TABLE 6

RESIDENTIAL BACKGROUND OF NEW EMPLOYEES PREFERRED FOR
INITIAL EMPLOYMENT BY OCCUPATIONAL FAMILY
AS EXPRESSED BY EMPLOYERS INTERVIEWED

Occupational Family	Number of Job Titles	Percentage Distribution by Residential Background Preferred		
		Farm Per Cent	Rural Non-Farm Per Cent	Urban Per Cent
Ag. Supplies and Equipment	651	68	13	17
Ag. Machinery Sales and Services	289	76	17	5
Livestock, Dairy and Poultry Products	416	51	11	36
Fruits, Vegetables, Crops and Forestry Products	249	51	14	35
Ornamental Horticulture	811	36	14	49
Agricultural Resources	75	39	20	41
Agricultural Services	131	62	12	24

TABLE 7

EDUCATION LEVEL OF NEW EMPLOYEES DESIRED FOR
INITIAL EMPLOYMENT BY OCCUPATIONAL FAMILY
AS EXPRESSED BY EMPLOYERS INTERVIEWED

Occupational Family	Number of Job Titles	Percentage Distribution of Job Titles by Educational Level Desired				
		Less Than H. S. Per Cent	H. S. Grad. Per Cent	Tech. Ed. Per Cent	Some College Per Cent	Bachelor Degree or Higher Per Cent
Ag. Supplies and Equipment	678	6	62	11	11	10
Ag. Machinery Sales and Service	343	5	64	16	9	5
Livestock, Dairy and Poultry Products	480	13	51	15	10	11
Fruits, Vegetables, Crops and Forestry Products	310	13	51	22	5	9
Ornamental Horticulture	811	18	50	12	13	8
Agricultural Resources	91	26	44	10	15	4
Agricultural Services	139	7	52	17	12	13

Estimates for Pennsylvania by Counties
of Employees Needing Agricultural Competencies

The agricultural occupations study for 29 Pennsylvania counties provided an estimate of the number of off-farm agricultural employees in Pennsylvania. In the next phase of the study the data obtained were used as a basis for estimating the number of off-farm agricultural employees in each of the other 38 counties.

To estimate the number of off-farm agricultural employees, it was necessary to find items of information that have a positive, linear relationship with the number of workers needing agricultural competencies. One of these items, the number of businesses employing workers needing agricultural competencies, was determined for the 38 counties not surveyed by County Selection Committees. The procedure was the same as that used for the 29 counties. Seventeen other items of agricultural information for each county, taken from the Pennsylvania Crop Reporting Statistics, were:

1. Proportion of county land in farms
2. Number of farms
3. Average value of land and buildings per acre
4. Motor trucks on farms
5. Tractors on farms
6. Average number of dairy cows per farm
7. Average number of beef cattle per farm
8. Average number of hogs per farm
9. Average number of sheep per farm

10. Average number of chickens per farm
11. Value of all field crops
12. Forest products sales
13. Nursery products sales
14. Maple syrup production
15. Total cash crops, all commodities
16. Value of commercial fertilizer used
17. Value of lime used

By linear regression procedures, coefficients were computed for each of the variables. The multiple regression equation from the data for the 29 counties surveyed was used to estimate for each county the total number needing agricultural competencies. Part-time current employees and employees to be hired during the next five years were estimated from the ratio of these groups to full-time current employees in the 29-county summary. Table 8 shows the estimates for Pennsylvania by counties for current employees and employees to be hired during the next five years.

TABLE 8

ESTIMATED NUMBER OF EMPLOYEES WHO NEED AGRICULTURAL
COMPETENCIES, BY COUNTIES FOR PENNSYLVANIA, CURRENT
AND TO BE HIRED DURING THE NEXT 5 YEARS

County	Employees Needing Agricultural Competencies			
	Current		To Be Hired In Next 5 Years	
	Full- time	Part- time	Full- time	Part- time
Adams	798	182	256	109
Allegheny	1,655	824	514	653
Armstrong	482	128	201	63
Beaver	732	221	222	132
Bedford	450	196	218	126
Berks	1,234	570	651	178
Blair	896	346	350	310
Bradford	366	85	131	46
Bucks	1,496	283	194	135
Butler	840	198	150	30
Cambria	494	127	171	75
Cameron	196	50	73	25
Carbon	394	123	133	78
Centre	530	109	190	58
Chester	2,378	351	672	489
Clarion	532	151	175	92
Clearfield	494	109	173	57
Clinton	334	72	118	33
Columbia	844	243	275	153
Crawford	574	186	214	118
Cumberland	826	220	268	48
Dauphin	854	128	252	75
Delaware	1,342	592	409	446
Elk	258	61	94	28
Erie	541	357	190	287
Fayette	1,022	260	338	141
Forest	185	46	71	25
Franklin	724	184	238	68
Fulton	268	76	126	30
Greene	338	98	117	58
Huntingdon	481	99	162	42
Indiana	653	342	324	395
Jefferson	413	84	148	41
Juniata	461	95	146	38

TABLE 8 (continued)

<u>County</u>	<u>Employees Needing Agricultural Competencies</u>			
	<u>Current</u>		<u>To Be Hired</u>	
	<u>Full-time</u>	<u>Part-time</u>	<u>Full-time</u>	<u>Part-time</u>
Lackawanna	1,671	655	506	467
Lancaster	3,785	795	1,451	402
Lawrence	514	338	106	94
Lebanon	1,056	170	225	33
Lehigh	1,416	243	159	161
Luzerne	1,032	313	304	188
Lycoming	542	117	191	66
McKean	525	119	184	63
Mercer	776	168	318	94
Mifflin	291	81	90	38
Monroe	713	234	233	158
Montgomery	2,615	601	677	302
Montour	264	72	91	39
Northampton	866	233	274	137
Northumberland	631	151	205	81
Perry	455	101	151	49
Philadelphia	368	152	123	109
Pike	235	81	85	51
Potter	320	72	118	38
Schuykill	535	136	229	107
Snyder	376	98	156	26
Somerset	762	182	270	184
Sullivan	203	56	77	29
Susquehanna	462	115	159	64
Tioga	443	99	157	50
Union	266	82	152	58
Venango	176	66	52	18
Warren	406	111	144	67
Washington	1,134	322	363	204
Wayne	665	175	231	76
Westmoreland	850	246	210	166
Wyoming	400	96	141	52
York	1,266	292	417	173
Totals	50,104	13,968	16,213	8,526

Classification of Job Titles for
Off-Farm Agricultural Occupations

The persons needing agricultural competencies employed in 29 counties were classified under 163 job titles (Table 10). Of these, 40 job titles for "current full-time employees," 37 for "expected five years from now," and 30 "to be hired during the next five years" accounted for 75 per cent of all employees in these three categories. Table 9 shows that most of the job titles with the largest numbers of current workers will have the largest numbers five years from now and will account for the largest numbers to be hired within the next five years.

TABLE 9

JOB TITLES THAT ACCOUNT FOR 75 PER CENT OF ALL EMPLOYEES
FOR CURRENT FULL-TIME EMPLOYEES, EXPECTED 5 YEARS
FROM NOW, AND TO BE HIRED DURING THE NEXT 5 YEARS

	<u>Current Full-time Employees</u>	<u>Expected 5 Years from Now</u>	<u>To Be Hired During Next 5 Years</u>
Agricultural Supplies and Equipment			
Ag. Supplies Manager	x	x	x
Ag. Supplies Fieldman	x	x	x
Ag. Supplies Bookkeeper	x	x	x
Ag. Supplies Product Salesman	x	x	x
Ag. Supplies Service Mechanic	x	x	x
Ag. Supplies Equipment Operator	x	x	x
Ag. Supplies Delivery Truck Driver	x	x	x
Ag. Supplies Sales Clerk	x	x	
Ag. Supplies Applicator			x
Agricultural Machinery Sales and Service			
Ag. Machinery Manager	x	x	
Ag. Machinery Salesman	x	x	x
Ag. Machinery Mechanic	x	x	x
Ag. Machinery Parts Manager			x
Ag. Machinery Engineer		x	x
Ag. Machinery Fieldman		x	x

TABLE 9 (continued)

	<u>Current Full-time Employees</u>	<u>Expected 5 Years from Now</u>	<u>To Be Hired During Next 5 Years</u>
Livestock, Dairy and Poultry Products			
Meat Processing Plant Manager	x	x	
Poultry Products Plant Manager	x	x	
Meat Processor	x	x	x
Poultry Processor	x	x	x
Meat and Poultry Products Salesman	x	x	
Stockyard Worker	x	x	
Dairy Products Plant Manager	x	x	
Dairy Products Lab. Technician	x	x	
Dairy Products Plant Worker	x	x	x
Dairy Products Driver Salesman	x	x	x
Dairy Products Plant Truck Driver	x	x	x
Dairy Products Plant Processor	x		
Egg Candler			x
Livestock Buyer	x		
Fruits, Vegetables, Crops and Forestry Products			
Fruit and Veg. Processing Worker	x		
Crops Processing Worker	x	x	x
Forester	x	x	x
Forest Products Processor	x	x	x
Ornamental Horticulture			
Nursery Manager	x	x	
Park Superintendent	x	x	x
Nursery Grower	x	x	x
Nursery Worker	x	x	x
Greenskeeper	x	x	
Groundskeeper	x	x	x
Tree Pruner	x	x	x
Nursery Salesman	x		
Floral Designer	x		
Florist	x	x	
Agricultural Resources			
Animal Keeper	x	x	x
Agricultural Services			
Ag. Construction Worker	x	x	x
Dairy Herd Improvement Tester	x	x	x
	<hr/>	<hr/>	<hr/>
	40	37	30

TABLE 10

JOB TITLES BY OCCUPATIONAL FAMILIES FOR
EMPLOYEES NEEDING AGRICULTURAL COMPETENCIES
IN 29 COUNTIES

Agricultural Supplies and Equipment

<u>Job Titles</u>	<u>Current</u>		<u>To Be Hired In Next 5 Years</u>	
	<u>Full- time</u>	<u>Part- time</u>	<u>Full- time</u>	<u>Part- time</u>
Ag. Supplies Manager	1,236	3	329	0
Ag. Supplies Production Manager	133	0	12	0
Ag. Supplies Sales Manager	58	0	18	0
Ag. Supplies Service Manager	24	0	0	0
Ag. Supplies Office Manager	38	0	8	0
Ag. Supplies Research Director	10	0	0	0
Ag. Supplies Fieldman	194	4	89	4
Ag. Supplies Bookkeeper	295	32	109	19
Ag. Supplies Secretary	27	3	3	0
Ag. Supplies Product Salesman	938	153	384	69
Ag. Supplies Sales Clerk	181	36	39	21
Ag. Supplies Service Mechanic	379	32	247	19
Ag. Supplies Applicator	132	46	79	20
Ag. Supplies Equipment Operator	1,891	267	561	144
Ag. Supplies Delivery Truck Driver	943	56	471	18

Agricultural Machinery Sales and Service

Ag. Machinery Manager	449	2	53	0
Ag. Machinery Service Manager	61	0	12	0
Ag. Machinery Parts Manager	101	6	78	2
Ag. Machinery Sales Manager	63	0	5	0
Ag. Machinery Office Manager	34	4	5	4
Ag. Machinery Engineer	126	0	98	0
Ag. Machinery Fieldman	130	0	92	0
Ag. Machinery Bookkeeper	66	7	18	0
Ag. Machinery Secretary	15	8	0	0
Ag. Machinery Office Clerk	0	0	0	0
Ag. Machinery Salesman	202	30	93	6
Ag. Machinery Sales Clerk	0	0	0	0
Ag. Machinery Mechanic	797	68	397	36
Ag. Machinery Mechanic's Helper	33	23	33	16
Ag. Machinery Field Mechanic	92	11	29	0
Ag. Machinery Welder	50	10	6	0
Ag. Machinery Parts Man	111	4	27	0

TABLE 10 (continued)

<u>Job Titles</u>	<u>Current</u>		<u>To Be Hired In Next 5 Years</u>	
	<u>Full- time</u>	<u>Part- time</u>	<u>Full- time</u>	<u>Part- time</u>
Ag. Machinery Set Up Man	44	24	16	4
Ag. Machinery Warehouseman	7	0	0	0
Ag. Machinery Deliveryman	44	4	15	4
Agricultural Products:				
Livestock, Poultry and Dairy				
Meat Processing Plant Manager	383	4	14	4
Poultry Products Plant Manager	196	9	20	0
Hatchery Manager	99	3	17	0
Livestock Market Manager	101	15	0	3
Meat and Poultry Products Sales Manager	36	0	3	0
Veterinarian, Meat Quality Control	33	0	0	0
Meat Grader	98	0	18	0
Poultry Grader	40	0	6	0
Meat Processor	1,736	351	130	37
Poultry Processor	515	242	259	99
Egg Candler	117	36	75	30
Meat Plant Worker	27	0	3	0
Meat and Poultry Products Salesman	864	54	53	3
Livestock Buyer	154	54	24	7
Poultry Buyer	22	0	3	0
Livestock Auction Secretary	25	57	0	4
Meat and Poultry Plant Bookkeeper	28	10	6	0
Stockyard Worker	188	449	27	97
Meat and Poultry Products Deliveryman	134	11	70	7
Hatchery Worker	141	59	38	11
Dairy Products Processing Plant Manager	253	15	43	4
Dairy Products Plant Production Manager	71	0	3	0
Dairy Products Sales Manager	27	0	12	0
Dairy Products Plant Fieldman	29	0	8	0
Dairy Products Laboratory Technician	189	7	63	0
Dairy Products Quality Control Technician	54	0	3	0
Dairy Products Plant Office Manager	8	0	0	0
Dairy Products Plant Bookkeeper	21	6	3	0
Dairy Products Plant Processing Supervisor	133	8	18	8
Dairy Products Plant Processor	163	7	38	8
Dairy Products Plant Worker	418	146	82	3
Dairy Products Salesman	40	27	15	0

TABLE 10 (continued)

<u>Job Titles</u>	<u>Current</u>		<u>To Be Hired In Next 5 Years</u>	
	<u>Full- time</u>	<u>Part- time</u>	<u>Full- time</u>	<u>Part- time</u>
Dairy Products Driver Salesman	925	0	161	0
Dairy Products Plant Mechanic	61	0	25	0
Dairy Products Plant Truck Driver	246	49	131	11
 Agricultural Products: Fruits, Vegetables, Crops and Forestry Products				
Fruit and Veg. Market Manager	70	4	17	0
Fruit and Veg. Proc. Manager	35	3	0	0
Fruit and Veg. Sales Manager	12	0	2	0
Fruit and Veg. Product Manager	12	0	3	0
Fruit and Veg. Fieldman	37	0	5	0
Fruit and Veg. Quality Control Specialist	8	3	0	3
Fruit and Veg. Office Manager	4	0	0	0
Fruit and Veg. Salesman	115	47	16	24
Fruit and Veg. Proc. Plant Foreman	25	6	6	0
Fruit and Veg. Processing Worker	217	14	23	4
Fruit and Veg. Market Worker	36	107	4	28
Fruit and Veg. Buyer	8	0	0	0
Fruit and Veg. Inspector or Grader	12	0	0	0
Fruit and Veg. Truck Driver	44	0	44	0
Crops Marketing and Processing Manager	75	0	42	0
Crop Quality Control Specialist	71	0	24	0
Crops Marketing and Processing Salesman	36	0	6	0
Crops Processing Plant Foreman	30	0	9	0
Crops Marketing and Processing Bookkeeper	3	0	3	0
Crops Buyer	3	0	3	0
Crops Processing Worker	636	30	309	36
Forest Products Manager	124	2	9	0
Forester	201	4	82	0
Timber Inspector or Grader	18	0	5	0
Forest Products Processing Supervisor	79	0	22	0
Forest Products Sales Manager	18	0	24	0
Timber Buyer	14	0	11	0
Sawmill-Lumber Equipment Operator	27	6	5	2
Forest Products Processor	206	39	122	7
Forest Products Deliveryman	51	9	2	15

TABLE 10 (continued)

Ornamental Horticulture	Current		To Be Hired In Next 5 Years	
	Full-	Part-	Full-	Part-
	time	time	time	time
Job Titles				
Nursery Manager - Greenhouse Manager	438	80	34	24
Garden Center Manager	87	0	10	0
Orn. Horticulture Sales Manager	7	0	0	0
Florist	181	6	12	8
Park Superintendent	227	10	122	8
Tree Service Manager	72	0	9	0
Landscape Architect	56	0	36	0
Golf Course Superintendent	102	3	16	0
Orn. Horticulture Specialist	22	4	5	0
Landscape Consultant - Landscape Aid	39	0	0	0
Floral Designer	143	65	17	40
Ornamental Horticulture Bookkeeper	49	12	2	0
Nursery Salesman	165	75	4	16
Garden Center Salesman	51	122	21	127
Nursery Sales Clerk - Garden Center	69	51	11	164
Nursery Grower - Greenhouse Grower	262	64	92	44
Nursery Worker	771	1,224	205	1,565
Garden Center Mechanic	39	21	6	36
Greenskeeper	441	603	52	376
Groundskeeper	2,045	1,108	428	632
Tree Surgeon	34	0	10	0
Tree Pruner - Tree Pruner Helper	430	68	77	0
Ornamental Horticulture Truck Driver	48	13	2	0
Agricultural Resources				
Recreation Farm and Business Manager	74	25	0	24
Soil Conservationist	97	0	49	0
Soil Conservation Technician	31	0	28	0
Soil Conservation Aid	6	0	4	0
Zookeeper	6	10	4	5
Aviary Manager	3	3	1	1
Fish Hatchery Manager	6	0	2	0
Wildlife Conservation Officer	101	0	74	0
Park Superintendent	25	0	38	0
Park Worker	13	0	7	0
Game Farm Worker	116	5	31	7
Animal Keeper	470	188	282	185
Camp Counselor	5	63	0	24

TABLE 10 (continued)

Agricultural Services

<u>Job Titles</u>	<u>Current</u>		<u>To Be Hired In Next 5 Years</u>	
	<u>Full- time</u>	<u>Part- time</u>	<u>Full- time</u>	<u>Part- time</u>
Veterinarian	0	0	0	0
Artificial Breeding Technician	128	0	50	2
Dairy Herd Improvement Tester	117	0	120	0
Farm Auctioneer	38	0	2	0
Ag. Service Salesman	42	6	11	0
Blacksmith	6	0	0	0
Chick Sexer	3	6	0	0
Sprayer Operator	33	5	22	10
Farm Building Construction Manager	44	0	10	0
Ag. Construction Workers	328	206	151	78
Rural Electrification Employer	70	0	8	0
Bank Teller	37	0	8	0
Agricultural Consultant, Bank	2	11	0	3
Farm Appraiser	25	0	3	0
Farm Loan Officer	39	0	4	0
Public Accountant	4	0	0	0
Production Credit Manager	34	0	15	0
Farm Organization Fieldman	11	0	4	0
Breed Association Fieldman	12	0	4	0
Farm Insurance Specialist	56	145	14	12
County Agricultural Agent	76	0	26	0
Vocational Agriculture Instructor	181	0	62	0
Agricultural Journalist	18	3	4	6
Ag. Market Specialist	9	0	5	2
A. S. C. S. Compliance Supervisor	42	26	15	11
A. S. C. S. Field Reporter	5	173	0	40

Competency Areas in Which Off-Farm Agricultural Employees Need Technical Education

A major purpose of the study was to identify the clusters of competencies and job titles associated with entry and advancement in off-farm agricultural occupations. The specific occupational areas studied were: agricultural supplies, agricultural mechanics, food products, forestry, and ornamental horticulture.

There were 1691 separate job title interviews made with a random sample of employers in the 17 Pennsylvania counties initially surveyed. Factor analysis for competencies needed to enter and to advance in off-farm agricultural occupations was applied to the data as a descriptive, correlational technique. The list of 60 competencies was resolved into 11 factors that can readily be translated into major course content areas. The factors grouped into three areas are:

Competency factor groups in agriculture

- Plant science
- Animal science
- Agricultural mechanics
- Agricultural business management

Competency factor groups in business and distribution

- Business management and economics
- Sales and business skills
- Job and employee characteristics
- Employee-supervisor relations

Competency factor groups in trade and industry

- Building construction technology
- Industrial mechanics
- Industrial quality control

The factoring for job titles provided meaningful groups of job title factor groups by occupational areas as follows:

Agricultural Supplies Occupation Area

Manager
Salesman
Bookkeeper
Technician
Service worker

Agricultural Mechanization Occupation Area

Manager
Salesman
Parts manager
Bookkeeper
Mechanic

Food Products Occupation Area

Manager
Plant manager
Salesman
Livestock dealer
Service worker

Forestry Occupation Area

Manager
Technician
Grader
Service worker

Ornamental Horticulture Occupation Area

Manager
Technician
Service worker

Tables 11 through 15 show the most clearly defined competency factor groups and the several clusters of job titles for the five occupational areas. For the competency factor groups and job title groups in which employers indicated that the level of training from To Enter to To Advance should be increased, an asterisk is used.

TABLE 11

**LEVELS OF TRAINING BY COMPETENCY FACTORS NEEDED
TO ADVANCE IN OFF-FARM AGRICULTURAL SUPPLY OCCUPATIONS
BY FACTORED JOB TITLE GROUPS**

<u>Competency Factors</u>	<u>Levels of Training Needed by Factored Job Title Groups</u>				
	<u>Manager</u>	<u>Sales - man</u>	<u>Book- keeper</u>	<u>Techni- cian</u>	<u>Service Worker</u>
Plant Science	High	High*	Med. *	High*	High*
Animal Science	High	High*	Low	Low	High*
Agricultural Mechanics	High	High*	Low	Med.	Med.
Agricultural Business Management	High	High*	High	Med.	Med. *
Business Management and Economics	High*	Low	Low	Low	High*
Sales and Business Skills	High	High*	High	High*	High
Job and Employee Characteristics	High*	Low	Med.	Low	Med.
Employee-Supervisor Relations	High	High*	High	High	High
Building Construction Technology	Med.	High*	Low	Low	Low
Industrial Mechanics	Low	High*	Med. *	Med. *	Low
Industrial Quality Control	Med. *	High*	Low	Med. *	Med. *

* Levels of training needed increased from To Enter to To Advance

TABLE 12

LEVELS OF TRAINING BY COMPETENCY FACTORS NEEDED
TO ADVANCE IN OFF-FARM AGRICULTURAL MECHANICS
 OCCUPATIONS BY FACTORED JOB TITLE GROUPS

<u>Competency Factors</u>	<u>Levels of Training Needed By Factored Job Title Groups</u>				
	<u>Manager</u>	<u>Sales - man</u>	<u>Parts Manager</u>	<u>Book- keeper</u>	<u>Mechanic</u>
Plant Science	High	High	Low	Low	Med.
Animal Science	High	High	Low	Med.*	Med.*
Agricultural Mechanics	High	High	High	Med.*	High*
Agricultural Business Management	High	High	Med.	High	Med.*
Business Management and Economics	High	High	Med.	High*	High*
Sales and Business Skills	High	High*	Med.	High*	High*
Job and Employee Characteristics	High	High*	Med.	Med.*	Med.
Employee-Supervisor Relations	High	High*	High	Med.	High
Building Construction Technology	Low	High*	Med.	Low	Med.
Industrial Mechanics	High*	High*	Low	High*	High*
Industrial Quality Control	Low	Med.*	Low	Low	Med.

* Levels of training needed increased from To Enter to To Advance

TABLE 13

**LEVELS OF TRAINING BY COMPETENCY FACTORS NEEDED
TO ADVANCE IN OFF-FARM FOOD PRODUCTS OCCUPATIONS
BY FACTORED JOB TITLE GROUPS**

<u>Competency Factors</u>	<u>Levels of Training Needed by Factored Job Title Groups</u>				
	<u>Manager</u>	<u>Plant Manager</u>	<u>Sales - man</u>	<u>Livestock Dealer</u>	<u>Service Worker</u>
Plant Science	Low	Low	Low	High*	Low
Animal Science	High	Med. *	High*	High*	Med.
Agricultural Mechanics	Med.	Low	Med. *	High*	Med.
Agricultural Business Management	High	Med. *	High*	High	Med. *
Business Management and Economics	High	Low	High	Med.	Med. *
Sales and Business Skills	High*	High*	High*	High*	Med. *
Job and Employee Characteristics	High	Med. *	High	High*	Low
Employee-Supervisor Relations	High	Med. *	High	High	High
Building Construction Technology	Med. *	Low	Low	Low	Med. *
Industrial Mechanics	Med. *	Med. *	Low	Low	Med. *
Industrial Quality Control	Med. *	Med. *	Low	Low	Med. *

* Levels of training needed increased from To Enter to To Advance

TABLE 14

LEVELS OF TRAINING BY COMPETENCY FACTORS NEEDED
TO ADVANCE IN OFF-FARM FORESTRY OCCUPATIONS
 BY FACTORED JOB TITLE GROUPS

<u>Competency Factors</u>	<u>Levels of Training Needed by Factored Job Title Groups</u>			
	<u>Manager</u>	<u>Technician</u>	<u>Grader</u>	<u>Service Worker</u>
Plant Science	High*	Low	High	Med.
Animal Science	Low	Low	High*	Low
Agricultural Mechanics	High*	High*	High	Low
Agricultural Business Management	High*	Low	High	Low
Business Management and Economics	Low	Med. *	High	Med.
Sales and Business Skills	Med. *	Low	High*	High*
Job and Employee Characteristics	Low	Med.	High	Med. *
Employee-Supervisor Relations	High*	High	High	High
Building Construction Technology	Med. *	Med. *	High	Med. *
Industrial Mechanics	Low	High*	High	Low
Industrial Quality Control	Low	Low	High	Med. *

* Levels of training needed increased from To Enter to To Advance

TABLE 15

**LEVELS OF TRAINING BY COMPETENCY FACTORS NEEDED
TO ADVANCE IN OFF-FARM ORNAMENTAL HORTICULTURE OCCUPATIONS
BY FACTORED JOB TITLE GROUPS**

<u>Competency Factors</u>	<u>Levels of Training Needed by Factored Job Title Groups</u>		
	<u>Manager</u>	<u>Technician</u>	<u>Service Worker</u>
Plant Science	High	High	High
Animal Science	Low	Low	Low
Agricultural Mechanics	Med. *	Med.	Low
Agricultural Business Management	High*	Med. *	Low
Business Management and Economics	High*	High*	Med. *
Sales and Business Skills	High*	High*	Med. *
Job and Employee Characteristics	Low	Med.	Low
Employee-Supervisor Relations	High	High	Med.
Building Construction Technology	Low	High*	Med. *
Industrial Mechanics	Low	High*	High*
Industrial Quality Control	Low	Med. *	Med. *

* Levels of training needed increased from To Enter to To Advance

SUMMARY OF THE STUDY

Generalizations that may be drawn from the findings are:

1. If persons to be hired during the next five years are to have some technical education in agriculture, each school teaching agriculture will have to provide 12 graduates for full-time employment and 6 graduates for part-time employment per year.
2. Employers expect about a fourteen per cent increase in the number of employees needing agricultural competencies in the next five years. This parallels the anticipated expansion in the total labor force.
3. Three occupational areas -- Agricultural Supplies and Equipment, Livestock, Dairy and Poultry Products, and Ornamental Horticulture -- account for 74 per cent of the businesses, 73 per cent of the current employees needing agricultural competencies, and 71 per cent of the employees to be hired in the next five years. Of 163 job titles, 37 account for 75 per cent of new employees, not including professional workers, in the next five years.
4. Agricultural competencies needed are mainly determined by the products handled by the business. Many of the agricultural subjects taught to students preparing for production farming also will be needed by students who enter off-farm agricultural occupations.
5. Salesmanship, human relations, and business management are competencies that are needed by all employees, but in varying degrees. There are many instances in which vocational agriculture may support, or be supported by, other vocational subjects taught.