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By-White, Robert H.; Woodin, Ralph J.

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Descriptors-*AGRICULTURAL TECHNICIANS, CURRICULUM, CURRICULUM RESEARCH, *EDUCATIONAL NEEDS, *EMPLOYMENT OPPORTUNITIES, EMPLOYMENT QUALIFICATIONS, EMPLOYMENT STATISTICS, MANPOWER NEEDS, OCCUPATIONAL INFORMATION, OCCUPATIONAL SURVEYS, *ORNAMENTAL HORTICULTURE, ORNAMENTAL HORTICULTURE OCCUPATION, PROGRAM PLANNING, QUESTIONNAIRES, SCHOOL SURVEYS, TECHNICAL EDUCATION

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The primary purposes of this study were to determine occupational opportunities for ornamental horticulture technicians in Ohio and to propose curriculums for training them. In the first phase, data were collected by questionnaire from 648 percent of 962 potential Ohio employers which was a 50 percent random sample of 1900 employers. In the second phase, a selected sample of programs was analyzed by a jury of 12 industry experts to determine curriculum content. Job titles were identified in landscaping, arboriculture and park management, greenhouse and nursery production, wholesale and retail sales, turf production or management, and floriculture. Age requirements ranged from 19 to 60 with an average minimum of 23 and maximum of 50. Salary averages ranged from a $467 starting to a $696 maximum. Ohio had an estimated need for an average of 262 technicians per year. In eight institutions in seven states selected by seven experts, a study of 21 programs revealed the following common characteristics--(1) length of 18 to 24 months, (2) award of associate degrees, (3) high school graduation admission requirement, (4) supervised work experience of 5 to 12 months, (5) emphasis upon technical subjects, and (6) a minimum if 60 semester hours. Ohio needs were determined to be 16 programs in the six areas. Proposed curriculums for five types of programs, a bibliography, and the questionnaire are included. (JM)

RESEARCH SERIES IN AGRICULTURAL EDUCATION

A Research Report of a Graduate Study.

Issued by
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THE EDUCATION OF ORNAMENTAL HORTICULTURE TECHNICIANS IN OHIO

This summary reports the major conclusions, recommendations, and findings of a recently completed study in Ohio.

The primary purposes of this study were to determine occupational opportunities for technicians in Ohio and to propose curricula for the education of various categories of ornamental horticulture technicians.

A questionnaire was used to collect information on the scope of the industry in Ohio, and about numbers of present and future technicians. Information on selected characteristics of ornamental horticulture technician employment was also obtained in the study. A population of 962 potential employers of ornamental horticulture technicians was selected from a list of over 1900 ornamental horticulture firms or persons in Ohio. Questionnaires were mailed to all members of the population and a usable response of 64.8 per cent was obtained.

A jury of experts, consisting of 12 selected businessmen in ornamental horticulture in Ohio, was used to determine the most necessary technical horticulture topics in the suggested curricula.

Institutions with similar programs regarded as being outstanding in other states were selected for study by a nomination procedure. Features and curricula of the 21 programs in the eight selected schools helped identify the six program types used throughout this study. These

characteristics of selected programs influenced the non-technical subjects in the suggested curricula. Features of the programs and curricula proposed for the State of Ohio were derived from the study of existing programs, Ohio Board of Regents and Ohio Department of Education requirements. These were modified by employer suggestions and the experience of the investigator.

Conclusions

The following conclusions were drawn from the study:

1. Many of the ornamental horticulture firms in Ohio during 1966 employed one or more technicians.

2. An estimated three-fold increase in the number of ornamental horticulture technicians in Ohio from 1966 to 1972 indicates that many more technicians will need to be prepared.

3. For the purpose of specialized educational programs, ornamental horticulture technicians can be classified according to the six types of: arboriculture and park management; floriculture; greenhouse and nursery production; landscape; turf; and general ornamental horticulture.

4. Persons desired by employers for technical positions generally are those that have completed two-year preparation programs, with a minimum of several months of practical work experience in the industry, and between 19 to 60 years of age.

5. Anticipated salary levels for ornamental horticulture technicians provide economic justification for establishing post-secondary educational programs.

6. The demand for ornamental horticulture technicians in Ohio from 1966 to 1972 will justify more than 16 educational programs to prepare the number of technicians needed annually.

7. Ranked in the order of additional technicians needed annually, the greatest number of ornamental horticulture technician education programs should be located in the northeast, followed in order by the northwest, southwest, and central regions of Ohio.

8. Curricula for technicians in ornamental horticulture should include these major characteristics: approximately two years in length; offered on a post-high school level; a minimum of three months of supervised work experience; and a little over half of the instruction devoted to ornamental horticulture, balanced by about 20 to 25 per cent general education and by 20 to 25 per cent in related technical subjects.

9. The method used to select the most important technical topics for inclusion in the proposed curricula was a workable procedure for this study.

10. It is possible to develop promising curricula for the preparation of capable ornamental horticulture technicians within the limits of: available time for instruction, the type of students expected to enroll in technician programs, and the types of training preferred by technician employers.

11. The ratio of about one technician to two professionals in ornamental horticulture will increase as the industry becomes larger and more complex, if sufficient numbers of qualified technicians can be obtained by employers.

Recommendations

The following specific recommendations for ornamental horticulture technician educational programs are based on the data presented in the study. These are proposed as a guide for planning and action in this segment of technical education in Ohio.

Recommendations for curricula for ornamental horticulture technicians

Six ornamental horticulture technician education curricula are presented in the study. These should be used as departure points in providing the most effective technical education possible for the industry in Ohio. Four types of ornamental horticulture technician training programs should be implemented as soon as possible. These four program types are: landscape, greenhouse and nursery, general ornamental horticulture, and arboriculture.

Common courses.--The pattern of offering courses common to more than one program type during the same quarter in the program is regarded as a desirable feature. This will allow greater efficiency in program operation, and induce desirable interaction between students in different programs.

Duration.--The minimum amount of time for the programs should be 21 months. Students should be scheduled continuously from matriculation until completion except for vacation periods. The time limitation and the orientation to the world of work on the part of technical students supports the importance of scheduling the student loads approximately as proposed.

Work experience.--Supervised work experience is a critical feature in the programs. The proposed amount was a minimum acceptable amount for all students. Even with four months, graduates without prior ornamental horticulture work experience should be encouraged to seek help from school instructional personnel during the first year of employment.

Other features.--Approval to grant associate degrees may be desired for the prestige inherent with this degree. The approval of the Department of Education and the Board of Regents should be considered for any contemplated programs. Major financial support and technical assistance may be obtained from the Department of Education. The Board of Regents administers the associate degree and the Board may provide additional financial support for approved programs.

Transfer credit should not be allowed to influence curriculum modification. The primary objectives of the programs should remain in sight at all times.

Numbers of recommended programs and their locations

Sixteen programs are recommended as a minimum number to provide the needed number of qualified ornamental horticulture technicians in Ohio. The 16 suggested programs should be established in areas where the need exists, all other factors being equal. This will provide advantages in supervised work experience, job orientation, and coordination or communication with industry. The programs should be in the regions specified, and should be located where facilities, space, and industry support can be maintained.

The locations of the recommended programs generally correspond to areas of greatest anticipated increase in number of technician positions. Therefore, six programs are recommended for the northeast region and fewer programs are recommended for the other regions, except that none would be located in the southeast region.

Recommendations for further study

Recommendations for additional study are an out-growth of this study and are offered as guides to future researchers. Some of the areas of needed research include:

1. Additional study of the occupational opportunities for technicians in Ohio in turf production and management, and in floriculture.

2. To determine factors that retard establishment of needed educational programs, and suggest procedures to surmount these barriers to educational progress.

3. To establish model programs of teacher education for emerging fields of technical education.

4. To establish and refine workable and reliable methods of program evaluation as aids to improvement of technical education programs.

5. To study other emerging fields of agriculturally related technical occupations in Ohio.

6. Additional study to synthesize the available information and studies on agriculturally related technical education in Ohio into a coordinated, efficient plan for technical agricultural education.

7. A follow-up of this study in five years to provide a basis for continued educational planning and to provide necessary curriculum revisions for ornamental horticulture technician education programs.

Summary of the Study

Ornamental horticulture, as an industry in Ohio, had grown rapidly during the decade prior to this study. This growth was reflected in the increase in numbers of businesses and in increased size of many individual businesses. Several factors had brought about this industry growth and concomitant changes in the operation of individual firms making up the industry. Some of the major factors were: increasing population in Ohio; a strengthening economy; increasing urbanization; and as with most industries during this era, rapid strides in technology.

Business growth and technology had changed many individual firms from small sideline businesses for farmers to full-fledged, year-round progressive firms. Rapid expansion created a growing need for the relatively unknown ornamental horticulture technician. Although the few schools that offered this type of post-high school education occasionally had used this term, only in the past half decade had the word come into use with some consistency of meaning.

Enactment of the Vocational Education Act of 1963 had opened new vistas in agricultural education. Vocational and technical education in ornamental horticulture had become the responsibility of agricultural education.

Little information was available regarding the need for post-high school educational programs in Ohio in the area of ornamental horticulture. There had not been any studies of the number of technicians needed, nor of the types of curricula to best prepare ornamental horticulture technicians. By early 1967, progress had been made in this area of

agriculturally related technical education, as evidenced by the horticulture program established during 1966.

Post-high school agricultural programs supported by the state department of education were offered in only four location in Ohio by 1966. In addition to the single horticultural program in the northern part of the state that was initiated in 1966, three other schools were providing instruction in various agriculturally related occupations. None of the three other institutions provided horticultural instruction, although one or two had made overtures in this direction.

The emerging role of the technician implied a specialized curriculum to best prepare him during the two years available for this type of education. Considerable differences existed between similar programs located elsewhere. It could not be assumed that curriculum designed in other parts of the nation was necessarily suitable for the needs of technicians in Ohio.

Economic justification for technician programs was needed. Besides the need for technicians, assurance was needed that technician salaries would be high enough to attract students and provide adequate long-range economic returns to the state to justify providing this type of technical education.

Purpose

The primary purpose of this study was to determine occupational opportunities for technicians in Ohio and to propose curricula for various categories of ornamental horticulture technicians.

Objectives

The objectives of this study were to:

1. Determine current numbers of ornamental horticulture technicians employed in Ohio.

2. Determine acceptable age characteristics for employment and wage characteristics for various categories of ornamental horticulture technicians.

3. Determine projected numbers of employment opportunities in Ohio for ornamental horticulture technicians by job categories and by geographic areas.

4. Identify and evaluate the content of courses in the curricula of selected current ornamental horticulture technician programs offered in the United States outside of Ohio.

5. Formulate suggested curricula for use in appropriate categories of post-high school ornamental horticulture programs in Ohio.

6. Provide recommendations of the numbers, types, and locations of ornamental horticulture technician programs needed in Ohio by 1972 based on the need for technicians in the industry.

Scope of the study

The scope of this study included only the ornamental horticulture industry in Ohio. The definition of ornamental horticulture used excluded vegetable, fruit, and berry production. Retail florist establishments were not included in the study.

Methodology

Subsequent to the review of literature relating to this problem, the procedures used to collect information were separated into two major efforts. One aspect of the total activity centered around the identification of and the need for technicians in ornamental horticulture. The remainder of the procedures were concerned with the nature of related educational programs and proposed curricula for Ohio.

The population consisted of 962 potential employers of technicians selected from more than 1900 ornamental horticulture firms or persons, and other possible technician employment sources. A sample of 50 per cent of the population was selected by use of the random numbers table. The five regions of Ohio used by the Ohio Board of Regents were used for reporting purposes. Questionnaires were provided with appropriate cover letters and mailed to all persons in the sample. Two follow-up letters at approximately 10-day intervals to non-respondents resulted in a return of 64.8 per cent usable questionnaires.

Comparison of the characteristics of respondents to non-respondents was accomplished by randomly selecting ten per cent of the non-respondents and contacting them by telephone. Except for total number of employees, features of both groups were similar thus providing a basis for projection to the population of the study.

The second phase of activity involved educational programs and curricula and was initiated by selecting related programs in other states. Seven knowledgeable experts in post-secondary ornamental horticulture cooperated by nominating successful programs. Eight institutions received

sufficient nominations for inclusion in the list of institutions selected for study. Catalogs and curricular materials were obtained from these institutions, studied, and analyzed. This analysis identified the six types of programs used in this study. Non-technical courses included in the suggested curricula were influenced to a considerable degree by patterns in the existing programs.

A jury of experts participated by assigning an order of importance to technical topics and by providing opinions regarding work experience. The jury consisted of 12 leaders in the ornamental horticulture industry in Ohio. Their perception of the relative importance of technical topics for each of the six identified types of technicians provided the primary basis for technical courses in the suggested curricula.

Kendall's Coefficient of Concordance W was applied to rankings for each of the types of programs and tested for significance by chi square.

Table 1 provides statistical data for the rankings of the six types of programs by the jury members. The degree of agreement for ranked topics in four of the program types were significant at the 95 per cent level of confidence or greater. The number of topics ranked for each type of program varied from 21 to a maximum of 27.

TABLE 1

ANALYSIS OF DEGREE OF AGREEMENT FOR TECHNICAL TOPICS RANKED IN OHIO FOR SIX TYPES OF ORNAMENTAL HORTICULTURE TECHNICIAN PROGRAMS

Type of Program	Number of Topics Ranked	Number of Rankings	Value of W	X^2 Level
Arboriculture and Park Management	21	4	.48	.01
Floriculture	23	3	.65	.01
Greenhouse and Nursery	27	3	.53	.05
Landscape	21	4	.35	.20
Turf	25	4	.62	.001
General Ornamental Horticulture	25	3	.47	.10

Additional Findings

Scope of the industry

The population was limited to 962 ornamental horticulture firms in Ohio. Many respondents listed more than one major activity for an average of 1.9, or almost two major activities per firm. Wholesale or retail was reported most frequently, followed by landscape and then by nursery or greenhouse operations. Table 2 gives the percentage of activity of each category based on a total of 100 per cent.

TABLE 2

INVOLVEMENT OF FIRMS IN ORNAMENTAL HORTICULTURE IN OHIO ACCORDING TO MAJOR BUSINESS ACTIVITY

Type of Activity	Number of Firms		
	Number Reported from Sample	Per Cent of Total	Estimated Number in Ohio
Wholesale or Retail	161	30.3	494
Landscape Operation	140	26.4	430
Nursery or Greenhouse Operation	122	23.0	375
Arboriculture or Park Management	43	8.0	132
Other	23	4.3	71
Floriculture	21	4.0	64
Turf Production or Management	21	4.0	64
Total	531	100.0	1630

Almost 16,000 employees worked either full-time or part-time in ornamental horticulture in Ohio during 1966 based only on the selected population. The number of employees in ornamental horticulture in Ohio paralleled the population rank of each of the five identified regions used for this study. The greatest number of employees were located in northeastern Ohio, as contrasted to relatively few employees in the southeastern part of the state. Table 3 presents data for numbers of employees in each of the five regions. Figure 1 offers the data for number of employees presented in a geographical display.

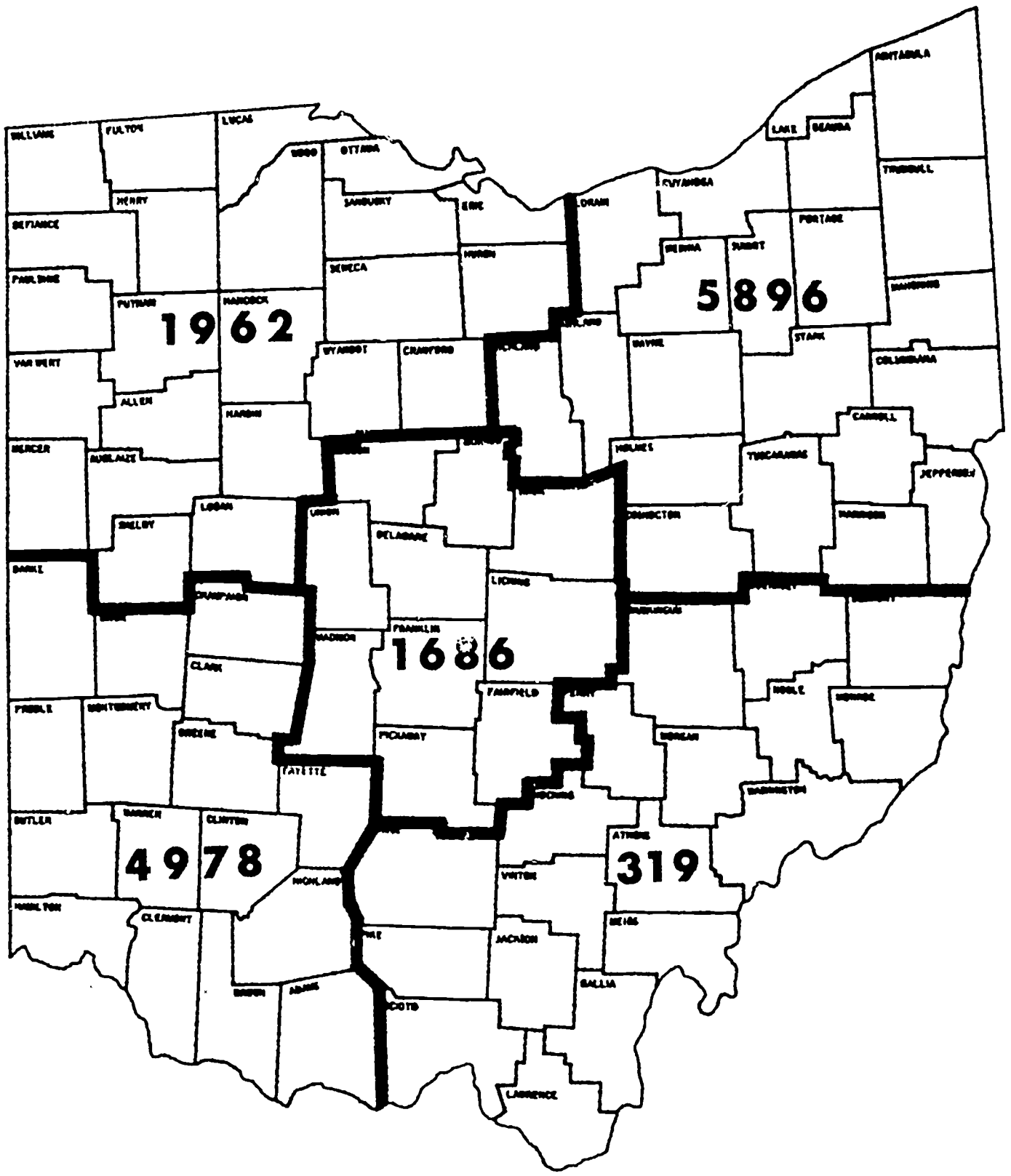
TABLE 3

NUMBER OF EMPLOYEES IN ORNAMENTAL HORTICULTURE
IN OHIO, BY REGION

Regions	Number in Labor Force Reported from Sample			
	Full-time	Part-time	Total	Estimated Total
Northeast	909	1679	2588	5896
Southwest	1100	1085	2185	4978
Northwest	294	567	861	1962
Central	497	243	740	1686
Southeast	84	56	140	319
Combination	342	50	392	893
Total	3226	3680	6906	15734

FIGURE 1

ESTIMATED NUMBER OF EMPLOYEES ENGAGED IN ORNAMENTAL HORTICULTURE IN OHIO DURING 1966, BY REGION



Estimated employees working in two or more regions - 893.

Total estimated employees in Ohio during 1966 - 15734.

Technicians in ornamental horticulture during 1966

There were an estimated 807 ornamental horticulture technicians in Ohio during 1966 among firms comprising this study. Based on 263 actual reported technicians, the projection to the population resulted in the estimate of 807, of which approximately 40 per cent were located in the northeast region. The southeast region accounted for less than 2 per cent of the technicians in Ohio, with the southwest being second lowest in numbers with only 11 per cent of all reported technicians.

Two out of five of the reported technicians were engaged in landscaping operations, constituting the largest group of technicians of all six types. Three other types of technicians were approximately equal in reported numbers and accounted for virtually all of the remaining 60 per cent. These other three major types of technicians were: arboriculture and park management, wholesale or retail, and nursery and greenhouse production.

The technical level positions referred to in this study may be more easily visualized by use of job titles. Many respondent employers provided brief job descriptions or descriptive phrases rather than job titles to identify their technicians. Table 4 provides typical job titles reported according to six identified types of ornamental horticulture technicians. No attempt was made to categorize job titles by frequency of listing, or by numbers of technicians within each job title.

TABLE 4

TYPICAL JOB TITLES OF ORNAMENTAL HORTICULTURE TECHNICIANS IN OHIO BY TYPE

Type of Technician	Typical Assigned Job Titles
Landscape	Landscape foreman Maintenance foreman Landscape supervisor Landscape salesman Highway landscape foreman Construction supervisor Maintenance gardner Equipment operator foreman
Arboriculture and Park Management	Superintendent of grounds Groundskeeper Tree crew foreman Forestry aid Forestry inspector Park maintenance foreman Parks superintendent Line clearance supervisor
Greenhouse and Nursery Production	Greenhouse foreman Nursery foreman Nursery propagator Field foreman Grower Shipping supervisor Storage manager Nursery manager
Wholesale and Retail Sales	Horticulture salesman Sales manager Sales representative Salesman Wholesale nursery salesman Garden center supervisor Assistant manager
Turf Production or Management	Greenskeeper Golf course superintendent
Floriculture	Rose consultant Floral designer

Minimum and maximum age

The data for minimum and maximum age indicate that age would not be a restricting condition of employment within the broad range of approximately 19 to 60 years. The average minimum acceptable age for initial employment in a technical position was about 23, with an average standard deviation of 4 years. The average maximum age was almost 50, with a standard deviation of 10 years.

As expected by the investigator, the minimum age displayed less variation than did the maximum age. The demand for technicians was so great that several employers reported "no maximum," and numerous replies were for persons aged 60 and over. Table 5 offers the data for minimum age.

Technician salaries

The average estimated starting salary for ornamental horticulture technicians ranged from $456.00 to well over $500.00 monthly. Wholesale or retail technicians with the lowest starting salary had one of the highest maximum salaries with an average of over $750.00 monthly. The average technician could anticipate a maximum salary of approximately $700.00, with some employers estimating up to $1,400.00 as the maximum monthly salary for technicians.

Table 6 lists the monthly starting and maximum salaries for ornamental horticulture technicians by each of the six types. The data are rounded to the nearest whole dollar.

TABLE 5

MINIMUM REPORTED ACCEPTABLE AGE FOR EMPLOYMENT OF SIX TYPES OF ORNAMENTAL HORTICULTURE TECHNICIANS IN OHIO, 1966

Type of Technician	Number Reported	Minimum Acceptable Age		
		Range	Standard Deviation	Mean
Landscape	57	18-35	3.4	22.7
Greenhouse and Nursery Production	37	18-35	4.1	24.0
Wholesale or Retail	37	18-30	3.1	22.3
Arboriculture and Park Management	14	18-27	2.5	23.3
Turf Production or Management	5	24-30	6.8	25.6
Other	4	21-30	3.5	24.5
Floriculture	3	20-35	6.8	25.3
Total	157			
Weighted Mean				23.15

TABLE 6

REPORTED SALARIES FOR ORNAMENTAL HORTICULTURE TECHNICIANS IN OHIO, 1966

	Starting Employment			Maximum Monthly Salaries		
Type of Technician	Number	Standard Deviation	Mean	Number	Standard Deviation	Mean
Landscape	58	$ 89	$462	57	$219	$692
Greenhouse and Nursery	39	82	458	39	180	677
Wholesale or Retail	35	85	457	35	267	759
Arboriculture	14	104	498	11	105	570
Turf	5	120	528	5	149	710
Floriculture	3	47	466	3	62	633
Total	154			151		
Weighted Mean			$467			$696

Anticipated number of technicians

The 800 ornamental horticulture technicians in Ohio during 1966 were expected to increase to almost 1600 by 1969. By 1969, landscape technicians were estimated to outnumber any other type by almost two to one. Even with this anticipated two-fold increase in three years, turf and floriculture will have very few technicians according to the survey.

By 1972 there will be approximately 2180 ornamental horticulture technician positions in Ohio, with the largest group of technicians working

in landscaping. Table 7 gives the estimated number of full-time ornamental horticulture technicians for 1972, according to technician type. The northeast region will have over twice as many ornamental horticulture technicians by 1972 as any of the other four regions in Ohio. Three other regions anticipated approximately equal numbers of technician positions, excepting the southeast portion of the state. By 1972 the southeast area of Ohio will still have relatively few technicians based on employer predictions. Figure 2 depicts the estimated numbers of ornamental horticulture technicians in each of five Ohio regions by 1972.

Additional technicians needed

The estimate of additional technicians needed in Ohio by 1969 averaged 262 per year over the 1966 to 1969 three-year period. The greatest need for technicians was in landscape, with a total expected increase of 493 positions for an average increase of 82 technicians per year during the six years from 1966 to 1972. Wholesale and retail and greenhouse and nursery production were the two types of ornamental horticulture technicians with the next greatest increase. The data for additional technicians needed according to type are presented in Table 8.

The number of additional ornamental horticulture technicians needed was also analyzed by the five geographical areas of Ohio. Corresponding to the relatively large percentage of firms in northeast Ohio, the largest number of additional technicians were encountered in this area. The areas with smaller numbers of technicians during 1966 reported comparatively greater anticipated increases in technician positions during the six-year span from 1966 to 1972, thus partially equalizing technician numbers among

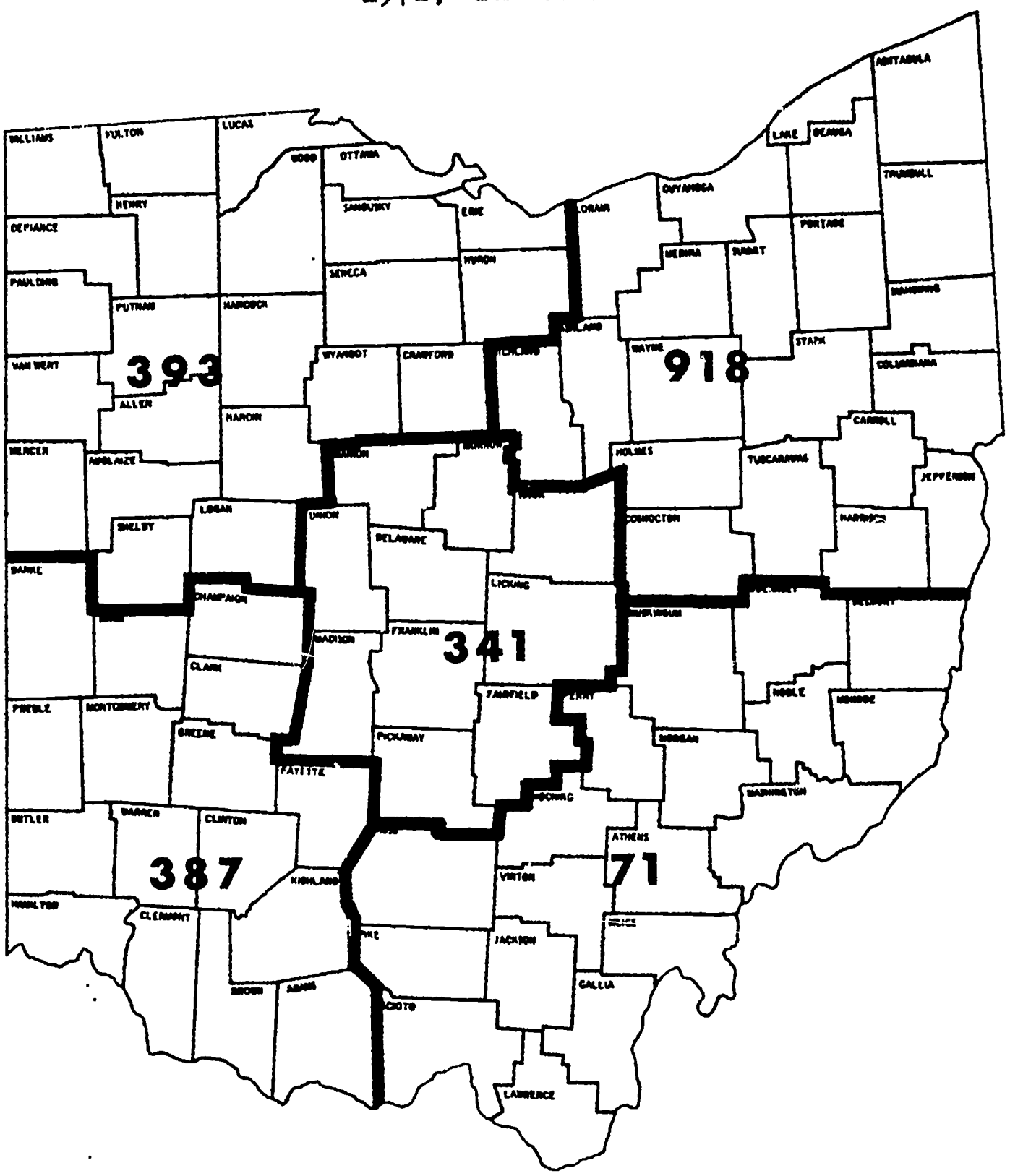
TABLE 7

NUMBER OF FULL-TIME ORNAMENTAL HORTICULTURE TECHNICIAN POSITIONS IN OHIO BY TYPE, 1972

Type of Technical Position	Number of Positions		
	Reported Number From Sample	Per Cent of Total	Estimated Number in Ohio
Landscape Operations	269	37.9	825.8
Wholesale or Retail	189	26.6	580.2
Nursery and Greenhouse Production	135	19.0	414.5
Arboriculture and Park Management	87	12.3	267.1
Turf Production or Management	11	1.5	33.8
Floriculture	10	1.4	30.7
Other	9	1.3	27.6
Total	710	100.0	2179.7

FIGURE 2

ESTIMATED NUMBER OF ORNAMENTAL HORTICULTURE TECHNICIAN POSITIONS IN OHIO DURING 1972, BY REGION



Estimated technician positions during 1972 involving two or more regions - 71.

Total estimated technician positions during 1972 - 2180.

TABLE 8

ADDITIONAL ORNAMENTAL HORTICULTURE TECHNICIANS NEEDED IN OHIO BY TYPE

Type of Technician	Estimated Number of Technicians in Ohio					
		1966-69 Increase		1966-72 Increase		
	1966	Total Increase	Average Per Year	Total Increase	Average Per Year	Per Cent
Landscape	332	280	93.3	493	82.2	148
Wholesale or Retail	150	219	73.0	430	71.7	286
Greenhouse or Nursery Production	141	184	61.3	274	45.6	194
Arboriculture or Park Management	157	70	23.3	110	18.3	70
Turf Production or Management	12	16	5.3	22	3.6	183
Floriculture	6	9	3.0	25	4.2	417
Other	9	9	3.0	19	3.2	211
Total	807	787	262.2	1372	228.8	170

areas. The average anticipated increase in Ohio was 170 per cent over the six-year period. Table 9 gives the prediction of additional ornamental horticulture technicians needed in Ohio for five geographical regions.

TABLE 9

ADDITIONAL TECHNICIANS NEEDED IN ORNAMENTAL HORTICULTURE IN OHIO BY REGION

Region	Projected Number of Technicians					
		1966-69 Increase		1966-72 Increase		
	1966	Total	Average N Per Year	Total	Average N Per Year	Per Cent
Northeast	319	347	115.7	599	100.0	156
Central	175	83	27.7	165	27.5	94
Southwest	157	138	46.0	230	38.3	146
Northwest	89	181	60.3	304	50.7	341
Southeast	9	31	10.3	62	10.3	689
Combination	58	7	2.3	13	2.2	22
Total	807	787	262.3	1373	228.8	170

Selected program characteristics

Eight institutions were selected from the schools nominated by seven experts in the area of ornamental horticulture technical education. The selected schools represented seven states, a list of the institutions is given in Table 10. The members of the experts who assisted in selection of the schools is given in Appendix B.

TABLE 10

SELECTED INSTITUTIONS OFFERING TECHNICAL LEVEL, POST-HIGH SCHOOL PROGRAMS IN ORNAMENTAL HORTICULTURE

Institution	Location	Number of Technical Program
California State Polytechnic College	San Luis Obispo, California	1
Cobleskill Agricultural and Technical College	Cobleskill, New York	2
DuPage School of Horticulture	Chicago, Illinois	2
Farmingdale Agricultural and Technical College	Farmingdale, New York	4
Michigan State University	East Lansing, Michigan	3
Modesto Junior College	Modesto, California	3
Pennsylvania State University	University Park, Pennsylvania	2
Stockbridge School of Agriculture	Stockbridge, Massachusetts	4

Examination of the 21 programs among the eight selected institutions revealed several common features. Table 11 provides an overview of the generally accepted practices in the institutions that were identified in this study.

TABLE 11

SELECTED PROGRAM CHARACTERISTICS OF 21 ORNAMENTAL HORTICULTURE TECHNICIAN PROGRAMS

Selected Characteristics	Times Observed in 21 Programs	
	Number	Per Cent
Program length of 18 to 24 months	20	95
Award Associate of Science or Associate of Arts Degree	10	47
Require High School certificate or equivalent for admission	21	100
Include supervised work experience for 5 to 12 months	12	57
Provide more instruction in technical courses than all other subjects	21	100
Equivalent of 60 semester hours as minimum for completion	16	76

Curricula for ornamental horticulture technicians

Curricula were proposed for the six identified types of ornamental horticulture technicians. The suggested curricula were founded upon the analysis of rankings of ornamental horticulture topics by leaders in the industry; the experience and practices of successful, on-going programs in other states; Ohio Department of Education and Ohio Board of Education standards; and the experience of the investigator.

The curricula were composed of a balance of technical, related technical, and general education courses. Each technical topic was

considered as a course and the amount of credit, classroom, and laboratory hours were assigned to each course. General education courses were identified by appraisal of the content of courses in the selected other programs. General education and related technical courses were listed to comply with Ohio requirements followed by as many of the technical topics as could be included within each of the curricula. Each course was assigned to the most appropriate quarter in consideration of several criteria. These influencing criteria were: sequential appropriateness within the curriculum, seasonal appropriateness for the course, allowable student load per quarter, and consideration for providing courses common to more than one curriculum during the same quarter. Minor adjustments permitted the construction of curricula that bear every evidence of being feasible and successful.

Table 12 gives the curriculum for landscape technicians, while the other five curricula are offered in the Appendix. All of the curricula are arranged with courses common to more than one program offered during the same quarter. Each of the curricula provide approximately 105 quarter hours of credit, require a total of 21 months of instruction, and include approximately four and one-half months of supervised practical work experience.

Educational programs needed in Ohio

The number of programs needed in Ohio to provide qualified graduates for available positions were calculated on a class size of 20 students. This number of programs was based on the assumption that no more than 15 of

TABLE 12

CURRICULUM FOR LANDSCAPE TECHNICIANS IN OHIO

Landscape - First Year	Hours Per Week: Classroom	Hours Per Week: Lab.	Credit Hours
Fall Quarter			
Botany	3	2	4
Agricultural mathematics	5	0	4
Tree identification	2	6	5
Landscape gardening	4	3	4
	14	11	17
Winter Quarter			
Written communication	4	2	4
Landscape plans	2	3	4
Psychology	4	0	3
Soils	3	4	4
Political science	4	0	3
	17	9	18
Spring Quarter			
Horticulture theory and practices	2	2	3
Plant nutrients and fertilizers	3	2	4
Salesmanship	3	2	3
Landscape maintenance	2	2	3
Turf management	1	6	4
	11	14	17
Summer Quarter			
Supervised work experience	0	40	10

TABLE 12--Continued

Landscape - Second Year	Hours Per Week: Classroom	Lab.	Credit Hours
Fall Quarter			
Records and bookkeeping	3	3	4
Horticultural science	4	2	3
Turf problems	2	2	3
Nursery practices	1	4	3
Contracts and specifications	3	2	3
	13	13	16
Winter Quarter			
Speech	3	2	3
Basic economics	3	2	4
Personnel management	4	2	4
Agricultural power units	2	4	4
Sociology	3	0	3
	15	10	18
Spring Quarter			
Supervised work experience (6 weeks)	0	40	6
Landscape construction (4 weeks)	20	0	4
	20	40	10
Total Credit Hours			106

the 20 students who start a class would eventually be placed on a job in Ohio. The figures also assumed a drop-out rate of approximately three students per program over the two-year period. The two students remaining between the 3 drop-outs and the 15 graduates of a class of 20 recognize those graduates not placed in technical positions in Ohio for various reasons.

Sixteen ornamental horticulture technician programs were believed needed in Ohio by 1969 based on the estimated rate of 15 employable graduates per year from each program. These should be considered as permanent, continuing programs enrolling the recommended 20 students each year. These 16 programs should include six programs in landscape, five in general ornamental horticulture, four in greenhouse and nursery production, and one in arboriculture and park management. The number of recommended programs of each type for each region is listed in Table 13 and geographically presented in Figure 3.

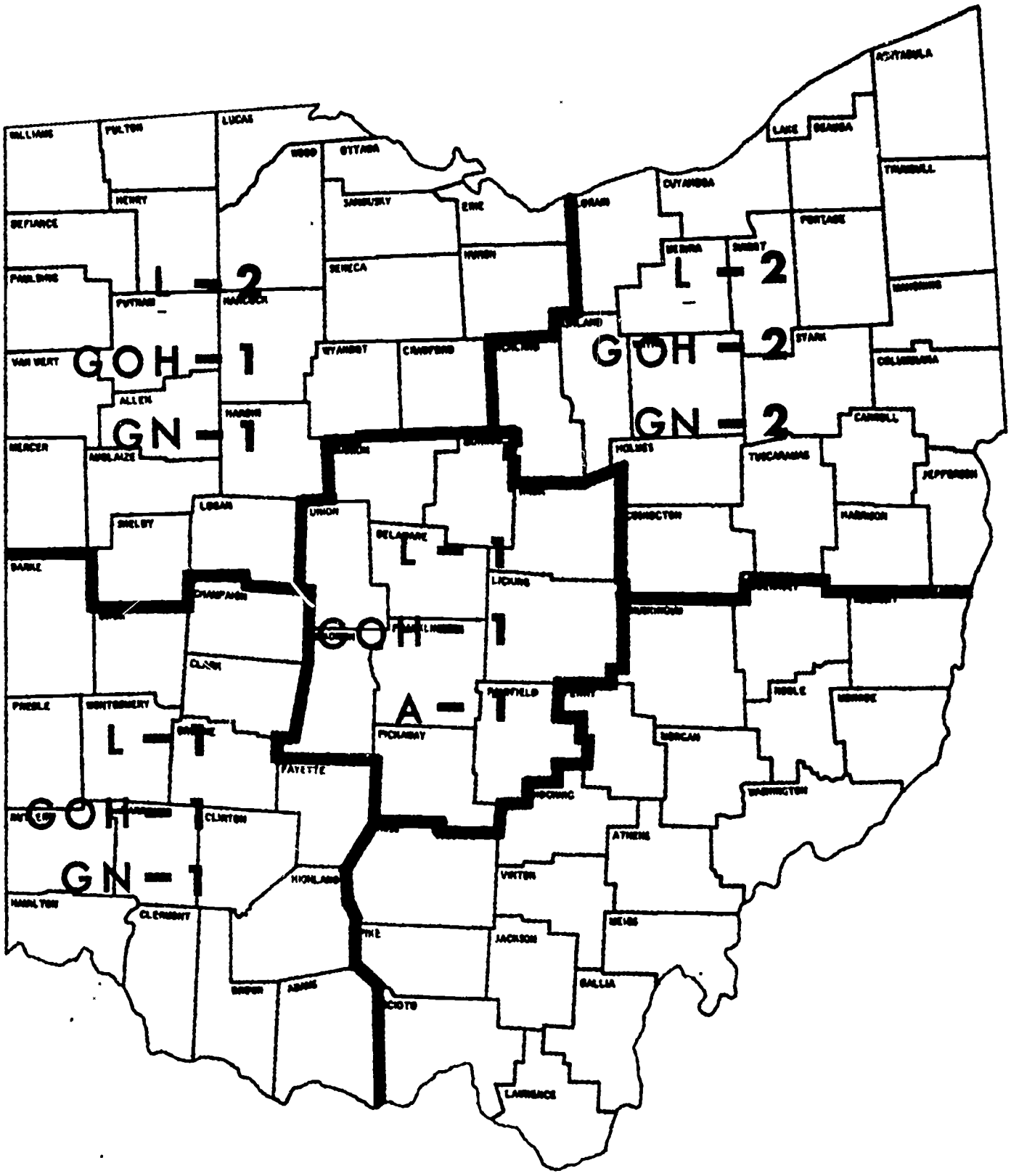
TABLE 13

ORNAMENTAL HORTICULTURE TECHNICIAN PROGRAMS NEEDED IN OHIO BY 1969

Region in Ohio	Recommended Technician Programs	
	Number	Type
Northeast	2	Landscape
	2	Greenhouse and nursery
	2	General ornamental horticulture
Northwest	2	Landscape
	1	Greenhouse and nursery
	1	General ornamental horticulture
Southwest	1	Landscape
	1	Greenhouse and nursery
	1	General ornamental horticulture
Central	1	Arboriculture and park management
	1	Landscape
	1	General ornamental horticulture
Total in Ohio	16	

FIGURE 3

NUMBER OF ORNAMENTAL HORTICULTURE TECHNICIAN EDUCATION PROGRAMS NEEDED IN OHIO BY 1969



Legend:

L = Landscape
GOH = General ornamental horticulture
GN = Greenhouse and nursery
A = Arboriculture and park management

APPENDIX A

DIRECTIONS FOR COMPLETING THIS QUESTIONNAIRE

This study is being conducted in two parts. Part I, of which your questionnaire is a vital part, is designed to gather information about workers in ornamental horticulture in Ohio, with emphasis on technical level employees. Part II of this study will be concerned with the educational needs of technical level workers and is dependent upon the return of this questionnaire.

Please review the various job positions within the labor force of your firm or organization and determine the number of workers you have according to the guide provided.

For the purposes of this study, ornamental horticulture is defined as any aspect of horticulture exclusive of food production, such as vegetable, fruit, or berry production.

GUIDE FOR THE CLASSIFICATION OF PERSONNEL ACCORDING TO THE LEVEL OF PREPARATION

Professional Level:

This level normally requires several years of formal education concerned with theoretical concepts as well as practical use. A license, certification or registration is normally needed. Examples include: agricultural engineers, certified public accountants, plant pathologists, and graduate horticulturists.

Managerial Level:

This level involves policy-making, planning, supervising, coordinating and guiding, usually through intermediate supervisors. Examples include: managers, presidents, executive secretaries and supervisors.

Technical Level:

This level requires sufficient skills and theory to provide a high level of competence and bridge the gap between skilled workers and professional personnel. One to three years of education beyond high school is generally required. Technicians may be highly skilled in production or other areas, or may be strongly oriented toward management skills. Examples include: landscape foremen, horticultural salesmen, nursery propagator foremen, golf course assistant superintendents, and sales technicians.

Skilled Level:

This level requires a high degree of skill and some knowledge of work processes, both usually learned through work experience and/or apprenticeship programs. Examples include: skilled plant propagators, skilled salespersons, and greenhouse supervisors.

Semi-Skilled Level:

An occupational level which requires a fairly high degree of skill within a fairly well defined work routine. These are typically operations requiring alertness, in which performance lapses would cause extensive damage to product or equipment. Examples include: tractor drivers, machine operators, truck drivers, general sales clerks, and experienced greenhouse workers.

Unskilled Level:

This level of employment requires no formal training or experience. Work is predominately manual and routine, and requires little or no independent judgment. Examples include: truck loader, laborer, clean-up man, and night watchman.

Section 1.

1.1 Schedule Number _____

1.2 Firm Name _____

1.3 County _____

1.4 Your Name _____

1.5 Major business activity of firm (check the most appropriate category).

1 ____ Turf production
2 ____ Turf management
3 ____ Landscape services
4 ____ Arboriculture
5 ____ Nursery production
6 ____ Greenhouse production
7 ____ Wholesale
8 ____ Retail
9 ____ Floriculture
10 ____ Combination (specify major areas) _____
11 ____ Other (specify) _____

Section 2.

Indicate the total number of employees in your firm or organization including yourself, then separate these into full-time and part-time positions. In each column, separate the persons in 2.11 into the most appropriate categories according to occupational level. Definitions of occupational levels are on previous page. (Note: if you are part of a large, non-horticultural organization or firm, record only the personnel concerned in some way with horticulture.)

Level of Occupations	Full-Time 1966	Part-Time 1966 *
2.11 Total number of employees this year (All levels)	_____	_____
2.12 Professional	_____	_____
2.13 Managerial	_____	_____
2.14 Technical	_____	_____
2.15 Skilled	_____	_____
2.16 Semi-skilled	_____	_____
2.17 Unskilled	_____	_____

* Part-time workers are defined as those persons who work 6 months or less, or 20 hours per week or less all year.

If you have listed one or more employees in 2.14 please complete the few remaining sections.

Section 2. (Continued)

List job titles or brief job descriptions for technical level persons employed during 1966.

	Title	Number of persons with this title
2.21	_____	_____
2.22	_____	_____
2.23	_____	_____
2.24	_____	_____
2.25	_____	_____

(Continue in section 5 if extra space is needed for additional titles)

Section 3.

The purpose of this section is to secure an estimate of the number of technicians needed for specified years. Begin by: (1) listing the total number of full-time technical employees at the top of each column, then (2) place each individual in the most appropriate area below. For 1969 and 1972 include all positions presently filled plus all anticipated positions.

Number of Full-Time Technical Level Workers Needed

Areas of Responsibility	1966 Number Employed	1969 Number Needed	1972 Number Needed
3.1 Total of all Technical positions	_____	_____	_____
Areas			
3.2 Turf production or management	_____	_____	_____
3.3 Landscape operations	_____	_____	_____
3.4 Arboriculture or park management	_____	_____	_____
3.5 Nursery or greenhouse	_____	_____	_____
3.6 Wholesale or retail sales	_____	_____	_____
3.7 Floriculture	_____	_____	_____
3.8 Other (specify)	_____	_____	_____
3.9 All part-time positions (Not counted above, include all areas)	_____	_____	_____

Section 4.

If you were hiring a qualified technical level person, what is the minimum and maximum age you would consider for this position?

		(This column for another type of technician, if needed)
4.1 Type of position	_____	_____
4.2 Minimum starting age	_____	_____
4.3 Maximum starting age	_____	_____

For the positions above, what would be the starting salary you could offer to a well qualified individual, and what is the monthly maximum that the person could expect to earn in that position?

	(Same type technician as directly above)	(Same type technician as directly above)
4.4 Type of position	_____	_____
4.5 Monthly starting salary	_____	_____
4.6 Monthly maximum salary	_____	_____

Section 5.

5.1 Any additional comments you would like to add regarding future opportunities for horticultural technicians.

Please complete and mail immediately to:

Robert H. White
The Ohio State University
Department of Agricultural Education
2120 Fyffe Road
Columbus, Ohio 43210

Thank you very much for your cooperation. By your sincere effort you have contributed toward the improvement of education in Ohio.

APPENDIX B

EXPERTS IN POST-SECONDARY ORNAMENTAL HORTICULTURE EDUCATION WHO NOMINATED INSTITUTIONS FOR STUDY

Person	Position
F. Raymond Brush	American Association of Nurserymen Washington, D.C.
Paul E. Hemp	Associate Professor Agricultural Education Department University of Illinois
K. W. Reisch	Professor, Horticulture Department The Ohio State University
Ralph R. Smalley	Chairman, Ornamental Horticulture Cobleskill Agric and Tech College
Ernest A. Tarone	Chairman, Agriculture Department Modesto Junior College
Carl Totemier, Jr.	Director, DuPage School of Horticulture
Ralph J. Woodin	Professor, Agricultural Education Department The Ohio State University

APPENDIX C

MEMBERS OF THE JURY OF EXPERTS WHO RANKED TECHNICAL TOPICS AND AREAS OF SPECIALTY FOR EACH JURY MEMBER

Person	Location in Ohio	Areas of Specialty[a]					
		A	F	GN	L	T	GOH
Paul Aukerman	South Vienna			*	*		*
Harold Barnes	Huron		*				*
Lewis Bookwalter	Springfield			*			
H. Burkhardt	Fairview			*	*		
Robert Cole	Circleville						*
Walter Engel	Columbus		*				
John Gerlach	Cleveland	*			*	*	
Alfred Hoffman	Columbus	*					
Richard Mallett	Rocky River	*				*	
James Simmons	Marysville	*				*	
John Spotnik	Leroy				*	*	
Philip Ulery	Springfield		*				

[a]Code
A = Arboriculture and Park Management
F = Floriculture
GN = Nursery and Greenhouse Production
L = Landscape
T = Turf Production or Management
GOH = General Ornamental Horticulture

APPENDIX D

PROCEDURE FOR RANKING TECHNICAL TOPICS

1. Take a group of slips, make certain you have a place to work, and spread them out in front of you with the title card in a prominent place.

2. Sort the cards into two or three groups according to how important a knowledge of the topic is to that type of technician. You may be able to temporarily sort out some topics and thus make two groups, or you may wish to have a group of "absolutely necessary," a second group of "important" topics, and a third group of "least important" topics.

3. Move the cards to place them in position starting with the most important and ending with the least important topic. If necessary, you can even have a few ties.

4. Very plainly number them according to 1 = most important, 2 = next most important, and so on until you run out of slips. Any topics in a tie position should all have the same number. For example, a list might read 1, 2, 3, 3, 4, 5, 6, 6, 7, 8, and so on.

5. For statistical reasons it is very important that all topics in a group be ranked and numbered.

6. Place the slips back in an envelope and seal it.

7. Open the next envelope and repeat the procedure, keeping in mind that the technician and his needs may be changed as you consider a different type of technician.

APPENDIX E

PROPOSED CURRICULA FOR FIVE TYPES OF POST-SECONDARY ORNAMENTAL HORTICULTURE TECHNICIAN EDUCATION PROGRAMS

CURRICULUM FOR ARBORICULTURE AND PARK MANAGEMENT TECHNICIANS IN OHIO

Arboriculture and Park Management - First Year	Hours Per Week: Classroom	Lab.	Credit Hours
Fall Quarter			
Botany	3	2	4
Agricultural mathematics	5	0	4
Ornamental trees and shrubs	3	4	3
Ornamental shrubs and small plants	3	4	4
Political science	4	0	3
	18	10	18
Winter Quarter			
Written communication	4	2	4
Psychology	4	0	3
Agricultural chemistry	3	4	4
Soils	3	4	4
Tree and park problems	2	0	1
	16	10	16
Spring Quarter			
Nursery practices	1	4	3
Entomology (insects and control)	3	4	4
Tree identification	2	6	5
Construction of turf areas	2	4	4
	8	18	16
Summer Quarter			
Supervised work experience	0	40	10

ARBORICULTURE AND PARK MANAGEMENT--Continued

Arboriculture and Park Management - Second Year	Hours Per Week		
	Classroom	Lab.	Credit Hours
Fall Quarter			
Business writing	4	0	3
Horticultural plant diseases	3	2	4
Records and bookkeeping	3	3	4
Weeds and herbicides	3	1	3
Mapping, grading and construction	2	6	4
	15	12	18
Winter Quarter			
Personnel management	4	2	4
Speech	3	2	3
Basic economics	3	2	4
Agricultural power units	2	4	4
Sociology	3	0	3
	15	10	18
Spring Quarter			
Supervised work experience (6 weeks)	0	40	6
Special topics seminar (4 weeks)	20	0	3
	20	40	9
Total Credit Hours			105

CURRICULUM FOR FLORICULTURE TECHNICIANS IN OHIO

Floriculture - First Year	Hours Per Week: Classroom	Lab.	Credit Hours
Fall Quarter			
Botany	3	2	4
Agricultural mathematics	5	0	4
Horticultural ecology	4	3	4
The floral industry	3	2	3
Annuals	2	2	3
	17	9	18
Winter Quarter			
Written communication	4	2	4
Psychology	4	0	3
Soils	3	4	4
Plant propagation	2	4	5
Greenhouse equipment	1	1	1
	14	11	17
Spring Quarter			
Plant nutrients	3	2	4
Political science	4	0	3
Indoor planting	2	3	3
Greenhouse operation and production	3	4	5
Salesmanship	3	2	3
	15	11	18
Summer Quarter			
Supervised work experience	0	40	10

FLORICULTURE--Continued

Floriculture - Second Year	Hours Per Week: Classroom	Lab.	Credit Hours
Fall Quarter			
Records and bookkeeping	3	3	4
Horticultural marketing	2	2	3
Entomology (insects and control)	3	4	4
Floriculture literature and problems	2	2	3
Greenhouse construction and heating	2	2	3
	12	13	17
Winter Quarter			
Basic economics	3	2	4
Speech	3	2	3
Personnel management	4	2	4
Horticultural plant diseases	3	2	4
Commercial floriculture	3	2	3
	16	10	18
Spring Quarter			
Supervised work experience (6 weeks)	0	40	6
Management of agricultural related business (4 weeks)	20	0	3
	20	40	9
Total Credit Hours			107

CURRICULUM FOR GREENHOUSE AND NURSERY TECHNICIANS IN OHIO

Greenhouse and Nursery - First Year	Hours Per Week: Classroom	Lab.	Credit Hours
Fall Quarter			
Botany	3	2	4
Agricultural mathematics	5	0	4
Ornamental trees and shrubs	2	4	3
Nursery seminar	3	0	2
Basic horticultural science	4	2	4
	17	8	17
Winter Quarter			
Written communication	4	2	4
General plant propagation	2	4	5
Psychology	4	0	3
Soils	3	4	4
Pruning and training	1	2	2
	14	12	18
Spring Quarter			
Shop practices	2	4	4
Propagation by cuttings	2	3	3
Plant nutrients and fertilizers	3	2	4
Political science	4	0	3
Salesmanship	3	2	3
	14	11	17
Summer Quarter			
Supervised work experience	0	40	10

GREENHOUSE AND NURSERY--Continued

Greenhouse and Nursery - Second Year	Hours Per Week: Classroom	Lab.	Credit Hours
Fall Quarter			
Records and bookkeeping	3	3	4
Irrigation and drainage	3	2	4
Nursery management	3	4	4
Entomology (insects and control)	3	4	4
	12	13	16
Winter Quarter			
Personnel management	4	2	4
Speech	3	2	3
Basic economics	3	2	4
Horticultural plant diseases	3	2	4
Planting plans	3	2	3
	16	10	18
Spring Quarter			
Supervised work experience (6 weeks)	0	40	6
Management of agricultural related business (4 weeks)	20	0	3
	20	40	9
Total Credit Hours			105

CURRICULUM FOR TURF TECHNICIANS IN OHIO

Turf - First Year	Hours Per Week: Classroom	Lab.	Credit Hours
Fall Quarter			
Botany	3	2	4
Agricultural mathematics	5	0	4
Turf grasses and use	2	4	3
Principles of turf culture	3	3	4
Golf course design	2	2	2
	15	11	17
Winter Quarter			
Written communication	4	2	4
Psychology	4	0	3
Soils	3	4	4
Agricultural chemistry	3	4	4
Turf practices	1	3	3
	15	13	18
Spring Quarter			
Plant nutrients and fertilizers	3	2	4
Political science	4	0	3
Landscape equipment	2	4	3
Ornamental trees and shrubs	2	4	3
Business writing	4	0	3
	15	10	16
Summer Quarter			
Supervised work experience	0	40	10

TURF--Continued

Turf - Second Year	Hours Per Week: Classroom	Lab.	Credit Hours
Fall Quarter			
Records and bookkeeping	3	3	4
Diseases of turf grasses	3	2	4
Entomology (insects and control)	3	4	4
Weeds and herbicides	3	1	3
Landscape planning	0	4	2
	12	14	17
Winter Quarter			
Speech	3	2	3
Basic economics	3	2	4
Personnel management	4	2	4
Agricultural power units	2	4	4
Sociology	3	0	3
	15	10	18
Spring Quarter			
Supervised work experience (6 weeks)	0	40	6
Irrigation and drainage (4 weeks)	20	0	3
	20	40	9
Total Credit Hours			105

CURRICULUM FOR GENERAL ORNAMENTAL HORTICULTURE TECHNICIANS IN OHIO

General Ornamental Horticulture - First Year	Hours Per Week: Classroom	Lab.	Credit Hours
Fall Quarter			
Botany	3	2	4
Agricultural mathematics	5	0	4
Ornamental trees and shrubs	2	4	3
Basic horticultural science	4	2	4
Political science	4	0	3
	18	8	18
Winter Quarter			
Written communication	4	2	4
General plant propagation	2	4	5
Psychology	4	0	3
Nursery seminar	2	0	1
Soils	3	4	4
	15	10	17
Spring Quarter			
Salesmanship	3	2	3
Plant nutrients and fertilizers	3	2	4
Shop practices	2	4	4
Annuals, perennials and small plants	2	3	3
Business writing	4	0	3
	14	11	17
Summer Quarter			
Supervised work experience	0	40	10

GENERAL ORNAMENTAL HORTICULTURE--Continued

General Ornamental Horticulture - Second Year	Hours Per Week: Classroom	Lab.	Credit Hours
Fall Quarter			
Records and bookkeeping	3	3	4
Nursery management	3	4	4
Entomology (insects and control)	3	4	4
Horticultural ecology	4	1	4
Broad and narrowleaf evergreens	1	1	2
	14	13	18
Winter Quarter			
Personnel management	4	2	4
Speech	3	2	3
Basic economics	3	2	4
Horticultural plant diseases	3	2	4
Nursery practices	2	2	3
	15	10	18
Spring Quarter			
Supervised work experience (6 weeks)	0	40	6
Management of agricultural related business (4 weeks)	20	0	3
	20	40	9
Total Credit Hours			108

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