FEATURES

Observations of Horticultural Training in Europe and The United States

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Europeans are training a great many horticulturists at all levels of instruction, and from the best of these they are producing excellent scientists who also have practical backgrounds. In the United States, the emphasis is on training scientists who very frequently have little understanding of practical horticulture.

The observations presented here are based on visits made during 1961 to 28 institutions teaching horticulture in seven European countries and to 32 institutions in the United States. It should be pointed out that the observations were made by one who has had commercial horticultural experience and is responsible for training students for industry.

The Ministries of Education in each European country provided valuable information and assited in arranging appointments. The final schedule included institutions from each level of instruction: apprentice training, technical training, and university programs. They were located in Scotland, England, The Netherlands, Germany, Switzerland, France, and Belgium.

The United Stated Department of Commerce *1959 Special Census of Horticultural Specialties* lists the wholesale value of each state's horticultural production. The 28 states having the highest dollar value were those visited. Because the writer was interested in learning where the nurserymen obtained their horticulturally trained men, letters were sent to the executive secretaries of the nursery associations in those states visited, requesting lists of institutions from which the industry obtained its trained men.

The European visits took place in July and August while most schools were still in session, and in the United States in September, October, and November after the start of the academic year. At each institution the facilities and equipment were noted and recorded, and departmental staff members were listed, giving educational background and commercial work experience. In addition to the educational institutions visited, over 100 commercial nurseries, both wholesale and retail, were observed. Owners, managers, or workmen were questioned about their own training and previous experience.

United States

While the United States has no programs comparable to the European apprentice training, a few parks, arboretums, and estates do have training programs for their employees. Although there must be other excellent high school programs in the United States, the only one which came to the writer's attention was the Los Angeles City school system where 40 junior high and 30 senior high schools have a well organized, coordinated program. Each school has an acre of ground with greenhouse, lath house, and classroom facilities. California and New York have a few junior colleges or technical colleges with well organized offerings in horticulture, and there may be others.

The four-year state colleges and universities (most of which are land grant institutions) are the principal source of academically trained horticulturists. However, the horticultural enrollment constitutes less than 1% of the total students on the campuses.

Following are some observations made: (1) The manpower, equipment, and money devoted to research far exceeds anything that was observed in Europe, and the results are looked upon with admiration and envy by Europeans. It can be said that the greatest emphasis in our institutions is on research and the graduate program. Unfortunately, this emphasis is often at the expense of the undergraduate student. (2) There is a trend toward the theoretical rather than the practical in laboratory work, even though the entering student seldom has had practical experience in basic horticulture or commercial work that would enable him to derive the greatest benefit from such study. (3) Horticultural enrollments are low, averaging less than 17 undergraduate students in the departments visited in 1961. Three fields of study, such as ornamental horticulture, deciduous fruits, and vegetable production, usually were presented in the department. (4) The greenhouses and outdoor facilities were poorly maintained in comparison to their European counterparts.

Europe

Horticultural education programs are available on three levels: (1) the apprentice, (2) the institute, and (3) the university.

1. Entrance to the apprentice program requires work experience in a commercial enterprise. The programs are usually located in parks or arboretums. Some time is spent on theoretical classroom work and the remainder is spent working under the direct supervision and guidance of the experienced horticulturist. Rotation of workers in different areas provides a broad and practical exposure to the entire operation. Frequent tests are given on theoretical and reading assignments and on the student's knowledge of plant identification. Since there are no classes given on the latter, the student must obtain this information on his own from labeled specimens, herbariums, or library. Supervision is close and exacting. Many students carry small note books to record their work experiences together with comments on their ability made by the supervisors. On satisfactory completion of the course, a diploma is awarded with the name of the arboretum or park. The fact that there is a long waiting list of applicants makes competition keen and mediocrity uncommon. As an example, the three-year program at the Edinburgh Botanic Garden is limited to 45 students. Each year 15 new students are admitted from an average of 35 applicants. Each student is interviewed and is accepted or rejected on his record of work, his interest, and sincerity.

2. The technical institutes, normally three-year programs, are replacing the apprentice programs. These institutes are residential (enrollment of 20 to 60 students), with all students studying some phase of horticulture. Most of the schools are for men, a few are coeducational, and one I visited was solely for women. As with apprentice programs, one to three years of satisfactory work experience is required for entrance. Applications generally have exceeded the number of students admitted by a ratio of two to one. The minimum age requirement is 18, and the applicant must have reached a satisfactory standard of general education. All prospective students are interviewed, and those rejected are informed of deficiencies they must make up before they can be admitted.

Theoretical lectures generally are given in the morning with the afternoon devoted to practical, commercial scale laboratory work. As an example, the Waterperry Horticultural School for Girls, located near Oxford, England, has

38 acres of ground consisting of 4 acres of apples, 8 of truck crops, 19 nursery stock and 6 of teaching areas. From this acreage, the 20 girl students propagate, grow, harvest, and sell through commercial markets, produce valued at 30,000 English pounds annually (approximately $84,000). This amount takes care of most of the expenses of the institution. Institute students usually are required to grow a crop of their own selection and make a written report of this work. Most institutes provide instruction for day release students and special courses as needed by the community.

3. The university programs are of three year duration. The student must have taken the academic program in his secondary work. The University of London at Wye (Wye College) requires all horticulture students to have had one year of commercial work experience before entrance, and to spend their vacations working with a commercial firm that has been approved by the college.

It can be seen that European horticultural training is oriented to commercial work. Most research and graduate work also is of a practical nature. Three university research projects of particular interest obeserved at Wageningen, The Netherlands, were: development of a double red delphinium; development of a garden pea in which the stringiness had been removed so that pod and pea can be eaten; and the study and development of tomato plants with additional chlorophyll.

Regardless of the level of instruction, the dedication of the teaching staff and the interest and sincerity of the students was impressive. The fact that most of the institutions were separate and apart from the conflicting and confusing problems of a giant campus made the atmosphere more conducive to concentrated horticultural study. The testing and qualifying of the horticulturist at a national level has had much to do with raising the prestige and image of the industry. (i.e., the Royal Horticultural Society's *National Degree of Horticulture* and the Netherlands' *Master Gardener's Diploma.*)

The number of individuals involved in various horticultural programs was also impressive. In the Netherlands, for example, Aalsmeer, a city of 10,942 population, had 590 students over the age 14 enrolled in special horticultural programs. Although no comparable figures were available for any city in the United States, the following statistics are interesting by way of comparison. The U.S. Department of Health, Education, and Welfare Report, OE 56006 *Enrollment and Degrees in Agricultural Institutions of Higher Education*[1] for the same period showed a totail enrollment in horticultural programs in the United States of only 1,339 students out of our population of 180,000,000.

It is doubtful if any of the programs as carried on in Europe could be used unchanged in our educational system. The fact that enrollment in most horticultural departments in the United States is dangerously low, and industry is in need of trained men, might indicate that we in the United States are not stressing sufficiently the practical and applied phases of horticultural education.

[1] This figure included junior colleges, colleges, and universities.

Pomological Aspects of Mechanizing Tree Fruit Harvesting

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In no other single operation in fruit production is so much labor cost involved as in harvesting. The harvest cost of sweet cherries for brining may equal two-thirds of the value of the cherries delivered to the brining plant, whereas it may be only 10-15% of the harvested value of Bartlett pears for canning, but even this is a sizable item. For centuries some control of harvesting costs has been accomplished by manipulation of tree size and shape. In recent years this approach has received additional impetus by the use of dwarfing rootstocks and new systems of training.

Many tree fruit and nut crops have in the past, or are now, receiving attention in relation to machine harvesting. Walnuts, almonds, prunes, and sour cherries are being harvested commercially by machine. Cling peaches, apricots, sweet cherries, apples, pears, plums, citrus fruits, olives, and dates have received varying amounts of attention. Mechanical harvesting studies with bush berries have progressed rapidly to the point where commercial machines are available for certain species. Emphasis has been on mechanical shakers associated either with catching frames or pick-up machines. Grape species are also receiving attention.

Basic considerations of the horticulturist relate to: a) tree health and longevity, b) yield of salable fruit, and c) fruit quality.

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If these three considerations are not adversely influenced by mechanization, and overhead costs are equal or less than those for hand harvest, then harvest mechanization is on the verge of reality. Minor changes in labor availability and cost can change abruptly the feasibility of harvest mechanization of certain fruits.

Now let us look in depth at each of the requirements for successful mechanization of the harvest operation, and attempt some evaluation of its influence on eventual economic feasibility.

Tree Health and Longevity

Vibrations from impact or shaking generally have not been harmful to the tree, except where the energy used was sufficient to remove leaves or break weak branches. However, areas where the bark is bruised, loosened, or removed by the knocker head or shaker clamp are sites for infection by pathogens or entry points for beetle larvae, in addition to restricting translocation. This problem is one of major concern in California prune and peach orchards, where commercial shakers have been used for several years.

Two fungi, *Ceratocystis fimbriata* and *Cytospora leucostoma* (syn. *Leucostoma persoonii*), the latter similar to *Valsa cincta* and *Valsa leucostoma* identified by pathologists in Michigan, have proven to be strong pathogens to stone fruit trees in California. *Ceratocystis* is capable of killing large primary branches in 2-4 years and entire trees where infection is on the trunk. Both organisms are widespread with *Ceratocystis* having a wide host range. Michigan workers have reported concern from *Cytospora* infections when shakers are used for thinning peaches.