Department has facilities designed for entomological research. Also for the first time in many years, all staff and graduate students are housed in the same facility.

**Future Activities:**

Management and control of pest insect species on many commodities will involve an integration of many approaches with less reliance on the use of pesticides than presently employed. Development of crop varieties resistant to insects, increased utilization of biological control agents and use of cultural techniques will be actively pursued. The integrated pest management approach is currently under evaluation for the sunflower insect complex and may be implemented on a broad scale. With increased emphasis on environmental impacts, the Department will continue to expand on its establishment of baseline data for insects in areas of the state undergoing major energy-related development. There will be increased emphasis on the role of insects as possible control agents for weeds.

Departmental staff have always attempted to maintain a versatility that will permit response to the changing needs of North Dakota citizens. The Department looks forward to a continuance of this capability and the ability to provide service to all who may request it.

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**HORTICULTURE AND FORESTRY**

E. P. Lana, Chairman

The importance of horticulture was recognized early when the institution was founded in 1891. Its first staff member, C. B. Waldron, was designated Professor of Horticulture and Forestry in the College of Agriculture and arboriculturist in the Experiment Station. In the succeeding years a major objective of the department was to select and develop new and better vegetable, fruit and ornamental cultivars for the citizens of the state and the agricultural industry. Other objectives included the development and use of shelterbelts for protection of man, crops and animals; the use of esthetics to better living conditions for rural and urban North Dakotans; and the improvement of cultural practices in horticultural crops. Since 1956 the same purposes, somewhat modified by agricultural population and social changes, are still predominant.

Horticulture is an area that deals with meeting people's needs as much as it does with crop production. The esthetic aspect, which affects all persons, is difficult to measure in the dollar and cents economy. However, those who have lived in the state for the past quarter century can begin to see the tremendous advances made in horticulture-related beautification. Greenhouse, nursery and flower shop production have increased. Landscaping of public areas — schools, roadsides, municipal buildings, industrial sites — have become a fact. Homeowners of the state now take pride in well-landscaped and horticulturally developed yards.

Agriculturally, the potato ($80 million per year) is the main horticultural crop produced in North Dakota, and the state ranks fifth in United States production. This production has expanded with the increase in popula-
tion, which is common with perishable horticultural crops. In recent years there has been an increase in general vegetable production, particularly around the larger cities of the state, and a tremendous increase in home gardening. The use of woody and herbaceous ornamentals has increased and many local nurseries handling hardy plants have developed in the state. All of our cities, and most of the towns, now have bedding plant outlets which were not very common 15 years ago. Although there is some commercial fruit production in the state, this industry has not developed markedly because of our short growing season and winter hardiness problems.

The Department of Horticulture has been nationally known for the results from its vegetable and potato breeding programs. Tomato breeding commencing in the early 1920's utilized the determinate growth gene, which allowed for tomato production in the northern tier of states and the Canadian provinces. This character also was used in the background development of the commercial cultivars now used for mechanical harvesting. Potato breeding, started in the 1930's, has now developed into a major national and international effort with emphasis on high quality cultivars with processing types.

In 1957 when a new range and headhouse were installed in 1977 to make this area more self-sufficient. At present most of the horticultural research formerly conducted at Fargo is now conducted at the Absaraka area.

Development of new cultivars in horticulture has been varied and well recognized by the commercial people and general public. Most of the releases from 1956 to date are still available to the public. Following is a list of releases and the major individual involved.

**ORNAMENTALS — D. G. Hoag**
- Dianthus — Allegro (wine) — 1960
- Andante (white) — 1960
- Rondo (pink) — 1960
- Sonata (med. pink) — 1961
- Serenade (salmon) — 1961
- Largo (deep red) — 1961
- Crescendo (rose red) — 1961
- Chrysanthemum — Apollo (red, bronze-red) — 1960
- Diana (red, yellow center-bronze, yellow center) — 1960
- Juniper — Medora (pyramidal) — 1956

**VEGETABLES — N. S. Holland**
- Broccoli — Mantador — 1960
- Squash — Gold Nugget — 1966 (Silver Medal All-America Selection Trials)
- Emerald — 1973
- Tomato — Sheyenne — 1960
- Lark — 1973
- Cannonball — 1973

**POTATOES — R. H. Johansen**
- Nordak (white skinned) — 1957
- Norgleam (white skinned) — 1957
- Norland (red skinned) — 1957
- Snowflake (white skinned) — 1961
- Viking (red skinned) — 1963
- Norgold (russet skinned) — 1964
- Norchief (white skinned) — 1968
- Norchip (white skinned) — 1968
- Bison (red skinned) — 1974

The Department of Plant Pathology and Entomology cooperated with disease and insect studies on these releases. Norland, Norgold and Norchip are among the top eight cultivars for production importance in the United States — Norchip is one of the best quality types for processing. Over 50 percent of the potato production in North Dakota is comprised of these North Dakota releases.

Cultural research also is varied. A long term study of hardy apple rootstocks and dwarfing stocks is conducted...
by Neal Holland. This study is to determine the best materials for apple production that will produce commercially and be hardy for the North Dakota climate.

Vegetable production investigation by E. W. Scholz is emphasizing the early production of crops by the use of plastic mulches and row covers to enable them to grow types normally not found in large production in this area. The development of drip irrigation for the horticultural crop producer is also being investigated.

A wide range of cultural work on potatoes has been conducted in the past 20 years. Included in this work has been micronutrients, harvesting dates (J. Hanson) regulators (C. Crotufo), potato scab (N. Sandar), hollow heart, irrigated production, seed piece decay, weed control growth regulators and nutrition by D. C. Nelson. Other departments cooperating in this research include Soils, Biochemistry and Plant Pathology. Of major importance was the clearance of 2,4-D for use on potatoes. Extensive work on soil fertility and nutrition have resulted in the modification and improvement of the soil test for potatoes. Currently work is being done on the method and times of fertilizer application, causes and control of hollow heart, and on many aspects of weed control and the effect of weeds on potatoes.

Ornamental research, particularly in the area of woody plant selection and evaluation is receiving added thrust by D. E. Herman. With Dutch elm disease attacking American elm and the deterioration of the Siberian elm, new trees and shrubs have to be tested so proper replacement materials can be found to substitute for disease and insect susceptible and non-hardy types. The NDSU Research Arboretum is being developed to study the value (pest resistance, hardiness, type) of trees and shrubs for shelterbelt and landscaping uses in urban and rural areas. Approximately 1300 accessions are under evaluation in just a four-year development period.

With the advent of the McIntire-Stennis Forestry program in 1964, shelterbelt research has been conducted in Horticulture and Forestry and in Plant Pathology and Entomology. Work with herbicides by John Zaylskie and survival studies by R. H. Heintz have been completed. At present renovation studies for mature shelterbelts are underway. In 1968 the Army Corps of Engineers funded a five-year grant on tree establishment at dam sites. A recommendation on deciduous and evergreen tree planting procedures was made to the Corps which became part of their cultural program.

Publications from 1956 to date total over 300. These can be divided into 100 technical or journal publications, 96 extension circulars, 40 bi-monthly or Farm Research articles, four Experiment Station or Extension Bulletins, four Research Reports and 66 miscellaneous articles (trade journals, newspapers, etc.). A book — Trees and Shrubs for the Northern Great Plains — by the late D. G. Hoag, was published by the North Dakota Institute for Regional Studies (1965).

The area of teaching cannot be overlooked during the past 20 years. In the school year of 1956-57 there were six horticulture majors in the department. By 1965-66 this had doubled to 11. In 1970-71 the number increased to 25. From 1973 through the spring of 1978 the average number of majors showed a steady increase (1973-33; 1974-47; 1975-53; 1976-105; 1977-118; 1978-100). There was a doubling of major enrollment from 53 in 1974-75 to 105 in 1975-76. At present, enrollment appears to be leveling at about 90-100 students majoring in horticulture. This large enrollment increase was not accompanied by a proportionate all-University student increase of the same magnitude. Many of the students enrolled in horticulture courses are not necessarily from the College of Agriculture. The percentage of female students enrolling in the field of Horticulture is approximately 45 percent. Because of the increased enrollment the department was able in 1977 to hire a new staff member, Ronald Zuber. He has assumed the teaching of the landscape classes.

The future of research and teaching in horticulture and forestry appears bright. Unless economic changes are drastic, the production of potatoes for seed, processing and fresh use will continue as a major enterprise in the state. The increase of population in urban centers should allow for an increase in vegetable, glasshouse and nursery stock production.

Vegetable production near urban areas will increase with the population and this will be aided by the development of new types of vegetable cultural methods and techniques. Vegetable and bedding plant production is closely allied to the greenhouse industry and consequently will respond together with the ornamental bedding plant industry.

This 1960 photo was taken at the presentation of an award for the high national ranking of "Gold Nugget" squash produced by Neal Holland. Pictured are Chairman Ed Laday, Holland and Director Hazen.

The continuance of woody plant research and observation will aid in the establishing of better trees and shrubs for shelterbelt and landscape use. The initiation of a woody and perennial breeding program to develop new and more hardy plants would result in a more dependable type for planting in the state. The use of plant materials for esthetic purposes will continue to increase as our society demands it. People are much more interested in plant materials for esthetic purposes than in the past. The European traditions of our appreciation for plant materials are being felt more and more in all parts of the United States as our country comes of age.