Agronomy — As NDSU Begins A New Century

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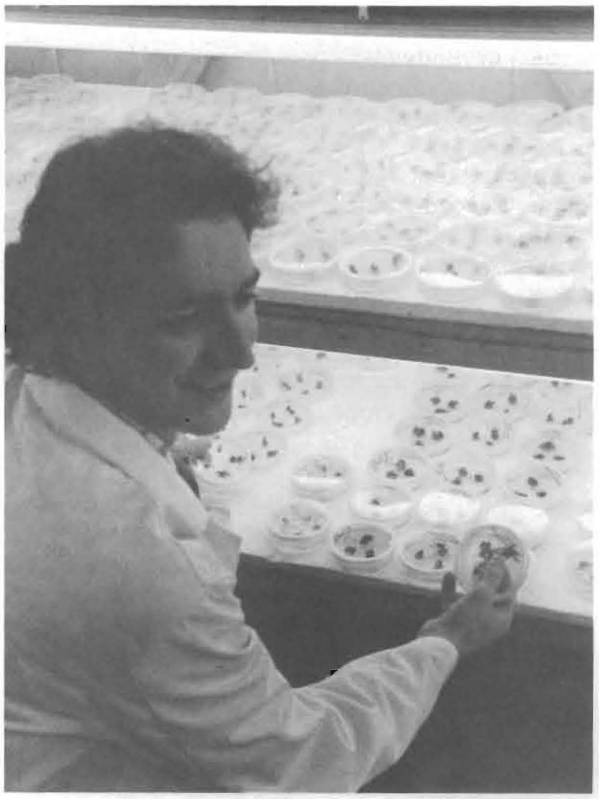
As we look to the future, we should consider our strengths and capabilities and the needs of the citizens of North Dakota, particularly those involved in agriculture. Service to North Dakota agriculture characterizes Agronomy. Examples of this service are new varieties of crops, new inbreds of corn and sunflower that are used in many commercial hybrids, and new systems for economic control of leafy spurge, other perennial weeds, and many annual weeds. Department researchers also have arranged for clearance of herbicides for use on minor crops, have developed economic control systems for weeds in reduced tillage systems, and have developed recommendations for many areas of crop production. Farmer's use of these 'services' has been instrumental in raising their crop production to record levels. Yields of our major crops have doubled in the past 30 years.

In the crops area, we can look for continued development of new varieties and inbred lines by our long-established breeding programs. We can expect varieties of dry beans and soybeans, highly adapted to North Dakota growing conditions, from relatively new projects on these crops. Further yield increases can be anticipated in all our major crops. However, new diseases, more stringent demands by industry for quality, and the difficulties of combining all desirable traits into a single variety mean that additional resources will be needed to maintain the rates of genetic progress that farmers have come to expect. Variety development is not strictly the domain of the plant breeder, but hinges on cooperation among the breeder, the plant pathologist, the cereal chemist, and in many cases, the entomologist and the physiologist.

The department has several innovative, highly productive research projects in plant genetics, cytogenetics, and physiology. Refined genetic stocks developed by state and USDA researchers have, for example, enabled us to introduce several major genes for disease resistance and for agronomic and quality traits into our major crop plants from their wild relatives. Breeding manipulations of economic plant traits which can have a large impact on crop performance often are facilitated by discovery of new genes and by an understanding of the physiology and genetic control of known important genes.

Basic whole-plant, plant genetic, and cytogenetic research programs have a critical, central role in providing defined germplasm to applied breeding programs and to basic cell and molecular programs. Consequently, a major goal of the department is to maintain and to expand its current strong plant genetics and cytogenetics program.

The department has initiated two research projects in the area of biotechnology. The techniques of biotechnology are enabling scientists to study the basic genetics of our crop plants in ways that previously were not possible. Initial enthusiasm about producing instant new varieties with nitrogen fixing ability, perennial characteristics, or winterhardiness has been tempered substantially as the genetic complexity of these changes became understood. The goal of the department is to apply the techniques of biotechnology to basic genetic and breeding problems which are important to future genetic progress in the state's crops.



Agronomist Phil McLean examines regenerated dry bean plants produced to search for genetic variability that may be useful for plant breeders.

The Agronomy faculty should be expanded with several more scientists trained in biotechnology. In addition to their basic research, the role of these biotechnologists, working with plant geneticists, breeders, plant pathologists, and cereal chemists, will be to translate the knowledge and techniques of biotechnology for practical applications to improve our crop plants. Techniques for growing plants from single cells and for single gene transfer either have not been developed or have been developed to a limited extent in the major crops. However, recombinant DNA, plant cell, and tissue culture technologies are being researched intensely in many laboratories throughout the world, and agronomy scientists will use any breakthrough.

We will continue to evaluate so-called "alternative" or "new" crops. Such crops are not new in North Dakota and have been studied periodically for up to 50 years. Their acreage often is limited because of erratic or nonperformance or because they lack a market. North Dakota already has a diverse crop agriculture, with significant acreage of over 21 crops. The primary focus of our research is to protect and to expand the competitive status of current crops grown in the state by improving their agronomic performance and quality characteristics. Meeting specific commercial processing quality needs within these crops also may provide, in a sense, "alternative" crops such as two-rowed barley and high protein wheat.

The new Loftsgard Research Center, with a planned completion date of 1990, will allow major expansion of the weed science faculty into several new areas and allow more in-depth research of areas now covered by too few scientists. One of the major concerns is the effect of herbicides on the environment, and we expect to emphasize this area. Part of this effort will be to develop means of reducing potential groundwater contamination by herbicides. Another research area will be to develop weed control practices which reduce or eliminate the need for herbicides.

We expect that the impact of biotechnology will be observed in weed science. Development of resistance to a specific herbicide has been successful in tobacco, and similar procedures may be successful with other crops and other chemicals. An expanded area of research will be on weed control in row crops. Presently, one person researches weed control in both small grains and row crops, and it is not possible for one person to adequately research all weed control aspects in these crops.

Finally, we plan to expand the research on herbicide application technology. Techniques of application which maximize spray retention by the weed and minimize retention by the crop would improve efficency of herbicide use. Adjuvants, spray nozzles, herbicides, spray volume, and application speed all may need to be selected specifically for a given situation to maximize effective weed control and minimize environmental risks.

As scientists specialize more, multidisciplinary projects for research become necessary because few problems related to production agriculture fit into any narrow niche. Agronomy has a long history of cooperative work with other departments, branch stations, the USDA, private industry, and others. In the future, a greater percentage of research problems will be recognized as multidisciplinary, and nearly all research projects will be cooperative in nature.

Agronomy has a strong undergraduate and graduate teaching program. We have been quite successful in maintaining our enrollment when much of Agriculture in other parts of the country faces sharply reduced student numbers. Agribusinesses are eager to hire people who grew up on a farm or who came from a farming community. These businesses find that the North Dakota work ethic is very valuable to them. To keep up with changing demands in the marketplace, we continually evaluate and update our curriculum. We have just added a business option in Agronomy to supplement the existing options in production, science, and weed science.

Agronomic research is a key component of an efficient, productive crop agriculture. To remain highly competitive, North Dakota farmers must continue to grow the best varieties of crops that can be developed by modern breeding and genetics technology. They also must use the latest, most refined weed control and crop production methods to minimize their costs of production. Adding new projects with associated scientists, support personnel, and operating and equipment funds in Agronomy and the Agricultural Experiment Station traditionally represent difficult decisions to the North Dakota legislature as they allocate finite resources. However, this continued "investment" in agronomic research is essential to the viability of the state's agriculture.

The new Loftsgard Research Center, built with federal funds, will provide the physical facility within which the crop and weed science arms of Agronomy can expand and conduct research to find answers to problems our farmers face.