



## Highlights

- *Agronomic and horticultural crops and nursery, greenhouse, floriculture, and sod account for over 81% of the state's total cash farm income.*
- *Palmer amaranth continues to be found in new North Dakota counties. Its herbicide resistance profile also threatens the production of pulse crops, sugarbeet, sunflower, flax, canola, and other crops that have fewer herbicide options than corn or soybean.*
- *In 2021, approximately 20% of the area accepted for certified potato seed across the U.S. was of cultivars or selections developed by the NDSU potato breeding program.*
- *Based on certified seed sales, we estimate that NDSU soybean varieties have about a 2.35% market share, generating \$44.2 million annually.*

## Richard D. Horsley, Department Head

Dept. of Plant Sciences  
NDSU Dept. 7670  
PO Box 6050  
Fargo, ND 58108-6050

richard.horsley@ndsu.edu  
Phone: 701.231.7973  
Fax: 701.231.8474

www.ag.ndsu.edu/plantsciences  
facebook.com/NDSUPlantSciences  
twitter.com/NDSUPlantSci

## About the Department

The Department of Plant Sciences is an integral component of the College of Agriculture, Food Systems, and Natural Resources, the North Dakota Agricultural Experiment Station (AES), and NDSU Extension. The department provides research and Extension in biotechnology, cereal science, crop physiology, crop production, food science, forestry, genetics, horticulture, plant breeding, sports and urban turfgrass management, and weed science.

### Research

Basic and applied research in these programs provides new wealth, economic development, and improved quality of life in the state and region. Not including crops grown as feed and forage for the livestock industry, agronomic and horticultural crops and nursery, greenhouse, floriculture, and sod account for more than 81% of the state's total cash farm income (*USDA-National Agricultural Statistics Service 2017, Census of Agriculture State Profile*).

### Extension

Extension faculty work closely with research scientists at NDSU and Research Extension Centers to develop multi-disciplinary educational programs. Programs to introduce new cultivars, effective cultural practices and cropping systems, efficient weed control strategies, integrated pest management, and improved horticultural practices have been successful due to the Extension specialists' close interaction with scientists and clientele groups.

## Research and Extension Impacts

### Breeding

**Soybean (Miranda)**  
Based on the last five years, an average of 6.53 million acres of soybean have been seeded in North Dakota, producing 214 million bushels of commodity worth over \$1.88 billion annually. Based on certified seed sales, we estimate that NDSU soybean varieties have about a 2.35% market share, generating \$44.2 million annually. This number does not take into account that growers can replant saved seed of NDSU varieties, saving growers around \$30 per acre in seed costs.

### End-Use Quality

**Pulse Quality (Rao & Bandillo)**  
The market demand for pulse crops is already high and expected to soar in the upcoming years due to continued expansion of the non-GMO plant-based



protein market. For example, the Beyond Meat Burger has gained traction with a current market cap value of approximately \$8.7 billion and the company Ripple Foods has sold millions of gallons of non-dairy milk made from a proprietary pea protein called Ripptein.

To date, three pulse cultivars, ND Eagle lentil, ND Dawn yellow pea, and ND Crown chickpea, have been developed by the NDSU pulse crops breeding program and released by the AES. Assuming 5-10% of pulse acres in future years are sown with NDSU varieties, these varieties will generate over \$30 million in farm gate revenue.

### Extension

**Horticulture (McGinnis)**  
The NDSU Extension Master Gardener Program is a volunteer service program that trains individuals to work on horticultural community service projects under Extension agent supervision. During the 2020 pandemic, Master Gardeners grew, gleaned, and collected 38,537 pounds of fresh vegetables and fruits (equivalent of 154,000 servings)



Tom Peters holds a Palmer amaranth plant.

to meet the increased demand of local food pantries in 24 counties. New for 2021, advanced Master Gardeners who were trained in plant diagnostic skills provided extra capacity in Extension offices by assisting agents in answering gardening questions from the general public. They also provide extra capacity when agents are on medical leave and when job transitions occur.

### Weed Control (Ikley & Peters)

NDSU Extension has created awareness to the weed Palmer amaranth similar to what was done for leafy spurge. If Palmer amaranth was to infest southeast North Dakota, where soybean is grown on nearly 2.2 million acres, it is estimated that the cost of weed control would increase by a factor of 3.2 and failure to control the weed could reduce soybean yields by up to 79%.

## Challenges

### Facilities

Our department's scientists are challenged by aged and inadequate field laboratories, facilities for drying and cleaning seed, short- and mid-term seed storage, and safely storing field plot equipment.

### Operating

The department hired Dr. Quincy Law as the new faculty member to lead the chemical and biological control of noxious and invasive weeds research program. Invasive plants currently gaining acres in the state include Palmer amaranth and narrowleaf hawkbeard. A challenge Dr. Law faces in running his state-wide program is the lack of a state-supported research specialist and operating funds. Having this support would

allow him to develop solutions for weeds currently impacting our crops and to be proactive in limiting establishment of invasive weeds.

The COVID-19 pandemic exposed the vulnerabilities of our food supply in the U.S. Shortages in staples such as meat, vegetables, fruits, and bread helped urban consumers realize that a stable, safe, and secure food supply should not be taken for granted. For the first time, many urban dwellers turned to growing their own fruits and vegetables, baking bread, and raising a few chickens in their back yards. Once these urban farmers consumed these "homegrown" ingredients, they realized the importance of locally sourced food

ingredients for having a flavorful and secure supply of food. Funding for our researchers and Extension specialists that work in the areas of horticulture and urban agriculture is severely lacking. Much of the state-appropriated operating funds that our horticulture and urban agriculture group currently receives is used to pay State Fleet costs to make the daily 66-mile round trip to the Horticulture Research Farm near Absaraka, ND.

The construction of the Peltier Complex will provide us laboratory space to expand our research on development of nutritious and flavorful food ingredients and utilization of co-products derived from processing our state's crops. Our wheat, barley, and durum

quality laboratories have focused on evaluating breeding lines for use by large processors and food companies; however, they have not been able to evaluate the quality of these lines for the growing and lucrative artisan and craft food markets because of the lack of space and operating funds. Likewise, our potato breeding program has had limited capacity to evaluate chip quality and no capacity to evaluate flake quality of their breeding lines because of the lack of space, operating funds, and a state-funded research specialist. A state-funded research specialist position on the potato breeding project was frozen in 2015 following the retirement of Bryce Farnsworth and eliminated in the 2017 budget cuts.



## Needs

### Capital Projects

A new **Field Crops Research Facility** is needed to house research projects now located in Waldron Hall, Wiidakas Laboratory, Potato Research, the Lord & Burnham South Greenhouse, and Sugar Beet Research. Waldron Hall was built in the 1950s to house the field laboratories for the wheat breeding programs in the Department of Agronomy. An addition was built in the mid-1960s to house approximately 16 additional scientists from the Departments of Agronomy, Plant Pathology, and Soils. The total gross area of Waldron Hall is approximately 68,000 sq. ft. The building now houses field laboratories and wet laboratories for nearly 45 scientists at the Main Station involving multiple disciplines. Many of these laboratories are shared and some scientists do not have assigned space, but rather "borrow" as possible. The seed drying, cleaning, and stor-

age facilities are grossly insufficient and pose a health hazard to those working in the facility. For Plant Sciences' needs, we anticipate the new Field Crops Research Facility will house field and wet laboratories, grain cleaning equipment, dryers, mid- and long-term seed storage space, and greenhouse space that will partially cover the space lost when the Lord & Burnham greenhouses are removed.

Additional **storage buildings for field plot equipment** are needed to meet the present and future needs for all AES scientists that conduct field research. The storage building spaces located on campus, NW22, and Prosper are grossly inadequate to store the equipment we currently have. In Plant Sciences alone, we have 57 tractors, 29 drills or planters, and 32 combines. We also require space to park 75 trailers that we use to transport equipment.

### Operating

Additional operating funds in food security research and Extension are requested to support:

- 1) Research conducted by Dr. Law on his chemical and biological control of noxious and invasive weeds project.
- 2) Increased research and Extension in the areas of horticulture and urban agriculture.
- 3) Increased research by Plant Sciences faculty that will have research laboratories in the Peltier Complex.

### Personnel

**One FTE is requested for an AES research specialist** at the Main Station to assist Dr. Quincy Law on his research to control noxious and invasive weeds. This individual would assist Dr. Law in inputting and organizing his project's field and greenhouse performance data, and conducting field, greenhouse, and laboratory research.



Waldron Hall

**One FTE is requested for an AES research specialist** at the Main Station to assist the potato breeder, Dr. Asunta Thompson, in developing improved potato varieties. This individual would assist Dr. Thompson in inputting and organizing her project's field and greenhouse performance data, DNA data, and conducting field, greenhouse, and laboratory research.