NDSU PLANT SCIENCES

Plant Sciences

December 2025

Impact Highlights

- *Agronomic and horticultural crops and nursery, greenhouse, floriculture and sod account for over 83% of the state's total cash farm income.*
- *The outputs from our department impact all four corners of the state. A notable achievement each year is the release of new varieties and plant products from our breeding programs. Over the past two years, the dry bean program released the black bean ND Galaxy and the pink bean ND Rosalind. The spring wheat breeding program released ND Stampede, ND Horizon, and ND Roughrider hard red spring wheat, along with ND Nighthawk hard white spring wheat. The oat breeding program released ND Miller and ND Williams oat, and the Woody Plant Improvement Program released Cosmic Flare™ Sugar Maple - Acer saccharum 'CosDak'.*

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

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

About the Department

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

Research

Basic and applied research in these programs produces new wealth, stimulates economic growth, and improves the quality of life in the state and region. Excluding crops grown as feed and forage for the livestock industry, agronomic and horticultural crops, nursery products, greenhouse, floriculture, and sod make up more than 83% of the state's total cash farm income. *(USDA-Economics Research Service (ERS) 2023, Census of Agriculture State Profile)*

Extension

Extension faculty in Plant Sciences collaborate closely with research scientists at NDSU and the Research Extension Centers to develop multidisciplinary education programs. These programs, which 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 our Extension specialists' close collaboration with scientists and community groups.

Research and Extension Impacts

Breeding

Spring Wheat Breeding (Green)
The new NDSU wheat variety ND Stampede provides at least a 10% yield increase over many current wheat varieties. If adopted on just 5% of North Dakota's wheat fields, ND Stampede could generate at least $9 million more in farm income, demonstrating a strong return on investment for developing new varieties. According to NDSU UDP Dr. William Wilson, NDSU spring wheat varieties offer significant long-term ROI, with an estimated $69–$284 million in direct economic benefits to North Dakota over each variety's market lifespan.

Wheat Quality

Cereal Science (Islam)
Since the early 1960s, the NDSU Wheat Quality Program has conducted annual quality surveys of HRS and durum wheat, including sampling, testing, and reporting key quality traits. Covering the Northern Great Plains and the Pacific Northwest, the survey evaluates the essential marketing qualities of the $3.6 billion HRS and durum wheat crops that enter the global commercial market each year. The results from these analyses are published in the Regional Crop Quality Report and the U.S. Wheat Associates Annual Crop Quality Report, which serve as main marketing resources for these wheat varieties.

Weed Science

Weed Resistance (Christoffers)
North Dakota has at least 11 weed species resistant to herbicides, and controlling herbicide-resistant weeds is estimated to cost $10 to $40 per acre more than standard weed control. In comparison, proactive resistance management strategies are estimated to provide long-term annual economic returns of $20 to $50 per acre. Our department's weed scientists are developing tools and strategies to support proactive resistance management through genetic diagnostics and integrated management systems.

End-Use Quality

Food Processing (Rao)
Dr. Rao's research on developing high-value alternative protein ingredients from pulses and hemp boosts North Dakota's economy by raising the value of these crops beyond simple commodity prices. With the global market for alternative

Research and Extension Impacts (Cont.)

protein expected to grow from $21.8 billion in 2024 to about $36.2 billion by 2030, her work provides a strong return on investment by increasing crop value for farmers, encouraging industry innovation, and attracting competitive grants and partnerships that bring new investment into the state.

Production

Forages and Cover Crops (Berti)
Cover crop acreage in North Dakota has significantly increased, reaching over 800,000 acres in 2022, and cereal rye alone expanded to 1.8 million acres in 2024. Dr. Berti's research shows that cover crops after corn, soybean, or wheat retain 30–50 lbs of nitrogen per acre, and even a conservative 10-lb N credit delivers substantial economic benefits. Using just 10% of corn acres, growers save $2.0 million annually, or up to $9.92 million based on 2024 rye acreage. Additional forage grazing value of $20 per acre on only 10% of wheat acres adds another $1.32 million, illustrating a multi-faceted ROI for soil health research.

Extension

Broadleaf Crops Agronomy (Carcedo)
Broadleaf crops are vital to North Dakota agriculture, covering over 10.8 million acres and placing the state among the top producers of pulse, oilseed, and specialty crops nationwide. Research from the Broadleaf Extension Agronomy program provides a strong ROI by reducing input costs and increasing crop value. Their guidance on managing Rhizobium in dry beans alone could save growers $24 million in unnecessary nitrogen fertilizer, while optimized soybean seeding-rate decisions could potentially generate $52 million from just a 2% yield increase across the state's 6.6 million soybean acres. Through applied research and statewide outreach, the program offers producers practical, research-based advice that enhances profitability and supports long-term sustainability for North Dakota's broadleaf crop sector.

Extension

Weed Control (Ikley)
Weed competition threatens North Dakota's 38.5 million farmed acres with potential annual losses of $2.3 to $8.2 billion. Research on herbicide-resistant waterhemp, kochia, and common ragweed offers a strong return on investment by reducing yield loss and safeguarding farm income. Mapping new resistance mechanisms further directs industry R&D, ensuring future weed-control tools that maintain crop productivity and statewide profitability.

Challenges

Operating

Securing operating funds for long-term research is difficult because most available funding mechanisms are designed to support short, clearly defined projects rather than the ongoing programs needed to advance agriculture over the long term. Competitive grants effectively fund 2–3-year research goals, such as testing specific hypotheses, evaluating management practices, or addressing emerging issues; they typically cover graduate student support, hourly labor, and supplies needed to achieve those objectives. However, grants cannot sustain the continuity, infrastructure, or institutional capacity required for long-term efforts like developing improved crop varieties or monitoring the spread of new herbicide-tolerant weeds, work that must proceed uninterrupted for decades to remain effective. These programs rely on stable operating funds to maintain essential infrastructure: research facilities, replacement of major equipment such as combines, tractors, and seeders, and ongoing repairs. A growing concern is the upcoming utility costs for the Bolley Agricultural Laboratory, where researchers from Waldron Hall, Wiidakas Laboratory, Potato Research, and the Lord & Burnham South Greenhouse will soon relocate. Since the NDAES pays no utilities for current buildings but will be responsible for all utility expenses at the new field lab, dependable operating support, rather than short-term grants, is vital to keep essential, long-term agricultural research ongoing without interruption.

Bolley Agricultural Laboratory—Operational by Summer 2026

Needs

Additional operating funds allocated to the NDAES to support increased operating costs for the new field lab, major equipment purchases and repairs.