

THE DEPARTMENT OF AGRICULTURAL AND BIOSYSTEMS ENGINEERING

The department provides research, extension and education in machinery systems, precision agriculture, irrigation and drainage, water resource management, food and biological materials processing, grain storage and energy.

The department has about 130 undergraduate students, 16 faculty, three part-time faculty, three post-doctoral researchers, nine staff members and about 31 graduate students. The department is located in the Agricultural and Biosystems Engineering building, with additional offices in Morrill Hall, teaching in the Machinery Learning Center and Bioprocessing Engineering Lab and additional research labs in Hultz Hall, Waldron Hall and Van Es.

DEPARTMENT HIGHLIGHTS

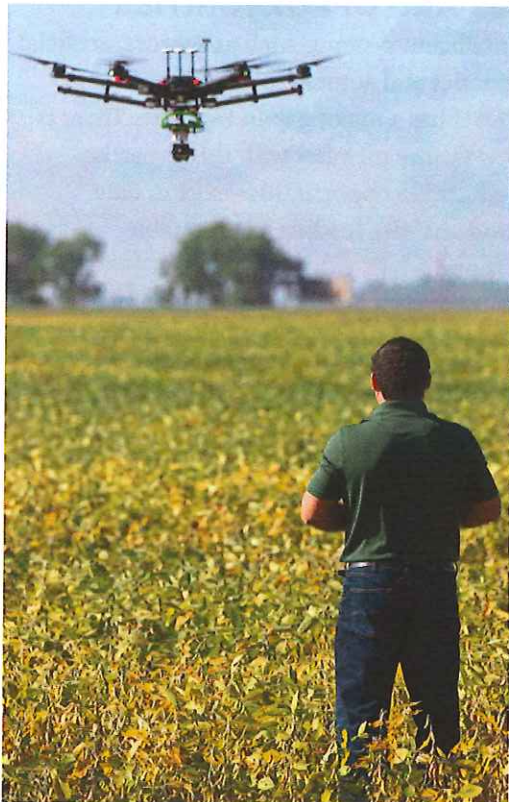
- Precision Agriculture major and minor, plus course incorporation into engineering degree
- Ag Systems Management (technology, business and agriculture)
- Engineering degree: agriculture, natural resources, bioprocessing focus areas
- Center for Digital Agriculture: approved by the State Board of Higher Education
 - » **Mission:** Address the research and educational needs of the region to increase efficiency and sustainability of production agriculture through digital technologies
 - » Center director needed
- USDA-ARS precision agriculture research
- Natural Resources research group
- Bioprocessing engineering research group
- Extension: machinery systems specialist, water engineer, post-harvest engineer

CHALLENGES AND OPPORTUNITIES

- The need for intelligent systems, such as sensors, artificial intelligence, robotics and automation, is increasing in agriculture. NDSU has a major gap in this area. There is a need for a new faculty member with this expertise.
- Research and education opportunities exist in data management and analysis, leading to actionable intelligent decisions.
- To expand the use of agricultural crops, there is a need to develop new products and explore value-added opportunities.
- Faculty support, such as research specialists and office staff, would enhance productivity.
- Controlled environment engineering is needed to support locally grown produce.
- Natural resource engineering for carbon sequestration and water management.
- ABEN offices and some labs are moving to Ladd Hall, while fabrication/teaching/research facilities are moving one-half mile to Pilot Plant on the west side of campus.
- Research is limited by adequate facilities.

FACILITY NEEDS

Expanded facilities would allow NDSU to be more competitive with its peers. The Raven Precision Agriculture Center at South Dakota State University has 26,000 square feet of industrial high bay research and teaching space. It includes numerous specialty spaces including a dynamometer bay, a fabrication bay, a bio-processing suite, woodshop and 1/4-scale tractor lab. In contrast, NDSU currently has 4,000 square feet of shared space.



RESEARCH NEEDS

- Intelligent systems: there is an increasing need for automation, artificial intelligence and robotics. One additional faculty member is needed.
- Facilities and equipment: Lack of appropriate space restricts research productivity, opportunities for equipment donation and educational offerings. Lack of land and equipment limits timeliness of research.
- Faculty support: Additional research specialists and office staff needed to enhance faculty productivity

RESEARCH OPPORTUNITIES

- Value-added: There is a need to develop new uses of agricultural commodities to enhance farm and related industries. There are opportunities to enhance cooperation with Northern Crops Institute and microbiology researchers.
- Carbon sequestration and water management: There are natural resource engineering research opportunities in areas like conservation tillage, nutrient management, machinery management, and biogas production.
- Digital agriculture: Data management and analysis leading to management decisions are vital parts of precision agriculture. One FTE is needed to meet the demand.
- Controlled environment agriculture: Research opportunities exist for the combination of horticultural and engineering techniques to optimize crop production, crop quality and production efficiency.