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NORTH DAKOTA CORN GROWERS ASSOCIATION

Whole System Effects of Soil Salinity in Corn and Soybean: Taking a Multi-Year, Multi-System Approach

The Problem:

Soil salinity awareness and management has become increasingly important to North Dakota producers. Nearly 90% of fields across the state exhibit some sort of reduced productivity as a result of this soil issue. Salinity directly affects crop productivity (Fig. 1), but may also influence soil function, arthropod/insect pest infestation, weed pressure and resistance to herbicides, crop diseases, and other factors that can indirectly affect the producers' bottom line. Therefore, a holistic approach is necessary to investigate how salinity impacts entire systems, especially for common rotations, such as corn-soybean.

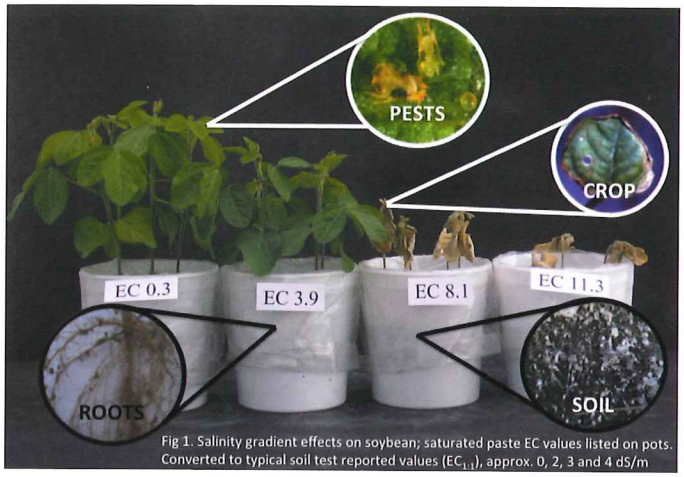

Fig 1. Salinity gradient effects on soybean; saturated paste EC values listed on pots. Converted to typical soil test reported values ($EC_{1:1}$), approx. 0, 2, 3 and 4 dS/m

Box 1. *What's different about this?*

- Collaboration across ND cropping systems
- Whole-system approach (Fig. 1)
- Multi-year time span (Fig. 2)
- New approach for combining research & management/education (Box 2)

Proposed Research and Extension Efforts:

We propose a multi-year, multi-systems approach to answering specific questions about both fundamental science and management practices (Box 1, Fig. 2). In the first phase (year 1), controlled greenhouse experiments looking at salinity and pest effects on specific crops (i.e. corn and soybean) are conducted. This will allow us to evaluate the system without the complications inherent in field-scale experiments. In the second phase of the project (anticipated yrs 2-3), predictions from the greenhouse experiments are tested in field scale surveys and experiments. We can expand the study to include additional questions (related to weed pressure, plant disease etc.) to quantify whole system effects across salinity gradients. Though field scale experiments are necessary, they are often complicated and unpredictable. So, additional greenhouse and field experiments may be necessary as we develop and test management strategies (yrs 3-5). As we collect data, we also create educational material (Box 2).

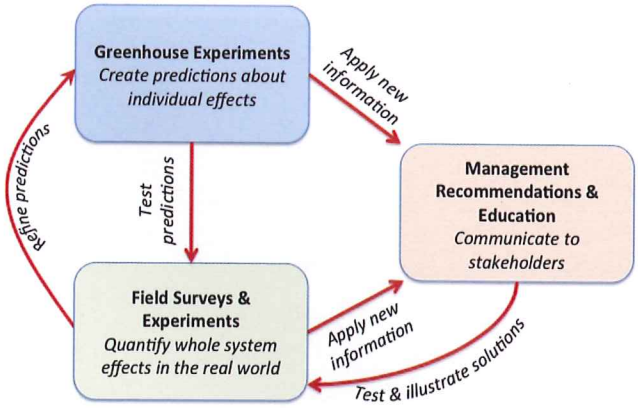

Fig. 2. How our questions and answers will inform each other and develop over time

Proposed Outputs:

Using a new model of grower-scientist interactions, **CROPS**, we will be able to **C**ommunicate **R**esearch and use **O**utreach activities to enhance **P**roductivity and **S**ustainability (Box 2). The materials produced using this approach streamline the transfer of valuable information being collected and interpreted in research experiments into several usable forms to reach targeted audiences. Products produced as a result of this approach are also presented in Box 2.

Box 2. *A new model of grower-scientist interactions*

Communicating
Research &
Outreach
to enhance
Productivity &
Sustainability

Extension/Outreach
Video series, webinars, demo plots field days, fact sheets, extension publications

Research
Scientific publications and presentations

Grower Education
Web-based research demonstrations