UNIVERSITY OF MINNESOTA | EXTENSION

CURRENT FUNDING AND NEEDS ASSESSMENT FOR IMPROVING IRRIGATION WATER MANAGEMENT (IWM) THROUGH THE UNIVERSITY OF MINNESOTA EXTENSION IRRIGATION SPECIALIST, JOSHUA D STAMPER.

Current Primary Funding:
$220,000 (through CWF) from 2015 1st Special Session, Chap 2, Article 2, Section 3h. These dollars primarily cover Extension Specialist salary and travel costs to provide technical assistance to irrigators and SWCD staff that work with irrigators, with specific goal of using Irrigation Water Management (IWM) to prevent the degradation of groundwater. Clean Water Council currently supports funding this position in the next biennium.

Another $80,000 (75% non-state $) in external dollars have been raised to fund specific irrigation related educational tools like evapotranspiration weather station in Becker, Hands-on SWCD staff trainings, and starting precision-ag irrigation scheduling program for Dakota County. None of this money went to extension specialist salary.

Notable activities since position creation:

- Produced multiple You-tube videos to walk irrigators through methods to better manage irrigation and Nitrogen fertilizer.
- Presented at over 60 IWM training sessions that reached over 2000 farmers, crop consultants, and agency staff on how to better utilize soil moisture data in irrigation scheduling.
- Developed significant foundational GIS and spatial resources to improve irrigation water management scheduling tools
- Installed over 200 soil moisture sensors in farmer fields to assist with irrigation decision making
- Wrote grant to underwrite irrigation capacity building workshop for MN SWCD staff that was hosted in Nebraska.

Applied irrigation/groundwater research gaps not being met, funded or prioritized:

- Funding to further study **the impacts of water stress on crop yields** to quantify the potential economic impacts of reducing irrigation allocations (as proposed by MN DNR in GWMA). Currently I have one study at Westport that looks at evaluating 3 levels of declining irrigation water applications and the impact of reducing plant populations within these irrigation treatments. In addition to looking at economic costs of yield reductions, we also glean significant data on the soil water conditions that are associated with periods of water stress. Projected need to expand this type of applied research is $60,000 over 3 years.
- The **relationship between how water is held in soil pores and the volume of space in soil pores** is the single most important piece of information that informs soil moisture based IWM. This relationship between soil volumetric water content and the tension that soil water is held, is referred to as a soil water characteristic (SWC) curve. We have tried to map every irrigated center pivot in MN, and developed an agricultural irrigation GIS data layer that

identified the most heavily irrigated soil series in MN. Of the 12 most heavily irrigated soil types in MN, we only have soil water characteristic curves for 3 of these 12 soils. Developing a SWC curve costs about $6000 per soil series. The total cost of filling the SWC curve knowledge gap would be $54,000

- What kind of groundwater savings can be had by **throwing the water conservation "kitchen sink" at agricultural irrigation**? We all acknowledge that water conservation is a vital part of preserving or water resources for future generations, but most assumptions about the water saving of certain practices came from research in the high plains of Texas. As such there is significant interest from irrigation service providers, energy utilities and agencies on the savings that can be obtained from the implementation of water conservation practices in MN. Working with West Central Irrigation in Starbuck, we have identified two "side by side" 40-acre center pivots in the same field. One pivot would be left, as is, with scheduling determined through irrigation scheduling checkbook. The other "kitchen sink" pivot would have zone variable rate irrigation based off of soil moisture sensor data to apply just the right amount of water to the right place, a variable frequency drive (VFD) would be installed to reduce pumping energy demand, and a high efficiency nozzle package would be installed to reduce evaporation. Both pivots would have electromagnetic flow meters to quantify the differences in water use over several crops/seasons. Electrical provider would provide analysis of energy savings from VFD per million gallons pumped. Yield data would also be collected to compare the agronomic impacts Cost to retrofit pivots and study inputs for 3 years would be around $70,000.
- **Measuring Evapotranspiration of crops besides Corn and Beans** to better inform the appropriation of groundwater. Below is a summary that Tim Griffis (UMN Biometeorology) and I put together with a cost estimate

For more than a decade, the UMN Biometeorology group has been measuring water vapor flux from corn and soybeans in Rosemount, MN using micrometeorological based Eddy Covariance technique. This method gives the most direct measurement of evapotranspiration and is broadly used throughout the world for studying the water balance of crops, ecosystems, and lakes. The basic measurement package consists of radiation sensors, wind/turbulence sensors, an infrared gas analyzer (IRGA) and a data logger capable of very fast measurements and large data storage. The total cost of a basic system is $52,000. In order to maintain the system, QA/QC, and process all of the data would require technical or student support ($50, 000 per year). This person could maintain multiple (up to 5) stations. This would allow the UMN to develop scientifically based measurements of crop water use and crop coefficients for **alfalfa, potatoes, and edible beans**. Three stations and three years of funding would be needed to calculate consumptive water use to inform future water use decisions. Total cost for the 3 year period, including incidentals would be $327,000.