

On-farm experimentation in precision agriculture: developing “big data” technology to improve the odds of agronomic profits in Montana

Rob Payn^{1}, Bruce Maxwell¹, Clem Izurieta², John Sheppard², and the On-Farm Precision Ag Experiment project team*

1. Dept. of Land Resources & Environmental Sciences, Montana State University

2. Gianforte School of Computing, Montana State University

Abstract: Recent developments in agricultural equipment technology are allowing an unprecedented opportunity to gain a scientific understanding of the primary constraints on crop production and profitability. More specifically, collection of high-resolution spatial data within individual fields enables a locally optimized application of agronomic science. In addition, agricultural equipment now allows variable rates of application for seeds, herbicides, fertilizers, and irrigation at a relatively high resolution within a given field. The central challenge of effective precision agriculture is the development of tools that allow producers to use local data in conjunction with the applicable agronomic model to generate high-resolution application prescriptions that will maximize profit from each field. This application of models at a relatively fine-scale resolution is not typically addressed by regional agronomic research. The On-Farm Precision Agriculture Experiment (OFPE) project team is building data and decision management tools designed to guide the precision agriculture prescription process on a field-by-field basis. These tools will enable calibration of agronomic models to fields in active production, based on data from previous years of experimentation and management. Then, the calibrated models will enable generation of optimized application prescriptions that are most likely to maximize the profit from each field. In this presentation, we provide a case study of the OFPE process in fertilizer application for dryland wheat production, and we seek feedback from the sugar beet and barley production community on how the process may be adapted to their decision support needs.

** Presenting author bio:* Rob Payn was born and raised on a small farm in northeastern Ohio. After earning an undergraduate degree in electrical engineering at the Ohio State University, he worked for 7 years as a computer network engineer. Unsatisfied with the corporate world, Rob returned to academia in the natural sciences in 2001, and has since earned a master’s degree in biology (2004, Virginia Tech) and a PhD in hydrology (2009, Colorado School of Mines). Rob joined the faculty at Montana State University in 2013, and his general research focus is understanding how water storage and movement affects the structure and function of ecological systems. The OFPE project is his first foray into agronomic research.