DELIVERY OF SOIL SCIENCE TO FARMERS USING ADVANCED SIMULATION TOOLS: A 10 YEAR CASE STUDY

Danielle Wildfong, Ken Greer, Dale Hicks, and Edgar Hammermeister
Integrow Ag Consulting, Saskatoon, SK; Western Ag Innovations, Saskatoon, SK;
Western Ag Labs, Saskatoon, SK, Canada

INTRODUCTION

Technologies that aid in farm management and input application can increase profitability only if they readily show an advantage that the farmer can measure (Walton 2010). Western Ag Labs Ltd. (WAL) is a soil science laboratory which provides an educational soil service to producers of Western Canada using the PRS™ Technology. The service provides their customers access to advanced simulation tools that serves as a decision support system for Crop Nutrition Planning (CNP). The PRS™ technology consists of: a) Plant Root Simulator (PRS)™-probe to gain soil data; b) PRS™ Nutrient Forecaster-computer software that designs the Crop Nutrition Plan; and c) A team of WAL Field Service Representatives (FSR) who act as CNP educators transferring knowledge directly to producers. A 10 year study was conducted among users of the service to quantify the following:

1. Customers' satisfaction with the knowledge transfer.
2. Rate of the PRS™ Technology adoption.
3. Change in average annual dollars spent on inputs (effect on the producers' bottom line).
4. Average percentage change in yield production.
5. Customers' perceived return on investment among whole farm adopters and indicator field adopters.
6. Impact on the farmers' knowledge and empowerment levels.

METHODS

This multiple case study research included two designs. The first strategy was to conduct a Service Delivery Satisfaction Survey (Hancock, 2010), evaluating FSR service delivery on service quality; with emphasis on education and knowledge transfer. A 21 question survey was conducted on a random sample of customers (n=53) based on their most recent service experience. The respondents used a likeable scale from 1 to 10 to rank their perceived experience (1 being strongly disagree and 10 being strongly agree). The questionnaire was conducted by e-mail, telephone and in person. Second, an Economic Impact Survey was done to measure the impact the service had on the customers' farm business. This included 16 farmer customers that were randomly selected and interviewed by phone; of which (n=8) were Whole Farm Adopters and (n=8) Indicator Field Adopters. The 'Whole Farm Adopter' forecast over 75% of their total acres/year, whereas 'Indicator Field Adopter' forecasts only 1 or 2 fields to estimate crop nutrient supplies for each major crop type. The survey was structured with 45 qualitative questions to gain a perspective of the impact. Certain questions were asked in direct and indirect forms to get a more accurate response. Participants of the studies were willing to complete the survey without incentives.

RESULTS AND DISCUSSION

Farmer Adoption - Research suggests that poor adoption of conventional soil tests was not

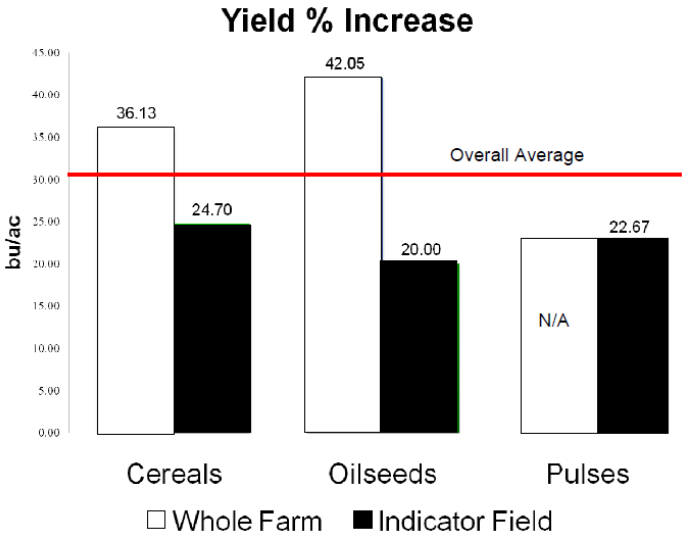
only a result of poor accuracy but also the limited utility of databases to be adapted to changes in the agro-ecosystem over time (Greer et al. 2003). Therefore, the growing need among farmers for more accurate soil nutrient supply data was recognized by WAL through the PRS™-Probe and Forecaster Technology. Thirty-eight percent (38%) of surveyed farmers said that they used conventional soil testing prior to trying the PRS™ technology. Of this group, 100% decided to switch exclusively to the PRS™ Forecaster, mainly as a result of the powerful simulation model that could be used as a decision support for crop nutrition planning. The survey showed two categories of adopters: 1) Whole Farm (WF) Adopter and 2) Indicator Field (IF) Adopter:

1) Whole Farm (WF) Adopter	**2) Indicator Field (IF) Adopter**
- Time required to adopt: 2.38 yrs.	- Time required to adopt: 2.13 yrs.
- Average confidence level in technology: 81.6%	- Average confidence level in technology: 81.3%
- Average personal rank as risk taker: 6.14	- Average personal rank as risk taker: 7.60

Learning & Empowerment – The Field Service Representatives work directly with customers by teaching one-on-one how to use the PRS™ Forecaster as a farm management decision support tool. 90% of respondents who had access to the PRS™ Forecaster used it on their own to make changes to their crop plans. The customers ranked the PRS™ Forecaster software in the following areas:

1. Usability/comfort level with the program: 84%
2. Empowering farm management tool: 80%
3. Value as a risk management tool: 78%

Agronomic Impact – The satisfaction with the level of Agronomic knowledge that impacted the business was 91%. Customer perception of the service being an overall positive experience was 90%. The customers viewed the service as a valuable agronomic resource that enhanced their farm business production. The average yields among major crops had increased as a result of using PRS™ Technology (Figure 1). The average yield increase over all crops and adopter types was 30.8%. Whole Farm Adopters reported an increase in yields of 39.1%. However, insufficient data existed to calculate the change in pulse yields for Whole Farm Adopters. The Indicator Field Adopters reported an average increase in yields of 23.1%. The PRS™ Technology was reported to be an accurate tool for agronomic decisions. Adopters reported 'backcasts' of their actual field yields often came within +/-1 bu/ac.



Economic Impact – When direct questions were asked during the interview regarding the service's effect on the bottom line and Return on Investment (ROI) resulted in lower scores as compared to indirect questions. The customer's perceived value of the service having impact on their bottom line was 3.3 of 5 (1 being low, 5 being high). When asked directly, the customers

indicated an average increase in their bottom line of 7%. The Whole Farm Adopters reported an average ROI of 21:1 on the PRS™ Crop Nutrition Plan and Indicator Field Adopters perceived a ROI of 10.5:1. When using the yield improvement, a calculated increase on the net bottom line was \$95.00 ac-¹ on average. All adopters surveyed felt that their fertilizer input dollars were spent in an optimal way.

SUMMARY

The time required for Whole Farm adoption was only slightly more than that required by farmers who used the 'Indicator Field' approach. Given that both groups had been customers an average of 6 years, we can conclude that WF and IF Adopters are unique groups. Both WF and IF Adopters had a similar level of confidence in the PRS™ Forecaster decisions and learning outcomes. The WF Adopters had a farm size that was less than half (~ 44%) that farmed by the IF Adopters. Smaller farms better accommodate the management of individual fields whereas the larger farmer more often uses the 'Indicator Field' approach to get "in the ballpark". The Whole Farm adoption of the PRS™ technology increased the agronomic output by around 39%, which resulting in an average \$95.00 ac^{-1} improvement in the bottom line. IF adopters did have improved yields, ROI and bottom line, albeit only half that of the WF Adopters. The responses to direct questions about economic gains resulted in much lower numbers than indirect questions on economic improvement. Participants' holdback may be due to concerns that the cost of the CNP service would be increased. The use of the Western Ag Labs' service has overall positive effects on the customers' yearly crop selection, production outcome, fertilizer budget, and human capital, thus resulting in a significant increase on the bottom line.

REFERENCE

Greer, K.J., Sulewski C., Hangs, R. "Applying PRSTM Technology for Nutrient Management." h*ttp://cropandsoil.oregonstate.edu/wera103/2003_WNMC_Proceedings* 2003(5).170-175.RetrievedMay1,2010 from http://cropandsoil.oregonstate.edu/sites/default/files/WERA103/2003_proccedings/p170_Greer_PRS_probe.pdf .

Hancock, S. *http://westernaglabs.com/survey/surveyV2.php, 2010*

Walton, J., Roberts, R., Lambert, D., Larson, J., English, B., Larkin, S.,Martin, S.,Marra, M., Paxton, K., & Reeves, J.. (2010). Grid soil sampling adoption and abandonment in cotton production. Precision Agriculture, 11(2), 135-147. Retrieved June 4, 2010, from ABI/INFORM Global. (Document ID: 1978279211).

PROCEEDINGS

OF THE

WESTERN NUTRIENT

MANAGEMENT CONFERENCE

Volume 9

MARCH 3-4, 2011
RENO, NEVADA

Program Chair:
Robert Flynn, Program Chair
New Mexico State University
67 E Four Dinkus Road
Artesia-NM 88210
(575) 748-1228
rflynn@nmsu.edu

Coordinator:
Phyllis Pates
International Plant Nutrition Institute
2301 Research Park Way, Suite 126
Brookings, SD 57006
(605) 692-6280
ppates@ipni.net