Agronomic Systems

To increase profitability, the On-Farm Network® (OFN) thinks in terms of cost per bushel to produce. Iowa farmers can withstand global competition and low commodity prices if their cost to produce is less than the commodity price. This means reducing unnecessary inputs as well as raising yield levels. The OFN is committed to helping farmers manage their cost per bushel to produce in conducting research in agronomic cropping systems and tools from precision agriculture.

SmartFirmer™ Technology

In 2018, the On-Farm Network began characterizing SmartFirmer™ Technology. Developed by Precision Planting, SmartFirmers are a seed firmer attachment that reads soil temperature, soil moisture, and soil organic matter during planting every several seconds. Interest in this technology was to determine whether farmers could use these readings to develop management zones for variable rate operations such as seeding or variable rate nitrogen.

Figure 1 represents SmartFirmer data from a field in northeast Iowa. Areas in red are lower in organic matter at approximately 2 percent, while greenish areas of the field had readings near 5 percent. The fine black lines indicate the USDA-NRCS Soil Survey Geographical database soil map (SSURGO) for the field. Note there is some agreement between SmartFirmer zones and SSURGO soils, but exceptions exist. This could indicate that SmartFirmer data could be used to refine and improve soil maps.

To understand whether SmartFirmers could be used to create management zones, the OFN team overlaid SmartFirmer derived zones for organic matter over yield data. If SmartFirmer zones are unreliable, yield values for each zone are expected to be similar.

Figure 2 shows measured soybean yields by level of SmartFirmer management zones derived from organic matter measurements. Note that zones derived from 3 and 3.5 percent organic matter are lower yielding compared to zones with higher organic matter such as 4 and 4.5 percent. Also note that the highest organic matter zone, 5 percent, was not the highest yielding. Examination of the soils in this zone indicates areas where drainage is poorest.

Results from analysis of this field and others indicates that SmartFirmers have promise to help farmers build improved management zones for variable rate applications. In the example of Figure 2, we could have divided the field into too many zones and breaking the field into three zones might be more practical for farmers.
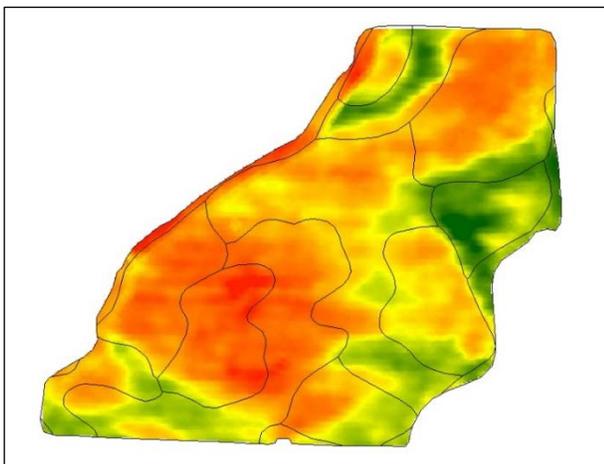

Figure 1. SmartFirmer management zones overlaid with SSURGO map. Dark red indicates areas of lower organic matter and green areas indicate higher organic matter zones.
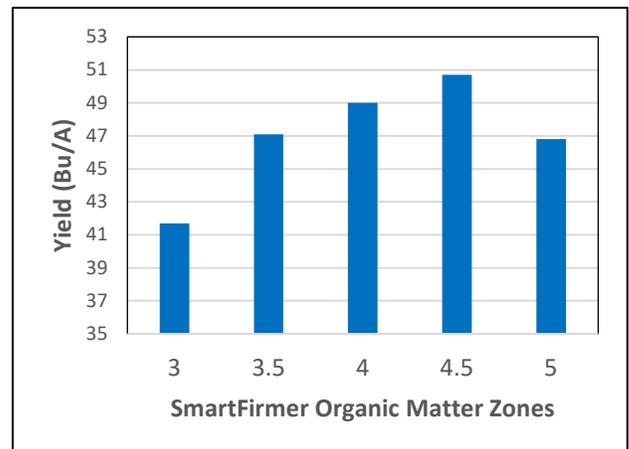

Figure 2. Soybean yield results by SmartFirmer zones derived from organic matter measurements.

On-Farm Network®