UMAC SUCCESS STORY

Using Remote Sensing to Determine Potassium Management Zones

Background:

Potassium (K) deficiencies can occur in coarse textured soils and in areas where erosion has removed the topsoil. These deficiencies have the potential to reduce yields and profitability.

Figure 1: Soybean K Deficiency

In the last few years, areas of K deficiency have been observed in UMAC states. K deficiency may result from several factors, including its removal by crops in excess of K additions. The amount of K removed from the soil by corn and soybeans averages 0.29 lbs/bu and 1.40 lbs/bu, respectively. In a two-year corn/soybean rotation, over 125 lbs K_20/acre can be removed from the soil. If K is not replenished through the natural weathering processes of minerals or by adding fertilizer, deficiencies will occur. Remote sensing can be used to identify K deficiencies in fields.

Potassium is a mobile nutrient within a plant. When K deficiency appears in plants, symptoms usually occur on older leaves first because K is translocated from the older leaves to the younger leaves. When K is deficient, the tips and edges of the older leaves start to turn yellow (chlorosis) (Figure 1). Eventually the leaf margins will die (necrosis) and turn brown.

Use of Data:

IKONOS imagery was obtained on July 3rd, 2002 for a farm in east-central South Dakota. A false color image was prepared using IKONOS bands 4 (near infrared), 2 (green) and 1(blue). In a false color image, healthy plant vegetation appears bright red. Upon investigation of the imagery by the farmer, some areas in cornfields did not appear as healthy as others (Fig. 2). Furthermore, plants in this area had symptoms similar to these shown in Fig. 1. The land manager suspected that these areas might be low in soil K.

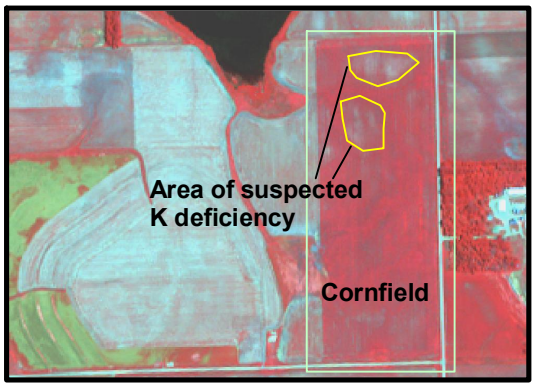

Figure 2. Areas in a cornfield of suspected K deficiency.

Economic and Environmental Benefits:

The remotely sensed imagery verified the extent of the problem and confirmed that K levels need to be monitored more closely. The farmer plans to use this information to improve potassium management in his fields. Solving the K deficiency problem in this and other fields can result in higher yields, improve nitrogen(N) use efficiency, reduce NO_3 leaching to ground water, and reduce wind and water erosion.

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For more information visit the SDSU Precision Agriculture Website:
http://plantsci.sdstate.edu/precisionfarm/

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