Iron deficiency chlorosis (IDC) is a serious management issue for soybean [Glycine max (L.) Merr.] grown on soils formed under calcareous parent materials in semiarid regions. In North and South Dakota and areas of central and western Minnesota, IDC causes estimated annual losses of $120 million. Soybean is an important rotational crop in these regions and managing fields prone to IDC is a major production issue for soybean growers.

Iron deficiency chlorosis is not like other nutrient deficiencies. The problem is not a result of a deficiency of iron (Fe) in the soil; rather, it is caused by the soybean plant's inability to utilize the Fe in the soil. Soybean is a Strategy 1 plant, which relies on the release of protons to reduce Fe$^{3+}$ to Fe$^{2+}$, which is taken up by the plant. In soils with high levels of carbonate, specifically bicarbonate, the ability of the soybean plant to reduce Fe$^{3+}$ is reduced and can result in chlorosis in the plant. This chlorosis problem varies on a year-to-year basis depending on the amount of moisture in the soil. Thus, developing a model to predict the severity of IDC for a given year is challenging.

Excess uptake of nitrate by soybean can increase the incidence of severity of IDC. There are two theories why this occurs. First, bicarbonate released from the root as nitrate is taken up may increase the pH around the root and decrease the uptake of Fe. Second, increased nitrate in leaves of sunflower (Helianthus annuus L.) has been found to result in an increase in the apoplastic pH, which affects the reduction of Fe$^{3+}$ to Fe$^{2+}$ and the plant's ability to utilize Fe. Surveys of green wheel tracks within field areas affected by IDC in western Minnesota indicate that nitrate uptake may be impacting IDC severity on soybean. Managing nitrate levels can be difficult for soils prone to IDC because of a greater potential to mineralize N as these soils are typically found in low lying areas of the landscape and have a relatively high concentration of organic matter in the surface 15 cm.

An article in the November–December 2014 issue of Agronomy Journal compares field management strategies for preventing IDC in soybean. Traditionally, variety selection has played an important role in mitigating the impact of IDC. Many soybean growers would like to increase yield by planting higher-yielding varieties that are more tolerant to IDC. Companion crops, such as oat, can reduce the rate of nitrate uptake and potentially dry the soil. Application of chelated Fe has been considered for soils prone to IDC. Companion crops have shown limited success for mitigating IDC, and plant response to fertilizer consisting of chelated Fe has been found to vary depending on the chelate's ability to keep Fe in a more available form.

Past research has shown that Fe chelated as Fe-EDDHA [ethylene diamine-N, N'-bis (hydroxy phenyl) acetic acid] can increase soybean grain yield on IDC-prone soils. Advances in manufacturing have resulted in Fe-EDDHA becoming more cost effective as a treatment for IDC. In central and western Minnesota, many farmers have begun utilizing Fe-EDDHA applied directly on the soybean seed at planting (in-furrow placement). Even though the cost of the product has decreased in recent years, there still are questions as to variable-rate application to apply Fe-EDDHA where it is most needed.

Strip trials can be used to better assess the effects of treatments in landscapes that contain soils with IDC. The use of Fe-EDDHA in-furrow application