

Improved precision of nitrogen fertilization in winter wheat

What is the perfect N rate in winter wheat? In order to address this question, field trials have been performed in Sweden for the past ten years. The aim of the trials was to reveal the optimal N fertilization rate and in the end develop new recommendations for winter wheat N fertilization.



An N dose-response field trial (to the right) and the farmers own "0-plot" (to the left).



Creating a "0-plot" at early fertilizaion with a tarp

The result from the trials showed that the optimal N rate varies greatly between years and locations, from optimum of 0 kg N/ha up to 320 kg N/ha. The use of an average rate of N for every crop, every field, and every year thus appears to be an unsatisfying approach.

From the trial results it was concluded that the key issue for a better N fertilization prediction was to develop methods for predicting soil N supply.

In the same trials, measurements with Yara N-sensor was consequently made in the unfertilized plots, and the values retrieved when measured at BBCH 32-37 showed a good correlation with the actual soil N supply in the yield. Models for predicting the optimal N fertilization under several different "protein goals" were constructed based on yield together with the measured value of the Yara N-sensor in an unfertilized plot in BBCH 32-37.

Formula for milling wheat (protein 11,5-12%):

$$76 + Y*22 - SN*2,1 = N \text{ rate (kg/ha)}$$

"Y" is (estimated) yield in tonnes/ha and "SN" is the Yara N-sensor value from unfertilized plot in BBCH 32-37.

The method have since 2015 been developed into an advisory service, available for wheat growers in Sweden. The farmer creates a "0-plot" in the field when fertilizing N in the first one or two fertilization timings in early spring, before BBCH 30. The plot needs to be minimum 4x4 m, and is usually created by placing a tarp on the ground at the time for fertilization. When the crop reaches BBCH 32-37 a measurement is done in the "0-plot" with the Yara N-sensor, and the yield potential is estimated. These two variables are put into the formula constructed from the field trails to obtain the optimal N rate for that crop.

Example of fertilization recommendation with low soil N supply:

$$76 + 10*22 - 20*2,1 = 254 \text{ kg N/ha}$$

Example of fertilization recommendation with high soil N supply:

$$76 + 10*22 - 90*2,1 = 107 \text{ kg N/ha}$$