Module 5.1-6 Split application optimizes nitrogen use efficiency of wheat in Argentina.

Spring wheat is one of the most important crops in Argentina, with an average production of 12.9 million tonnes for the period 2007-2011. Almost 30% of the total production is located in the southeastern Buenos Aires Province. Most of the wheat planted in this area is sown using high-yielding French-type varieties, increasing nutrient demand and farmers' use of inorganic fertilizer.

Despite the high indigenous soil fertility of the region, the extended use of aggressive tillage has depleted soil organic matter content, which is the main N reservoir. In order to mitigate soil degradation, farmers have adopted minimum or no-tillage practices during the last decade. However, the incorporation of these best management practices was accompanied by a drastic increase in soybean cultivation that has also contributed to soil fertility depletion. The combination of these scenarios has increased N fertilization rates to the range of 100 to 150 kg N/ha.

The increasing prices of N fertilizer have encouraged farmers to demand technologies to improve N use efficiency. Therefore, a first step was to recommend delaying the N application, traditionally done at sowing, to tillering. This practice increased NUE by about 30% (Barberi et al., 2008), and was rapidly adopted by farmers during the last decade. More recently, the concept of splitting the N rate between tillering and flag leaf stage is being studied as an alternative to further improve synchrony of N supply with crop demand.

In order to compare N application strategies in wheat, six experiments were conducted between 2007 and 2010 under no-tillage at three locations of the southeastern Buenos Aires Province (Velasco et al., 2012). The source of N was urea (46% N) at three different rates (90, 120 and 150 kg N/ha), broadcast in a single application at tillering or split between tillering and flag leaf stage.

Splitting N fertilizer increased grain yields at all N rates (**Figure 1A**). At higher N rates the benefit of splitting the dose declined. Splitting the N dose also improved grain quality, as an increase in grain protein content (**Figure 1B**) was observed. The optimum N rate for protein was higher than that for yield. However, the partial N balance does not decline much below 1.0 for the 60+60 treatment that was optimal for protein, indicating that production of high yield, high protein wheat can be compatible with minimal losses (**Figure 1C**).

Moving from the traditional timing practice of application at sowing to a split application at tillering and flag leaf stage improved both yield and N use efficiency. The substantial increases in efficiency have likely reduced losses of N and their impacts on the environment as well.

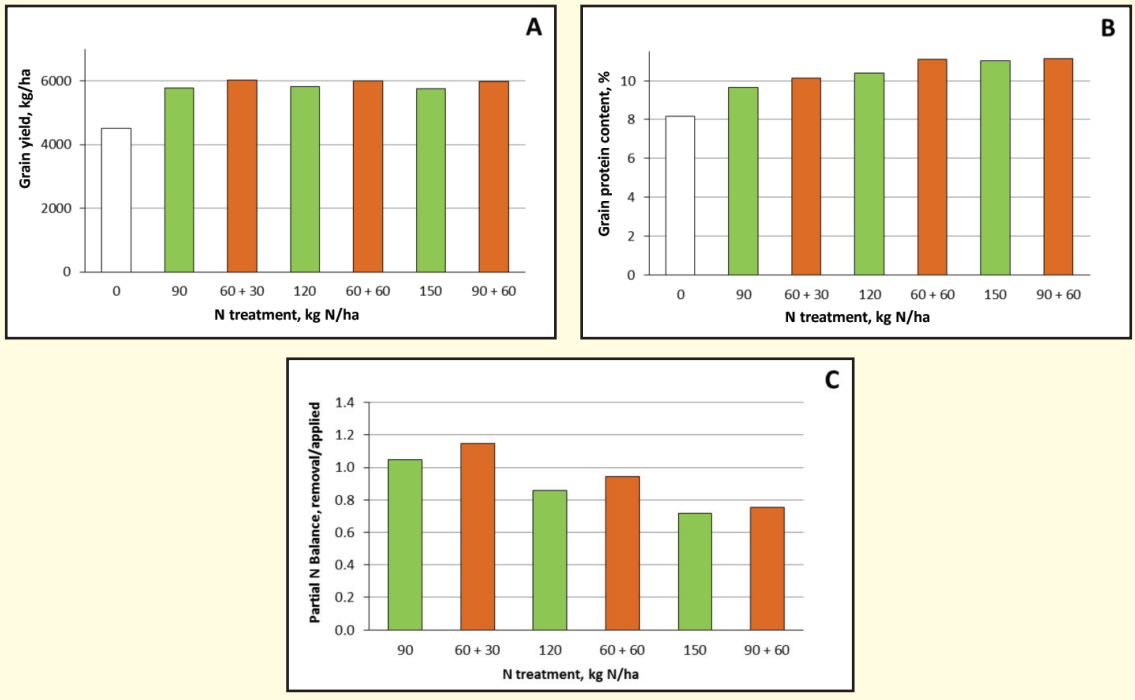

Figure 1. Grain yield, grain protein content and partial N balance in relation to N rates applied in a full dose at tillering or split between tillering and flag leaf. Source: Velasco et al. (2012).

References

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Submitted by F. Garcia, IPNI, Argentina, November 2013.