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Case Study 7.3-4 Adapting phosphorus and sulfur application timing to double-crop wheat-soybean in Argentina. In the humid Pampas of Argentina, the intensification of cropping practices and the use efficiency of resources provide for increased farm profitability. In this context, double cropping is becoming a key component of agricultural systems. Widespread interest in double cropping wheat–soybean is based on economic factors together with machinery, markets and know-how associated with growing individual wheat and soybean crops.

In order to attain high soybean yields, it is essential to sow immediately after wheat harvest. Given the fact that fertilization might cause logistical complications during soybean planting, it is important to determine if P and S can be applied in the wheat crop at rates that meet nutrient requirements of both crops. This strategy is based on the capacity of both nutrients to be retained by the soil matrix.

Seven experiments were performed in the Northern Pampas of Argentina during two growing seasons (2001 and 2002). On these plots, P, S and a combination of P + S were applied based on the average crop removal rate for the region (30 kg P/ha and 20 kg S/ha). Two fertilization strategies were compared: a single rate for both crops applied at wheat planting (sequence fertilization), and the same rate split between wheat planting (13 kg P/ha and 8 kg S/ha) and soybean planting (17 kg P/ha and 12 kg S/ha; crop fertilization). A control treatment without P and S was also evaluated. P was applied as MAP (12–52–0, $N–P_2O_5–K_2O$) and was banded with a seed–fertilizer planter. S was broadcast at planting as gypsum (18% S).

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Double-cropped soybean after wheat crop in Northern Pampas of Argentina.

The soils of the experiments contained less than 2.4% organic matter. Soil Bray-P1 values were lower than 15 mg/kg, and soil $SO4^{-2}$-S contents were lower than 15 mg/kg (0-20 cm). Previous research indicates that crops grown in soils with these features present a high probability to respond to P and S fertilization. **Figure 1** (left) shows the wheat yield increases in response to fertilization. Average responses for the treatments P + S were about 400 kg/ha (15% yield increase), and there were no differences between sequence and crop fertilization strategies.

Soybean yield also increased in response to P and S fertilization as shown in **Figure 1** (right). Average responses were about 240 kg/ha (+12%) and differences between sequence and crop fertilization strategies were small.

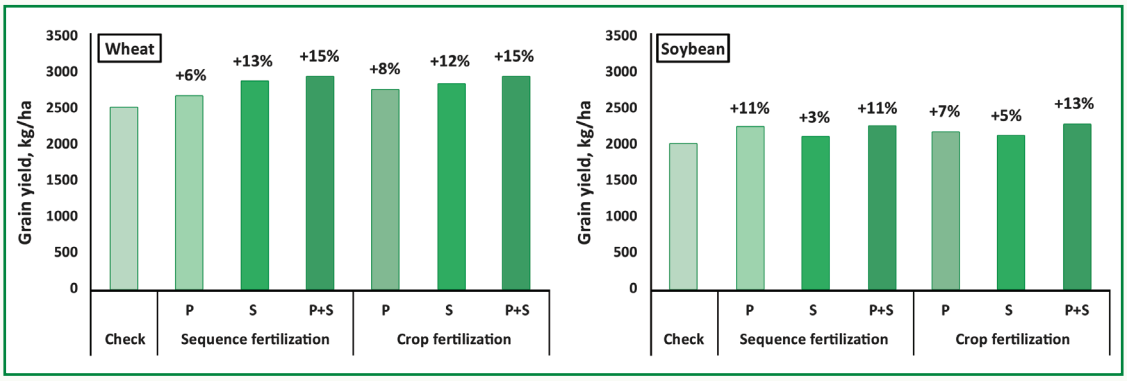

Figure 1. Wheat and double-cropped soybean grain yield for treatments with P, S and P+S fertilization in a full dose at wheat planting (sequence fertilization) or divided between plantings of both crops (crop fertilization). Source: Salvagiotti et al. (2004).

These results confirm that for the soil and weather conditions of the Northern Argentinean Pampas, it is possible to apply P and S once annually to meet wheat and double-cropped soybean requirements in a single operation at wheat planting. This represents an advantage because it offers logistical convenience in a context where soybean planting date defines crop success.

Adapted from: Salvagiotti F., G. Gerster, S. Bacigaluppo, J. Castellarín, C. Galarza, N. González, V. Gudelj, O. Novello, H. Pedrol, and P. Vallone. 2004. Ciencia del Suelo 22 (2) 92-101.

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