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## FERTILIZATION MANAGEMENT IN DOUBLE CROPPING

John H. Grove

Double crop systems are being widely adopted by grain and silage producers in Kentucky. The wheat-soybean grain intensive system accounts for nearly 750,000 acres of cropland in the state each year. Alternative silage systems for beef and/or dairy producers involve a fall seeded small grain (wheat, barley, triticale) that is harvested at an immature stage of growth. Immediately afterward a crop for silage (corn, grain sorghum) or grain (soybean, grain sorghum) is planted. When reduced and no-tillage management practices are used the timeliness of planting is improved and losses of surface soil moisture are minimized as the second crop starts growth. As two crops are to be harvested in a single season, fertilizer management is of considerable importance to double crop producers.

### Fertilization and Double Cropping for Silage

Fertilization in such systems involves questions of timing. Nitrogen fertilizer should be applied to each crop in succession according to current recommendations (AGR-1: Lime and Fertilizer Recommendations). From the practical standpoint, it is convenient to apply all phosphorus and potassium in the fall for both crops in the double crop system. However, when the small grain is to be harvested for silage, UK Agronomy research indicates that it is probably better to apply potassium separately for each crop since immature small grains harvested for silage remove large amounts of potassium and if the following corn or grain sorghum crop is ensiled, they too will remove large amounts of potash.

If the small grain is to be harvested for silage, apply phosphorus and potassium according to soil test recommendations for small grains in the fall. Additional potassium should be applied prior to seeding the second crop (see Table 1). Because of the increase in potash removal in corn silage production systems it is also recommended that the potash fertilization rate prior to corn planting be increased by 60 lb  $K_2O/A$  over the rate recommended for corn grain production for fields devoted to either continuous corn silage production, or for corn following small grain silage production.

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Table 1. Potash recommendations for second crop following small grain silage.

Soil test levels	lbs K <sub>2</sub> O/acre to apply			
	Soybeans	Grain Sorghum	Corn Grain	Corn Silage
High (above 250 K)	0	0	0	60
Medium (250-165 K)	0-60	0-60	0-60	60-120
Low (below 165 K)	60-120	60-120	60-120	120-180
Very low (below 75 K)	120-150	-----	-----	-----

Fertilization and Double Cropping For Grain

Double cropping is often associated with "intensive" production and producers who double crop may become concerned about rapid depletion of soil reserves of plant available phosphorus and potash. Results to date from on-going UK research on continuous grain intensive double cropping (4 crops every 2 years) at Lexington to determine fertilization practices for this system indicate that: 1) when soil test potassium was raised from low to medium, the relative grain yield response was greater for soybeans (+17%) than wheat (+10%). Raising the potash soil test to "high" levels did not increase the yield of either crop. 2) fall potassium fertilization at a rate recommended for full-season soybeans was sufficient for both crops. 3) grain yields of wheat increased with phosphorus application even though soil test levels were in the high range. This was due to the late planting date for wheat (early November) inherent in this continuous double crop grain system.

The results indicated that wheat was more sensitive to phosphorus nutrition whereas the soybean crop was responding more to potassium. This suggests that the most efficient and economical way to manage fertilizer in this system is to apply phosphorus according to small grains recommendations and potassium according to soybean recommendations (Table 2) in the fall when seeding the small grain. Addition of the P<sub>2</sub>O<sub>5</sub> and K<sub>2</sub>O fertilizer recommended for the two individual crops to arrive at one double crop fertilizer recommendation is not necessary or economical.

Table 2. Phosphorus and potassium fertilizer recommendations for small grains, full season soybeans, and double cropped small grains (for grain)-soybeans.

	Single Crop Small Grains		Full Season Soybeans		Double Crop Small Grain and Soybeans	
	P <sub>2</sub> O <sub>5</sub>	K <sub>2</sub> O	P <sub>2</sub> O <sub>5</sub>	K <sub>2</sub> O	P <sub>2</sub> O <sub>5</sub>	K <sub>2</sub> O
High (above 60 P, 250 K)	0	0	0	0	0	0
Medium (60-30 P, 250-165 K)	0-80	0-40	0-40	0-60	0-80	0-60
Low (below 30 P, 165 K)	80-120	40-80	40-80	60-120	80-120	60-120
Very Low (below 10 P, 75 K)	-----	-----	80-100	120-150	-----	120-150

Soil samples should be carefully taken every two years in fields where a double cropping system is being used in order to insure maintenance of soil fertility at the medium to high level where potential yield losses due to inadequate nutrition are minimal and to prevent uneconomical fertilizer usage.