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Phosphorus Placement for Annual Crops in the Tropics

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Motivation

- Highly soluble P fertilizers tend to perform better when applied as granules in furrow to soils with pH values ranging between 6.0 to 6.5.
- Recently, in looking for better operational efficiency, many farmers have been challenging this recommendation and are increasingly in some regions broadcasting these sources of P on the soil surface before seeding.
- This presentation discusses agronomic and environmental implications of such change.

Common Question

- “May I broadcast P?” or “May I continue to broadcast P?”
- Generally the question is asked with the hope for a positive reply.
- In reality, the answer is more complex than a simple “Yes” or “No”.

Intense Debate

- Both sides (in favor or not) present data proving their point.
- A long-term view may indicate that the widespread use of this practice can lead to problems.
- This long-term view is not often the focus of those making field-level decisions. It should be the focus thought of those responsible for planning agriculture at region or country level.

Agronomic Aspects

- Recommendation for the placement of soluble P sources in tropical soils have always tried to minimize the contact of the fertilizer granule with the surface of soil particles as a means to improve efficiency.
- Three main strategies: (1) Corrective, (2) Maintenance, and (3) Combination of both.
- New option has been used lately: Surface broadcasting of soluble P at rates similar to a maintenance strategy.

Agronomic Aspects

- There is no general rule.
- An essential step is to understand the available P status throughout the whole soil profile.

Agronomic Aspects

- Availability of P in three soil management scenarios (A = natural ecosystem, B = P fertilizer applied on the soil surface, C = P fertilizer applied in-furrow in a well-managed, no-till cropping system).

Soil depth, cm	Management		
	A	B	C
	Soil P concentration, ppm*		
0 to 5	3	65	48
5 to 10	2	6	25
10 to 20	1	2	19
20 to 40	1	1	15
40 to 60	1	1	2

*Resin soil test P categories: very low = 0 to 6, low = 7 to 15, medium = 16 to 40, high = 41 to 80, very high \geq 80.

Agronomic Aspects

- Depending on an interaction of factors, mainly soil P availability through the soil profile and climatic conditions:

P in furrow > P broadcasted

P in furrow = P broadcasted

P in furrow < P broadcasted

Environmental Aspects

- Agriculture in general and P fertilization in particular are among the factors influencing eutrophication of water.
- With P broadcasted, soluble and particulate P will be more susceptible to reaching water reservoirs through runoff.
- Local research is necessary to establish the potential risks of the different methods of P placement to runoff.

Environmental Aspects



Runoff happens – even in the well-drained Oxisols of the tropics.

Guidelines for the Placement of Phosphorus

- **New areas**: If possible, broadcast and incorporate as to raise the levels of available P.
- **Increasing soil P with time**: Avoid broadcast.
- **Soil topography**: Soils with sloping topography should receive P in furrow.
- **Soil profiles with P stratification**: The higher the risk for water stress and the more sloping, the greater the requirement to apply P fertilizer in-furrow.

Guidelines for the Placement of Phosphorus

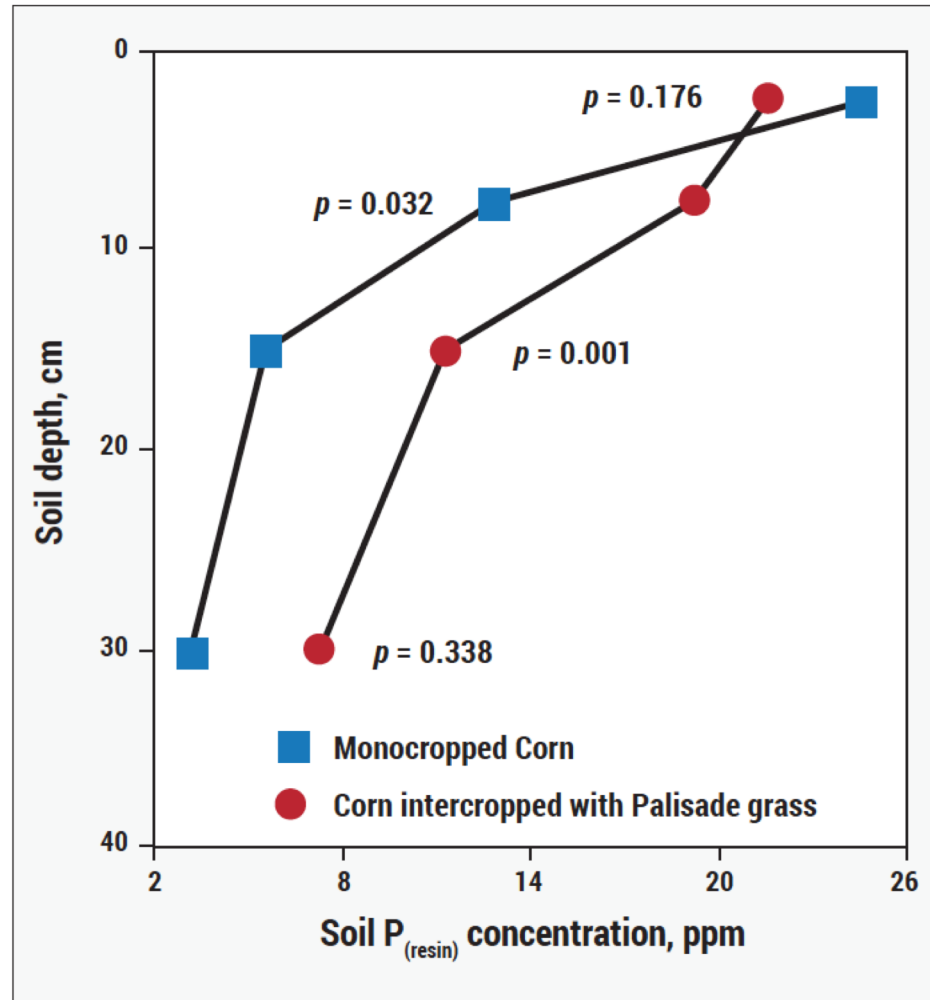
- Soils profiles without P stratification and with sufficient available P: P fertilizer may be broadcasted.
- Alternate the placement.
- Ensure optimal seed and P fertilizer placement: More modern techniques are now available.
- Pay close attention to spatial variability of P in looking for uniformity.

Guidelines for the Placement of Phosphorus

- **Do no-till right:**
 - ✓ Better water infiltration. Protection against erosion and runoff.
 - ✓ Crop rotation. Certain grasses have robust root systems that help to absorb P.
- **Monitor the spatial distribution of soil fertility:**
Helps to define better placement method.

Guidelines for the Placement of Phosphorus

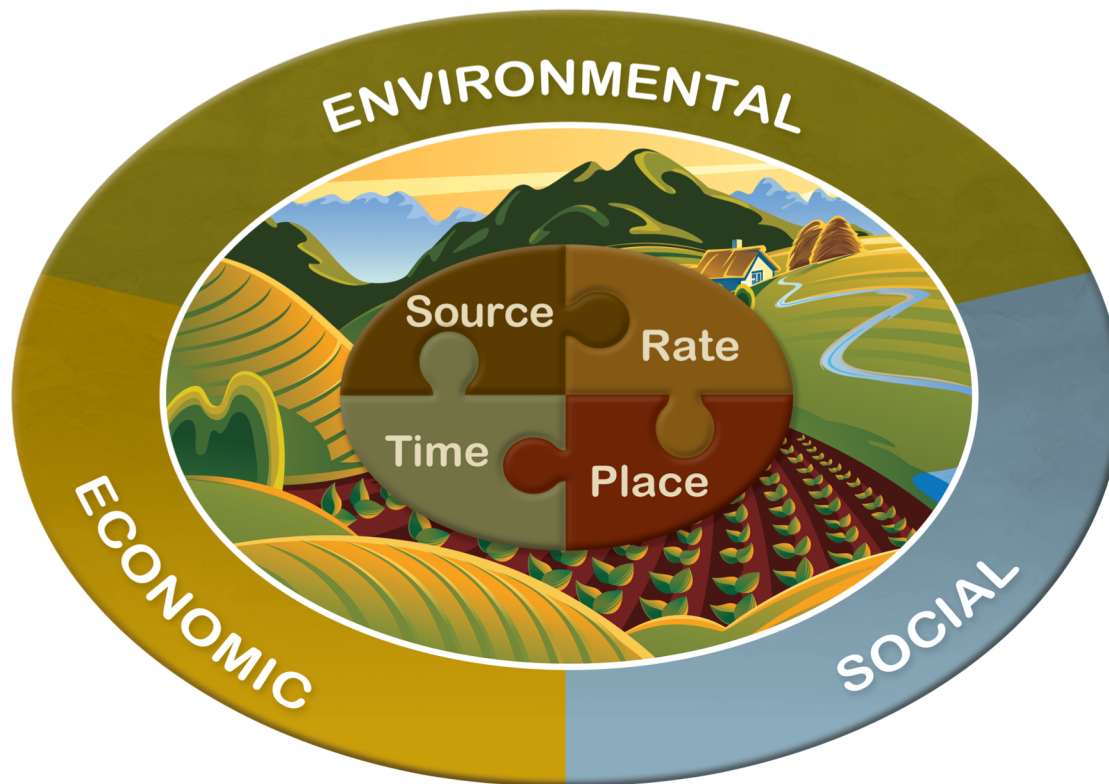
- Farming systems including grasses may increase the soil P through the soil profile in well-managed no-till systems.



Source: Crusciol et al. 2015.

Guidelines for the Placement of Phosphorus

- Always use the 4R Nutrient Stewardship.



Take it to the field

- In years with good water availability and P supply, expect little agronomic difference between broadcast and in-furrow P placement.
- Farmers should promote practices that increase the soil P concentration throughout the soil profile and not just the surface.

Take it to research and agri leaders

- When considering P placement we should not just focus on agronomic aspects. The environmental concerns are legit and needs our consideration (water pollution and trade commerce).



Thank You Very Much For Your Attention!



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