“Right-sizing” in international agricultural development: An example -- Plant nutrient management practices for small scale and subsistence farmers
Questions

• Should Agriculture in third world be Sustainable?
• Should Precision Technologies be implemented into the Third World?
• Could Precision Technologies be implemented into the Third World?
Questions

• What is your definition of Sustainable Ag.
  – Example?
• What is your definition of Precision Ag.
  – Example?
• How often is Precision Tech Sustainable
• If a Precision technology increased inputs could it still be considered Sustainable.
Sustainable Ag

• The Producer

• The Consumer
Precision Ag

- Average Producer
- Young/progressive
Mountains
Diversity
Family Farms
Family farms
Questions

• Should Precision Technologies be implemented into the Third World?
• Could Precision Technologies be implemented into the Third World?
Keep in Mind

Large Ag is in Most Countries

Precision Ag is not always Large
4 R’s

1. Right Source
2. Right Place
3. Right Rate
4. Right Time

IPNI: International Plant Nutrition Institute
Consistent Yield and Response

Exp. 502, 1971-2009

Grain yield, bu/ac

Response Index

Ave Yld 42 bu/ac

**N Need (Theoretical)**

Exp. 502, 1971-2009

<table>
<thead>
<tr>
<th>Year</th>
<th>Optimum N Rate (lb/ac)</th>
<th>Max Yield (bu/ac)</th>
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<tbody>
<tr>
<td>1971</td>
<td>Avg. 51 +/- 39</td>
<td>Avg. 44 +/- 15</td>
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Optimum N Rate determined by N-up 112 – N-up check * 50% efficiency
The Nitrogen Cycle
Nitrogen

• Additions
  – N₂ Fixation, Industrial, Fertilizer, Decomposition, Rainfall and Lightning

• Losses
  – Leaching, Denitrification, Ammonia Vol., Plant Loss

• OM
  – 1,000 lbs N / 1% OM / 6in soil
  – Mineralization, Immobilization
Reference Strips

• **What:** A high rate of N applied in, across, through, over or under each and every field

• **How Much:** Minimum of 125% of yield goal recommended rate, this includes residual and preplant.

• **How and Where:** 10 to 100 ft wide, anywhere representative.

• **When:** Winter crops; before or after sowing (1+ months), Summer crops; before or immediately after planting.
N-Rich Strip
The Original NRS

View from Blarney Castle.  

Fairview Oklahoma
Small Scale
Reference Strips

• Are Very Visual..
Optical Sensors

• Numerical, describe the crops BIOMASS.
• DOES NOT really WORK WITH OUT A REFERENCE.........
• Multiple options
  – Companies
  – Resolution
Optical Sensors
Commercial Handheld
April 16, 2007
Dr. Norman Borlaug
Ciudad Obregon, MX
1. Visually determine the approximate NDVI value of the N Rich-Strip (NRS) and the Farmer Practice (FP).
2. Divide the NRS NDVI by the FP NDVI, this value is the Response Index (RI). The RI is on the right hand side of each graph.
3. Using the graph which best estimates the number of days where GDD>0 for the field, choose the line that is the closest to the RI calculated, and then find the point on that line for the NDVI value nearest to that of the FP. Where the NDVI of the FP and the line intersect is the recommended N rate for that field at that moment.

Images collected at growth stage Feekes 5. This is when leaf sheaths lengthen, normally occurs in Oklahoma around February.
Hand Planter

- 159 million ha’s, maize, developed
- 34 million ha’s, maize, 3\textsuperscript{rd} world
  - 60% planted by hand
3rd world hand planter

- If single seeds could be planted 14-17 cm apart, much like conventional planters accomplish in the developed world, production levels could easily increase 25%.

- Despite the fact that third world maize yields are generally less than 2.0 Mg/ha (Dowswell et al., 1996), this 25% yield increase on 60% of the hand planted maize area in the third world would be worth more than 3 billion dollars/year (corn price at $0.3/kg)

- \[ 20,000,000 \text{ ha} \times 2.0 \text{ Mg/ha} \times 0.25(\% \text{ increase}) \times 0.3 \]

http://nue.okstate.edu/Hand_Planter.htm
Opico Quezaltepeque, El Salvador
Any Questions??????

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