The Role of IPM in a Crowded and Hungry World – Trends in Field Crop IPM in the US

Charles T. Allen
Crops in the South: Historically Pest Intensive

Soon after the discovery of Insecticides

• Calendar-based spray schedules
• Disregard for natural enemies/biocontrol
• Limited field scouting
• Limited consideration of environment
• Limited consideration of human health issues
• Issues began to emerge
Calcium Arsenate Application
• Synthetic Organic Insecticides - late 1940s
• Cotton pest control heavily insecticide-based
• Resistance – 1954 boll weevil, 1963 bollworm/budworm
• Banks grass mite miticide resistance in corn and grain sorghum late 1960s
• By 1983 25 pests of cotton resistant to organochlorine insecticides
• Growers slowly realized they must change
Off-Farm

• Pesticide residues and effects in
  ✓ Animals
  ✓ Plants
  ✓ Soil
  ✓ Water
• Human Health Issues
  ✓ Acute poisonings
  ✓ Chronic conditions
• Social and Political Pressure
  ✓ Silent Spring - 1962
  ✓ Establishment of the EPA – 1970
  ✓ Changes in how pesticides used
    ▪ Training
    ▪ Licensing
    ▪ Record keeping
    ▪ Awareness
    ▪ Stewardship/Conservation
Advent of Scouting/Consulting

- State Extension Services began scouting programs - 1967
- Federal support of IPM programs - 1972
- Research/Extension developed thresholds
- Reliance on ecologically-based mgt systems
- 6.8 million cotton ac in scouting programs – 1983
Renewed Focus on Cultural Management

- Crop Rotation
- Planting Dates
- Variety Selection – Short Season
- Early Harvest and Quick, thorough crop residue destruction
- Scouting and Thresholds – supporting Biocontrol
IPM Worked

- Growers and workers trained
- Lower pesticide use
- Reduced pesticide movement off-site
- Increased reliance on natural enemies & ecologically-based mgt
- Cost - $14.3 million/yr
- Benefit - $133 million/yr

Smith 1983
More Change on the Farm
Late 1990s to 2000

- Boll weevil and pink bollworm eradication
- GMO crops
  - Bt varieties/hybrids
  - Herbicide resistant varieties & hybrids
- Traditional Host Plant Resistance
- Seed Treatment insecticides & fungicides
- Preventative Treatments
  - Atoxigenic *Aspergillus flavus* strains

Bottom Line – Pest Management increasingly purchased in or on the seed

Farm efficiency & profits improved
Impacts of Boll Weevil Eradication in Texas

Tons of Insecticides Not Applied for Weevil Control

Cumulative Positive Net Economic Impact of BWE in Texas 1996 - 2012 ... $2.3 billion
Result of BWE and Bt Transgenic Crops Foliar Treatments For All Insect Pests on Texas Cotton

Cumulative Annual:
- 12 million acres not sprayed
- Savings ~$120 million

Source: Cotton Insect Losses BWCC
Not all of the results were positive, however.
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<th>1981</th>
<th>2012</th>
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<tr>
<td></td>
<td>35-40 Chem Co. Fieldmen</td>
<td>12 Chem Co. Fieldmen (31%)</td>
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<tr>
<td></td>
<td>18 Crop Consultants</td>
<td>5 Crop Consultants (72%)</td>
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<tr>
<td></td>
<td>30+ Aerial Spray Svcs.</td>
<td>5 Aerial Spray Svcs. (83%)</td>
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<td>USDA-ARS Research Sta.</td>
<td>USDA-ARS Station Closed</td>
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<td>A&amp;M Res. &amp; Ext. fully staffed</td>
<td>A&amp;M Res. &amp; Ext. reduced</td>
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Intensive Agricultural Area
Relatively Small
Isolated from other U.S. Agricultural Areas

Changes in Infrastructure for Field Specific IPM

- 6-yr period – Consultants down 28-35% (AR and LA, 2006-12)
- 6-yr period – Aerial Applicators down 11% (7 southern states)
- 6-yr period – Commercial Ground applicators down 6.9% (12 southern states)
- 5-yr period Extension Entomologists down 33% (15 southern states)

**Bottom Line:** Significant Loss of Infrastructure supporting Field Specific IPM
More Change ... Present and Future

- Resistance – weeds, western corn rootworm, bollworm, fall armyworm
- Invasive and Changing pests – bagrada bug, brown marmorated stink bug, Bermuda grass maggot, sugarcane aphid, spotted winged drosophila, tawny crazy ant, old world bollworm ...

- **Bottom Line - instability**
Why the increase in invasives?
Meanwhile on Campus

• Fewer students from farms

• Emphasis & funding
  ✓ Discovery
  ✓ Not so much field-specific farm service careers

• Result
  ✓ Fewer qualified students to work with farmers
  ✓ Fewer qualified students to work with seed and chemical industry

Bottom Line: Greater Ag and Farm Vulnerability
Let’s Change the Level of Our Focus
Population Growth
✓ Our greatest environmental issue
✓ Will there be enough?
  ✓ food
  ✓ fiber
  ✓ fuel
  ✓ housing
✓ Demand for food will increase
✓ Agricultural productivity – must be high
Increasing World Population

Lower Resources and Higher Threats
✓ Greater demand for food/fiber
✓ Demand for people with field-specific IPM skills?
Will we be ready?
The stakes will be very high if we are not!

Thank You!

Questions?