

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

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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



On-farm Results of Insecticide Intensive Management

- 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

Boll Weevil Eradication 2015



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



Pre-Eradication

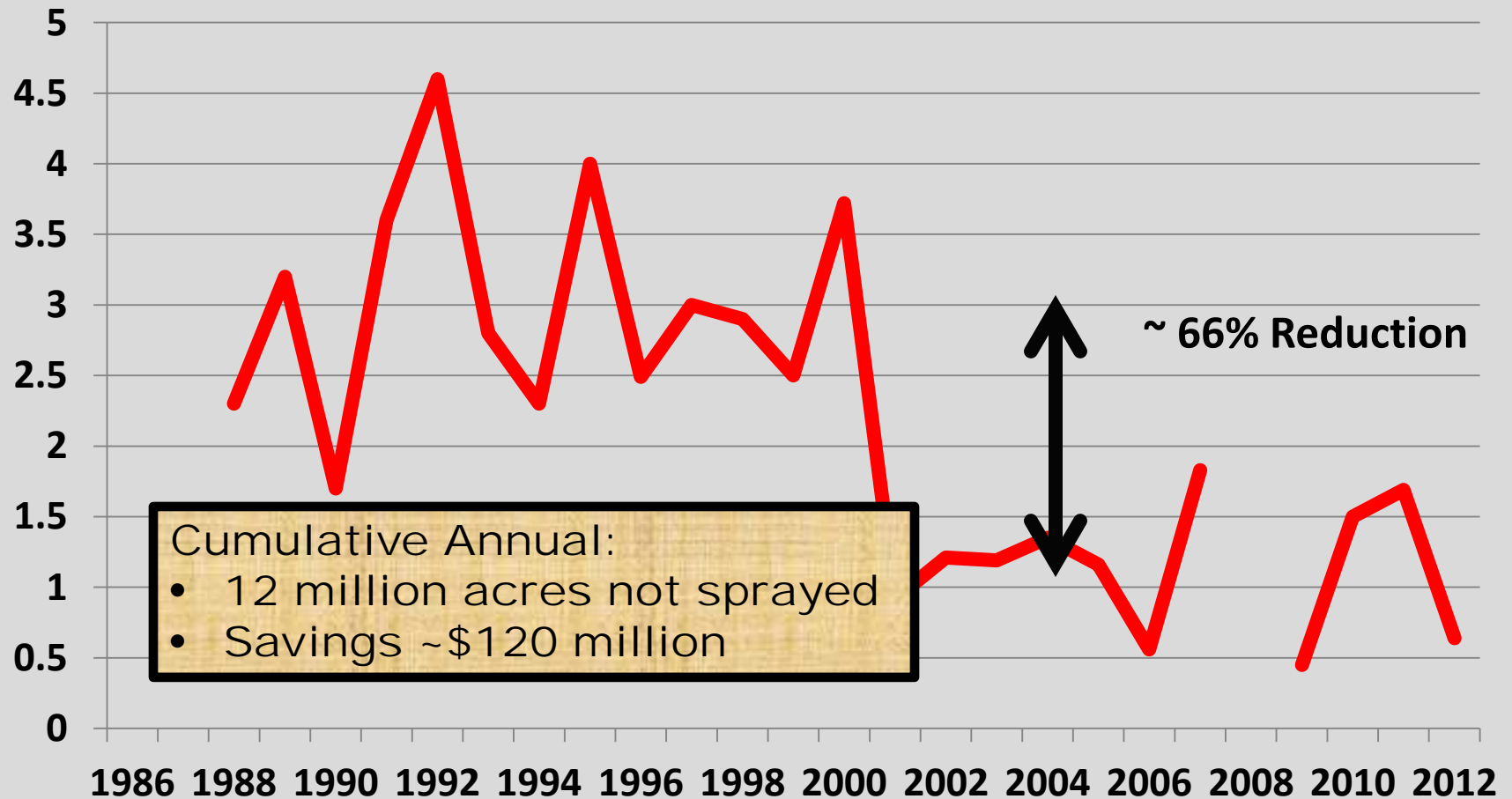


Active Eradication



Completed , Post-eradication

Result of BWE and Bt Transgenic Crops Foliar Treatments For All Insect Pests on Texas Cotton



Source: Cotton Insect Losses BWCC

Not all of the results were positive, however.



Lower Rio Grande Valley

1981 vs 2012

Intensive Agricultural Area
Relatively Small
Isolated from other U.S. Agricultural Areas

1981

35-40 Chem Co. Fieldmen
18 Crop Consultants
30+ Aerial Spray Svcs.
USDA-ARS Research Sta.
A&M Res. & Ext. fully staffed

2012

12 Chem Co. Fieldmen (31%)
5 Crop Consultants (72%)
5 Aerial Spray Svcs. (83%)
USDA-ARS Station Closed
A&M Res. & Ext. reduced

John Norman. 2012. personal com.

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

Back on the Farm

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

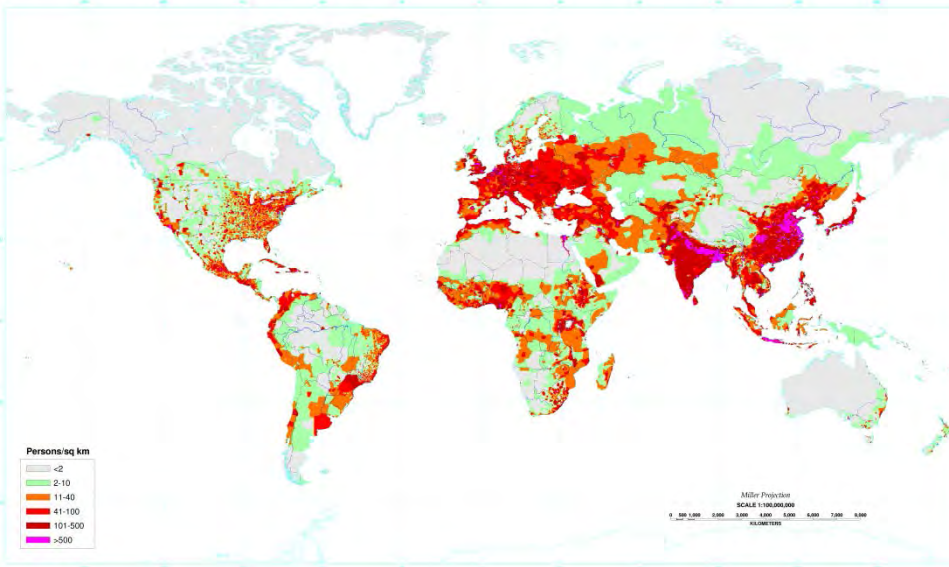
Bottom Line: Greater Ag and Farm Vulnerability

Let's Change the Level of Our Focus

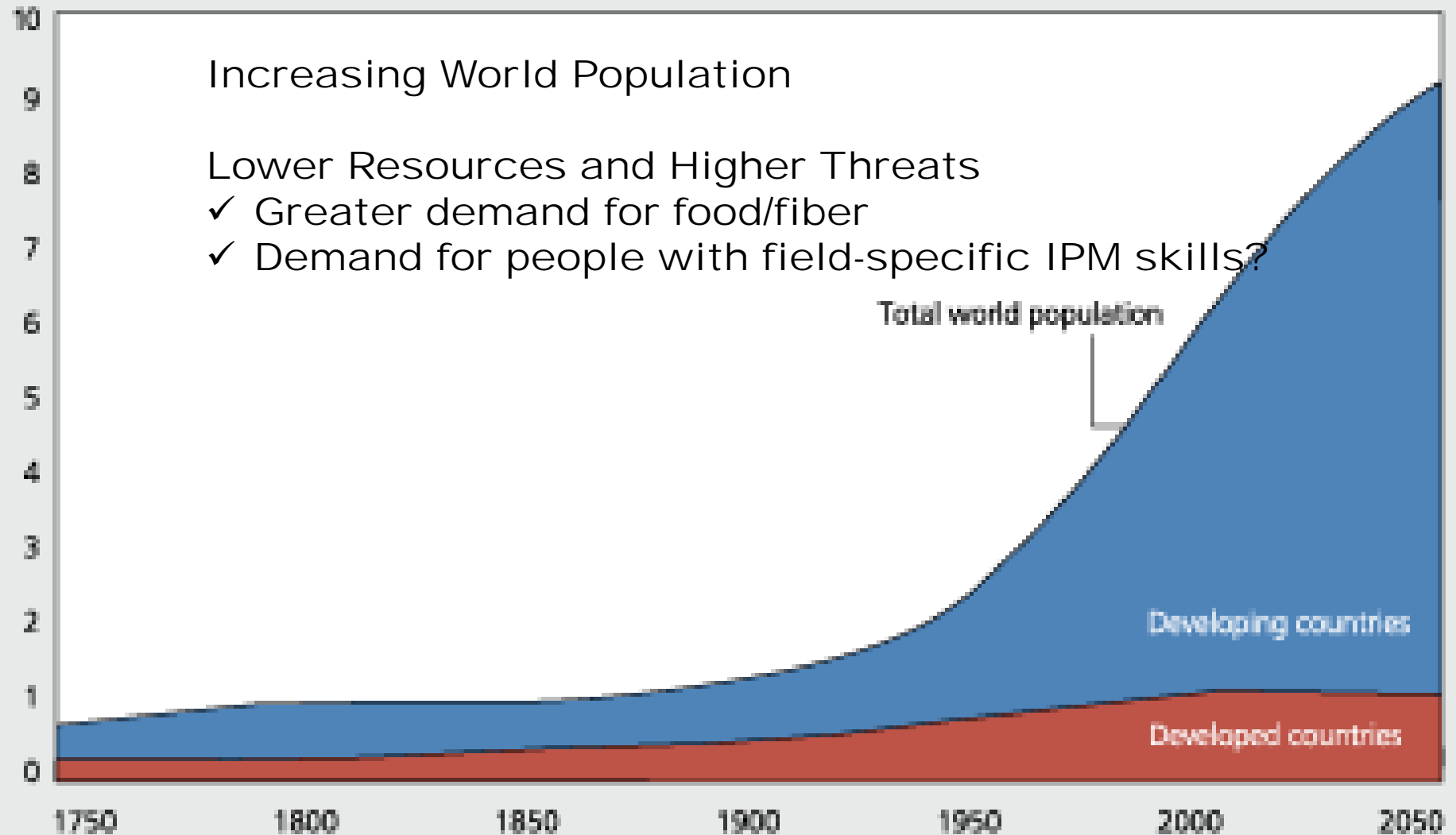


Population Growth

- ✓ Our greatest environmental issue
- ✓ Will there be enough?
 - ✓ food
 - ✓ fiber
 - ✓ fuel
 - ✓ housing
- ✓ Demand for food will increase
- ✓ Agricultural productivity – must be high



Billions





Will we be ready?

The stakes will be very high if we are not!

Thank you!

Questions?