

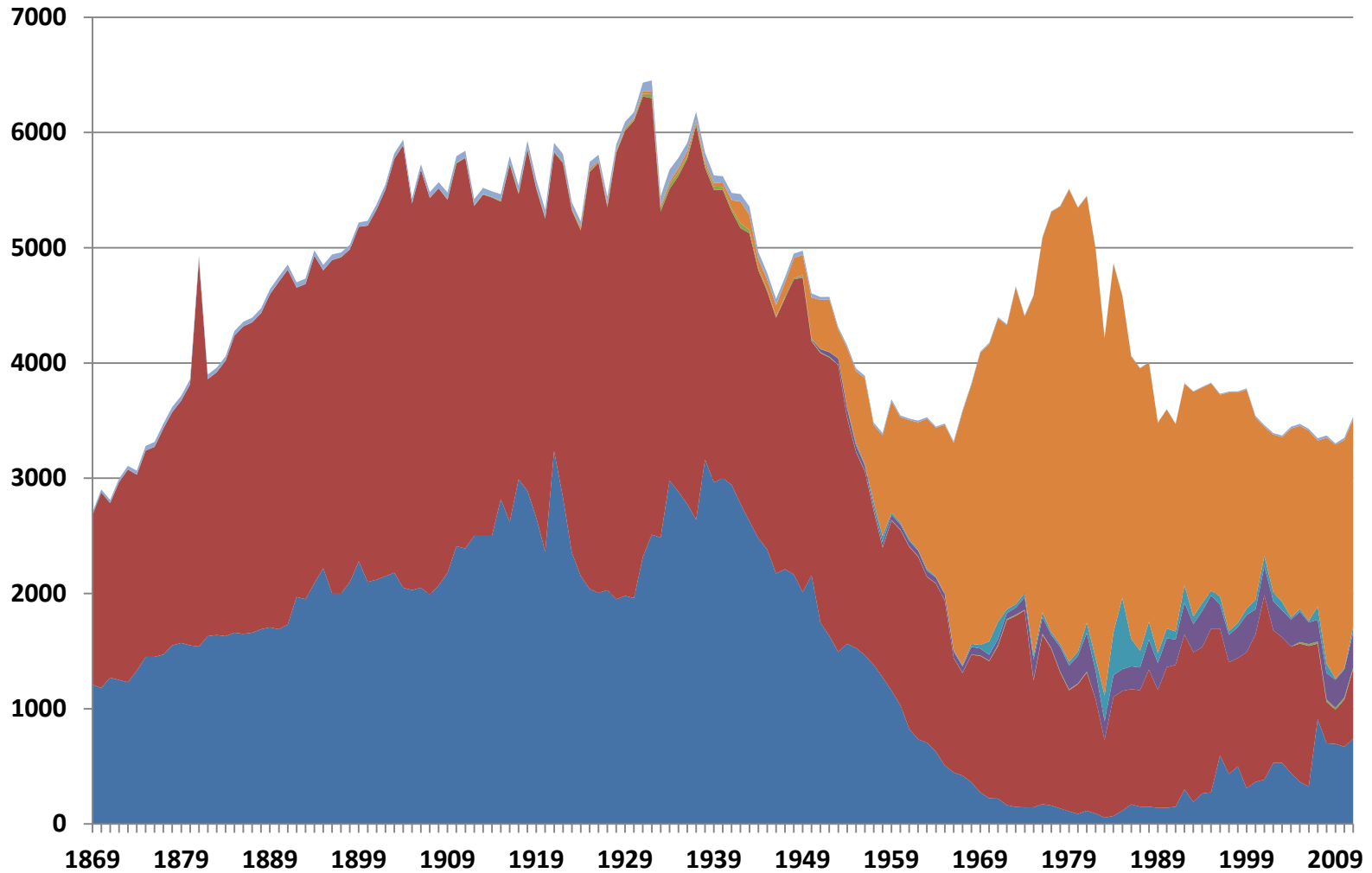
Landscape Effects on Pest Management



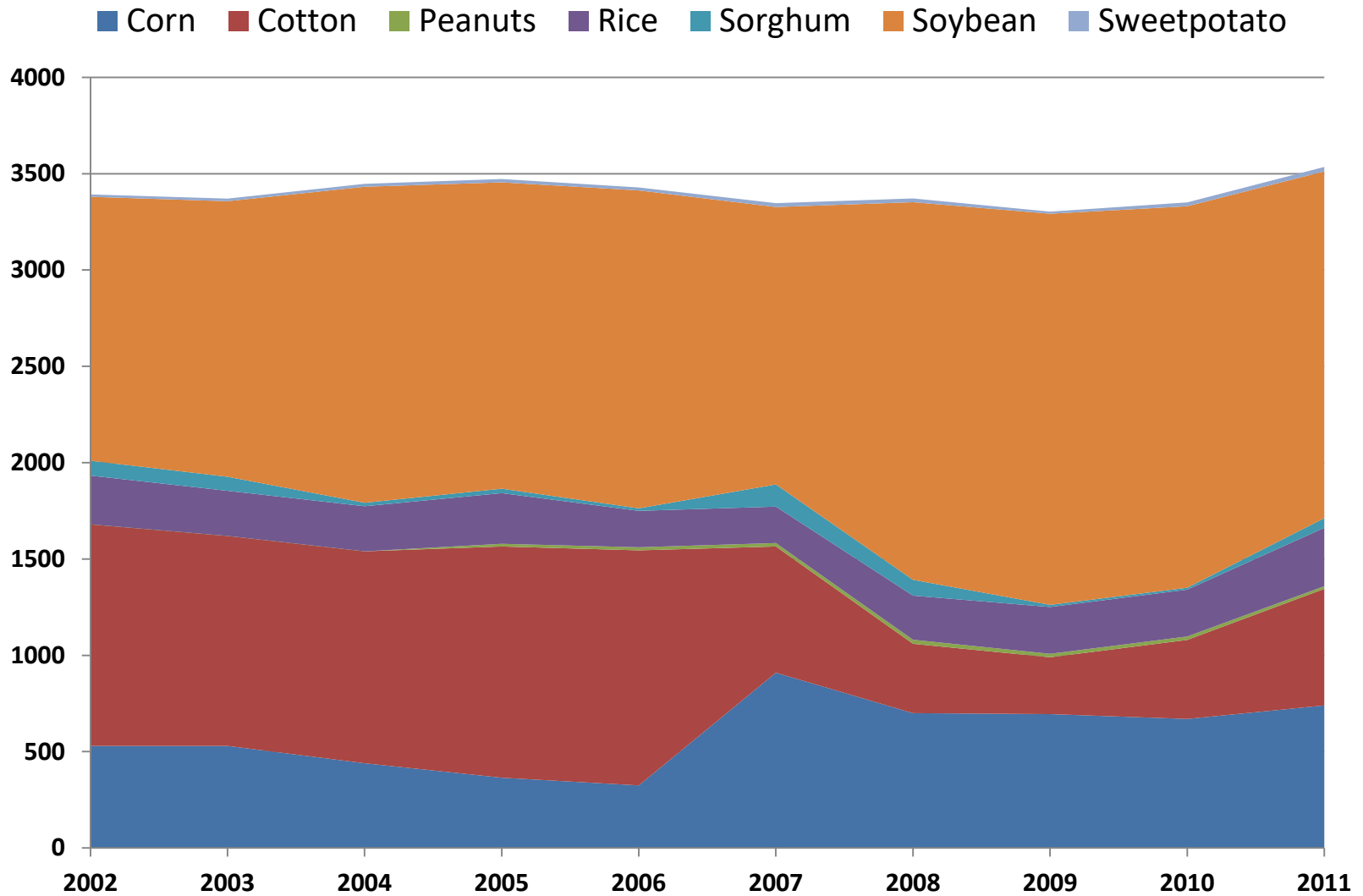
0 0.15 0.3 0.6 0.9 1.2 Miles

MS crop acreage harvested

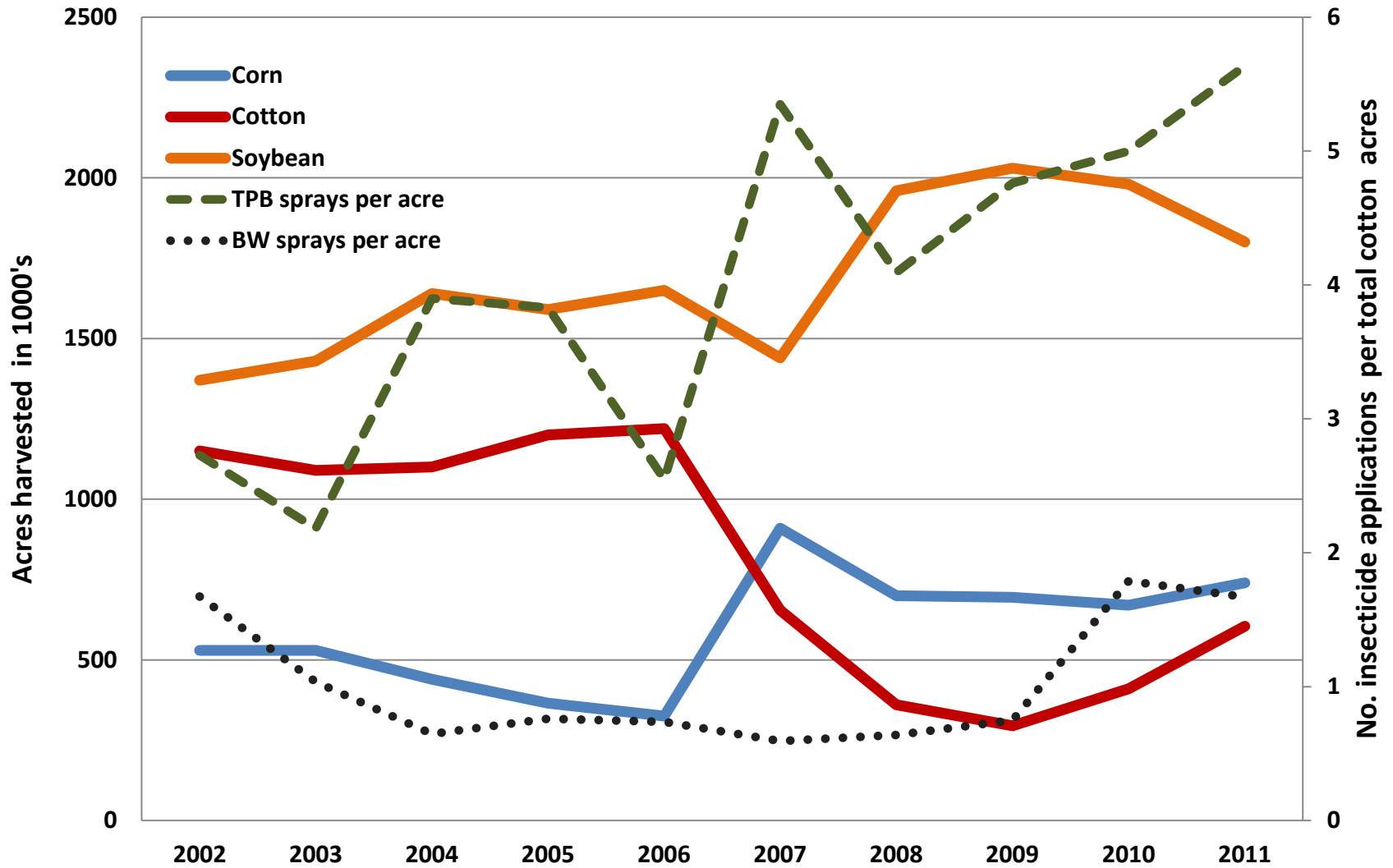
■ Corn ■ Cotton ■ Peanuts ■ Rice ■ Sorghum ■ Soybean ■ Sweetpotato



MS crop acreage harvested



Insecticide applications targeting bollworms or TPB on cotton in MS



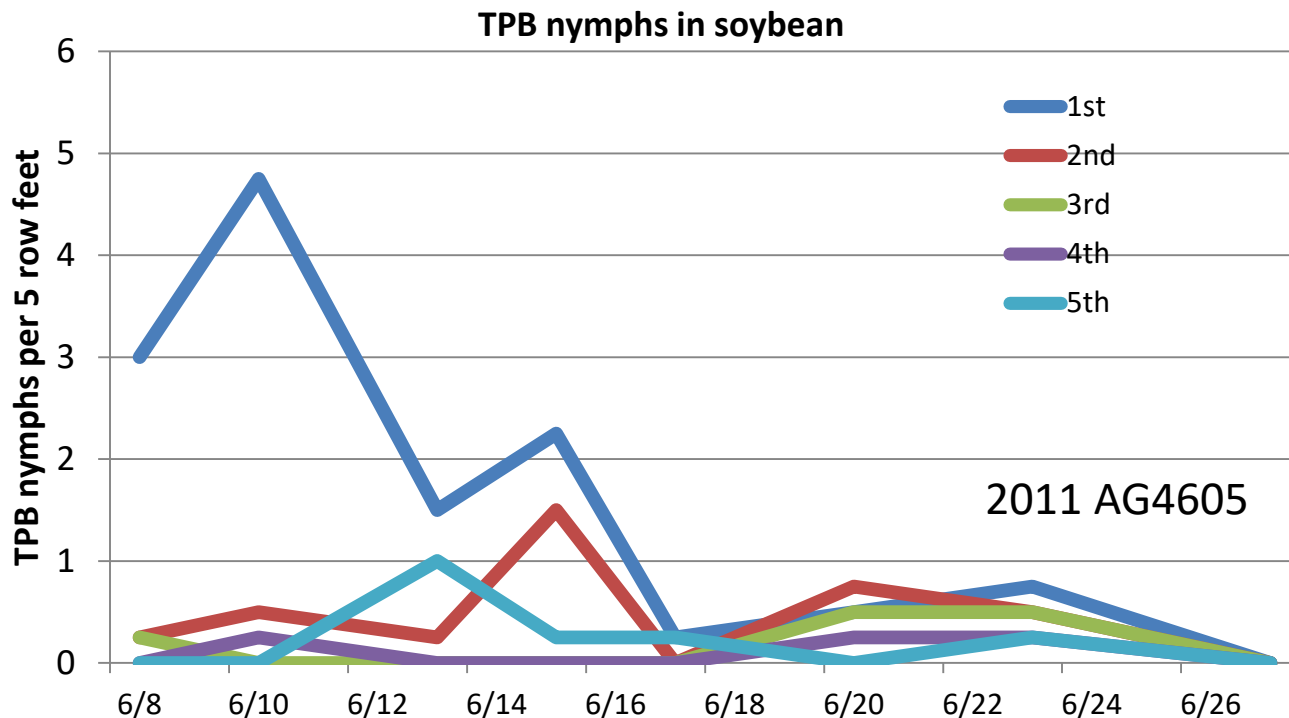
Host plants

- Bollworms and tobacco budworms > 230 host plants
- Tarnished plant bugs > 320 host plants



Crop hosts

- Corn favored host of bollworms
- Influx of TPB into cotton from corn during R2-R3 growth stage (Kumar and Musser 2009)



Influence of local crop on insect populations in cotton fields

- R. A. Pickens and Son Farm (2003-2005)
- Cotton, corn, soybean, rice
- Cotton sampled twice weekly
- 100 plants/field



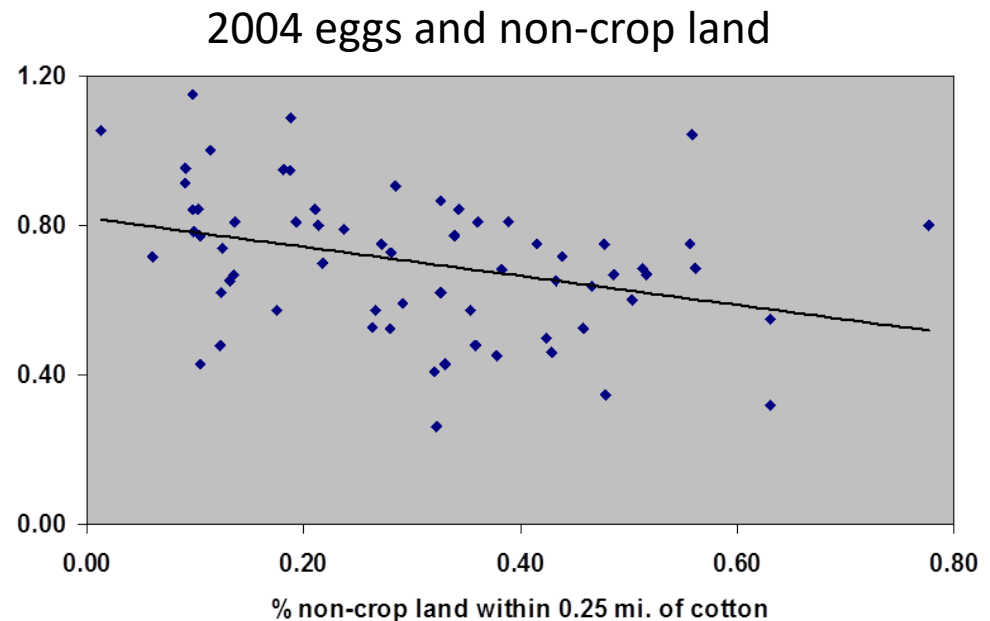
Influence of local crop

- Crop types within a 0.25 mile buffer around each cotton field were estimated
- Relationships between monthly and yearly average of heliothine eggs and plant bugs and the percentage of various crops within buffer examined



Relationships between heliothine eggs and surrounding land

- All relationships with non-crop land were negative; yearly average significant in 2 of 3 years
- Significant positive relationship with all corn June 2004 and 2005
- Significant positive relationship with all cotton in August 2004



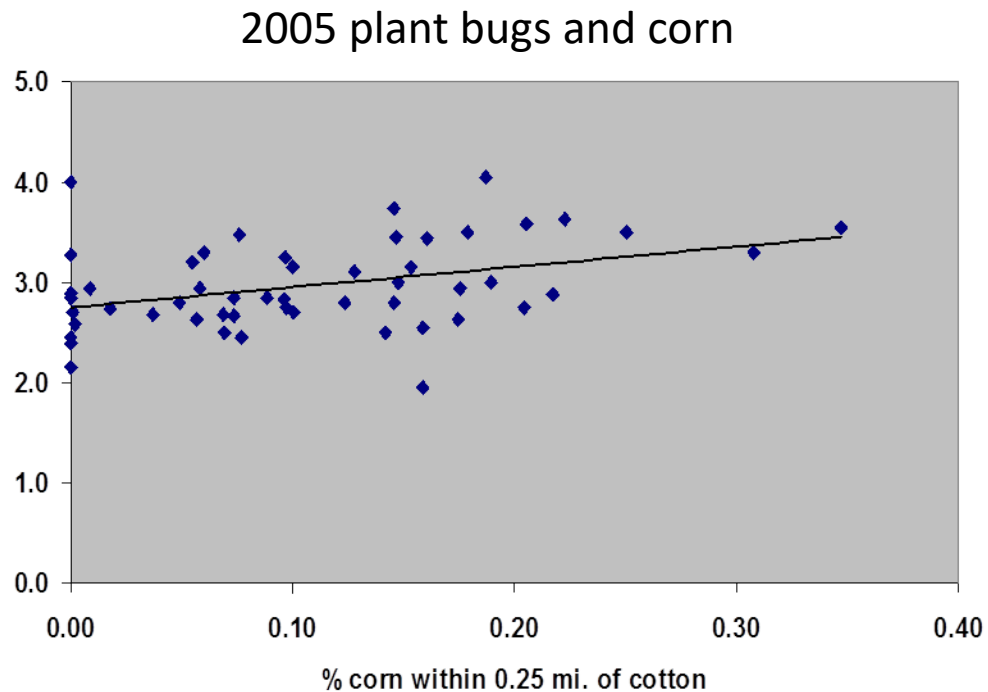
R = - 0.343

P = 0.005

n = 65

Relationships between plant bugs and surrounding land

- Relationships with non-crop land mostly positive, only significant in July 2003
- All positive relationships with total corn, significant in 2005
- Significant negative relationship with cotton in 2 of 3 years

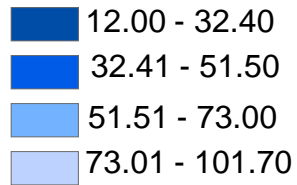


R = 0.378

P = 0.006

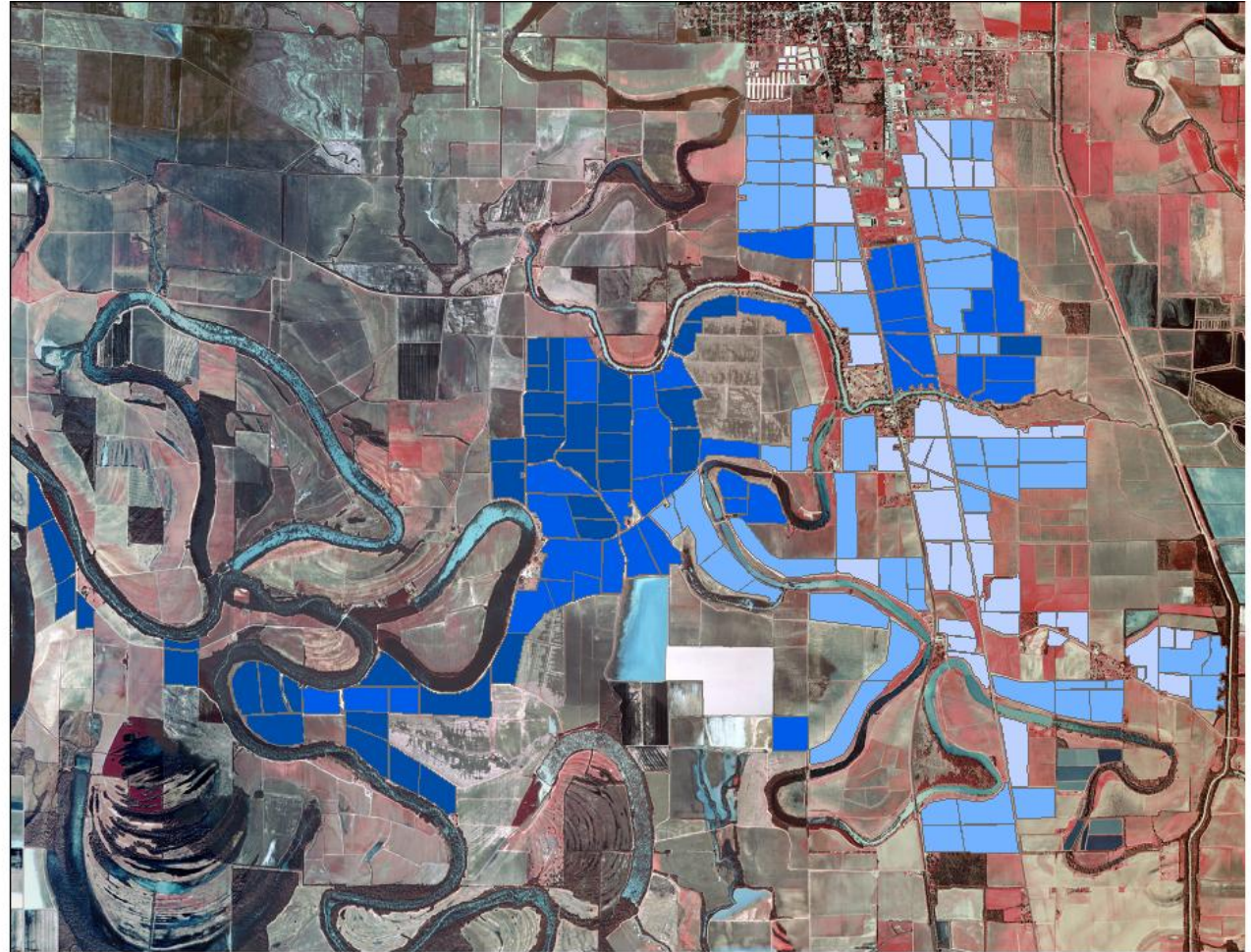
n = 52

Mean rankings of heliothine eggs across 125 cotton fields

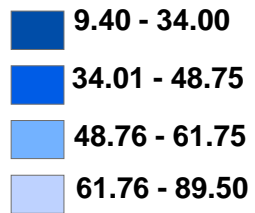


-Field rankings based on eggs per 100 plants

- Lower rankings = greater no. of eggs

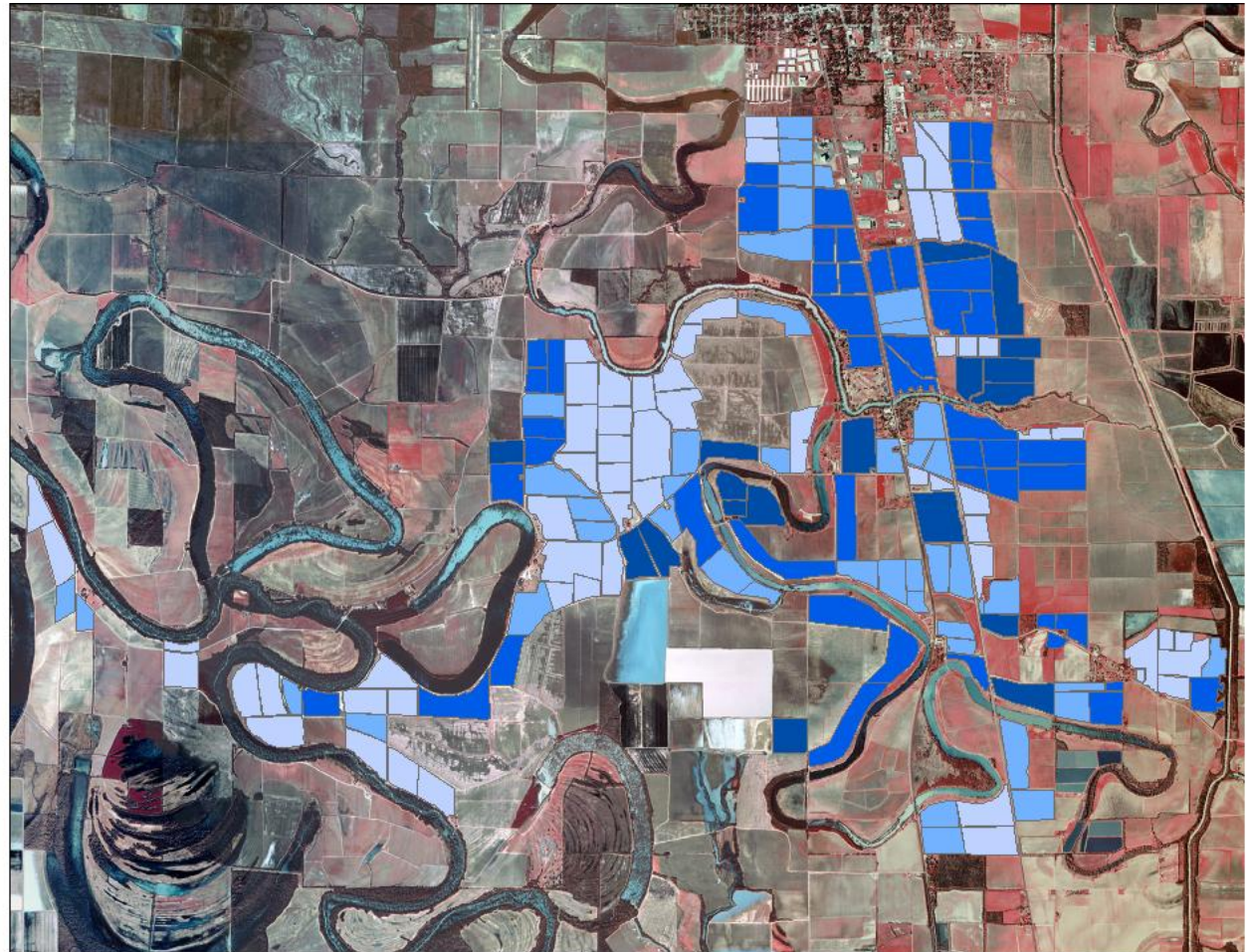


Mean rankings of TPB across cotton fields



-Field rankings based on TPB per 100 plants

- Lower rankings = greater no. of TPB



Determination of nymphal hosts of TPB

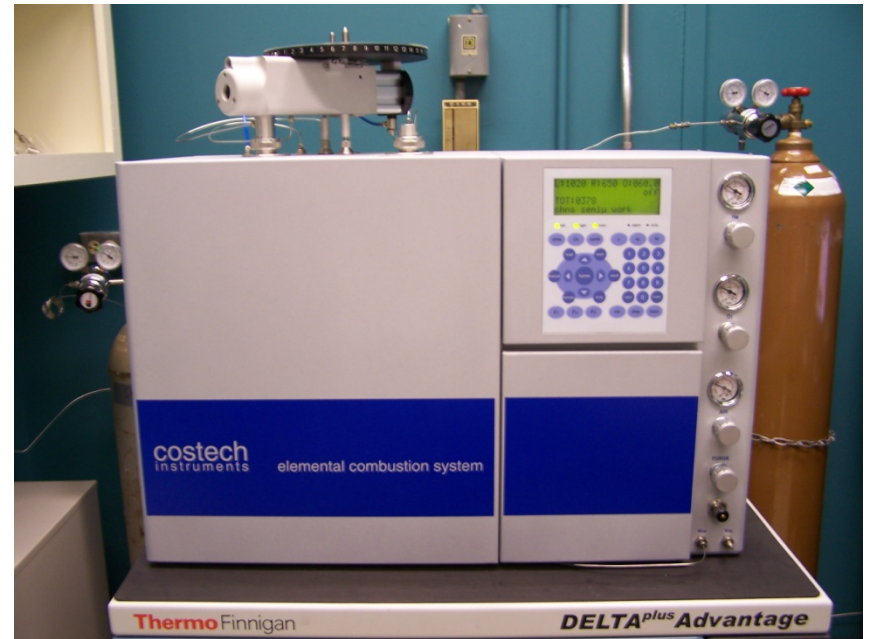
- Plants having C_3 physiology
 - Cotton
 - Soybean
 - Have less ^{13}C relative to ^{12}C
- C_4 plants – grasses
 - Corn
 - Sorghum
 - Pigweed
- This ratio within the wings examined for tarnished plant bug host plants



Stable isotope analysis

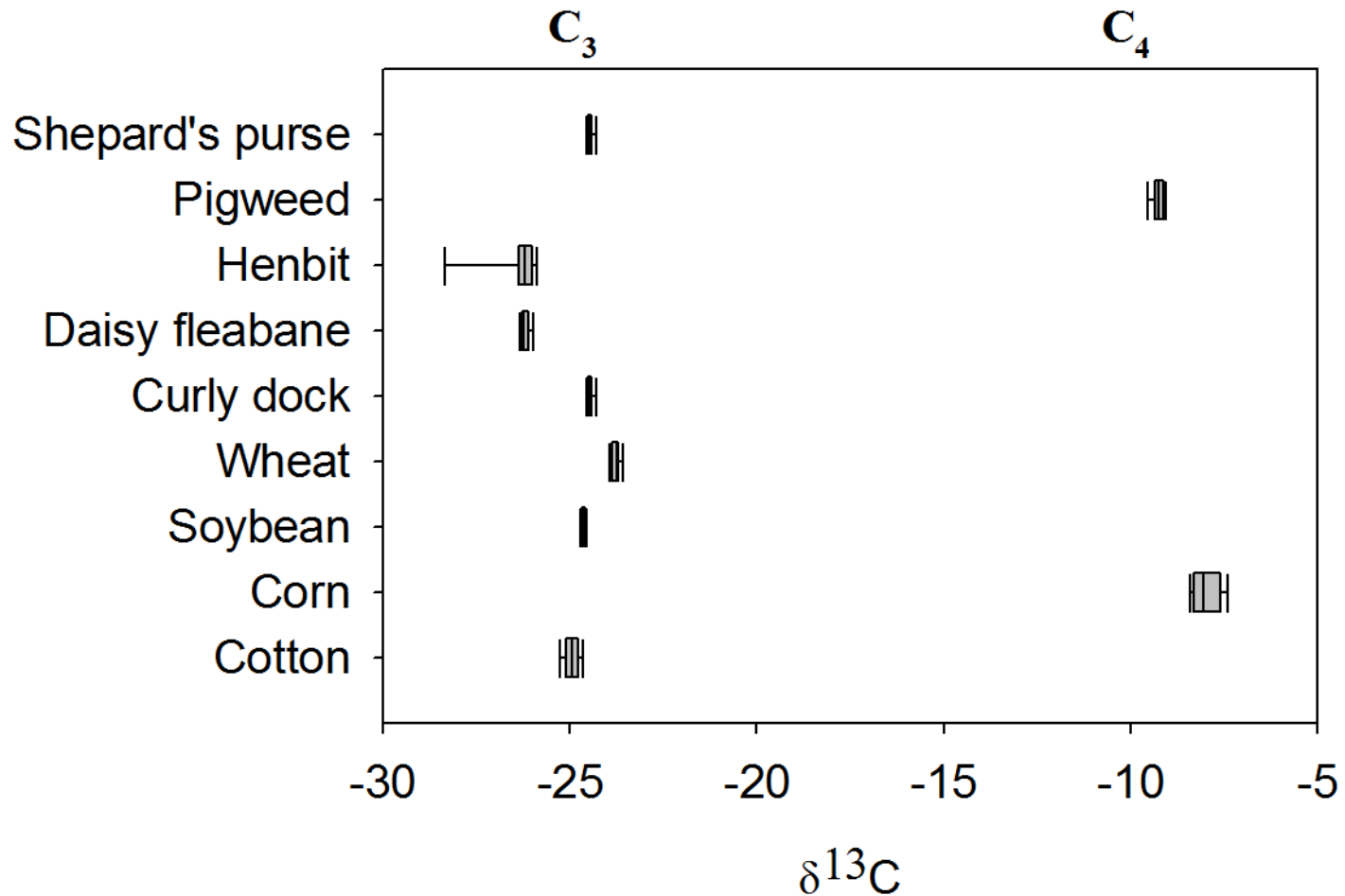


Wings cut and placed in tin capsules

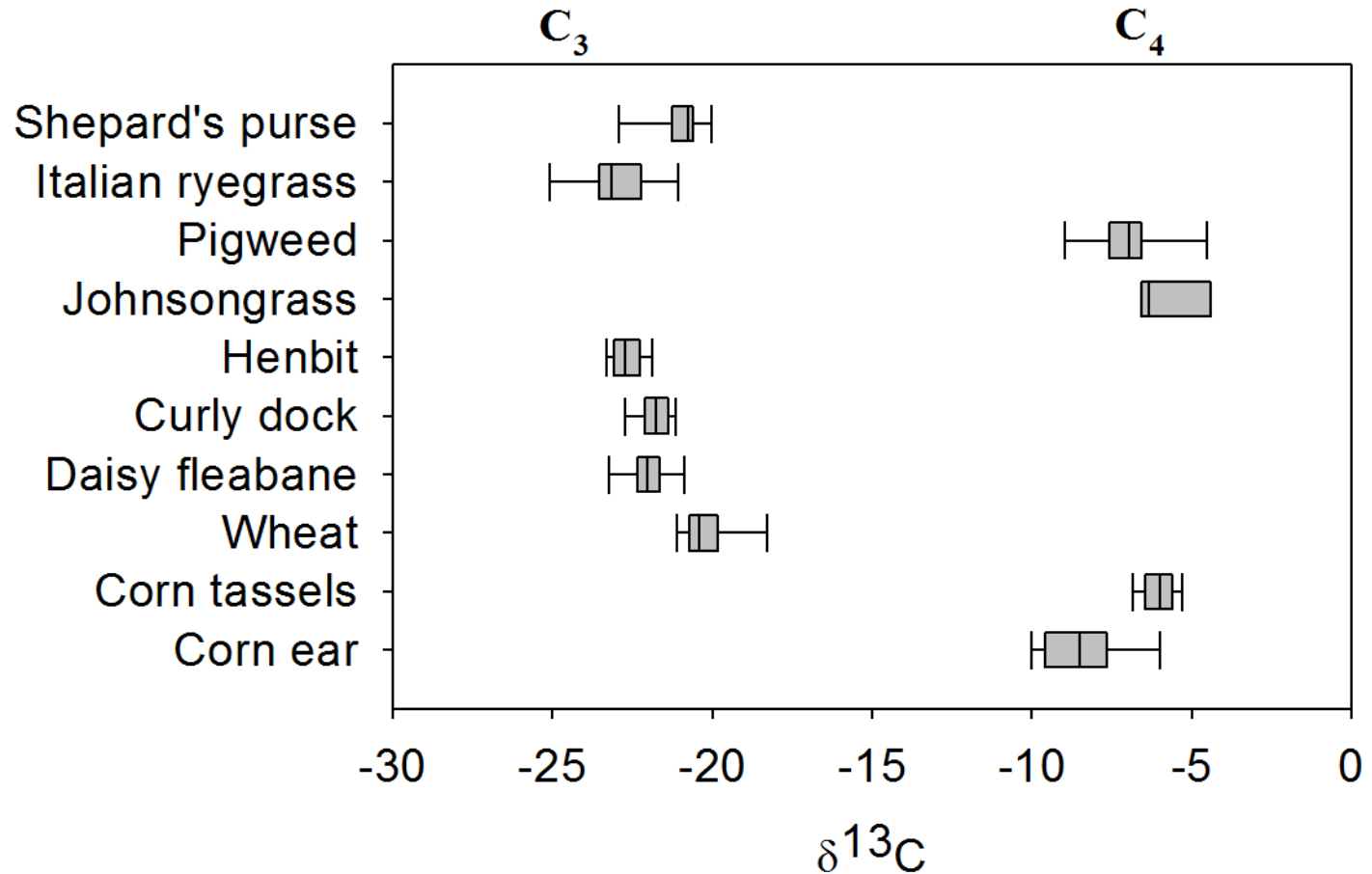


Elemental analyzer with isotope ratio mass spectrometer

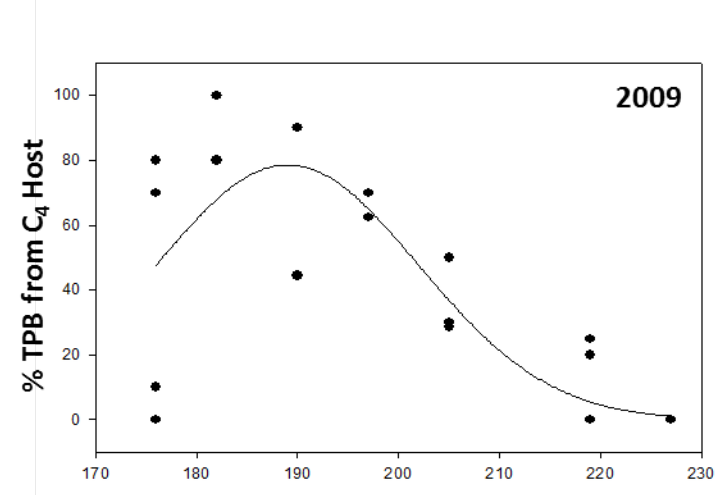
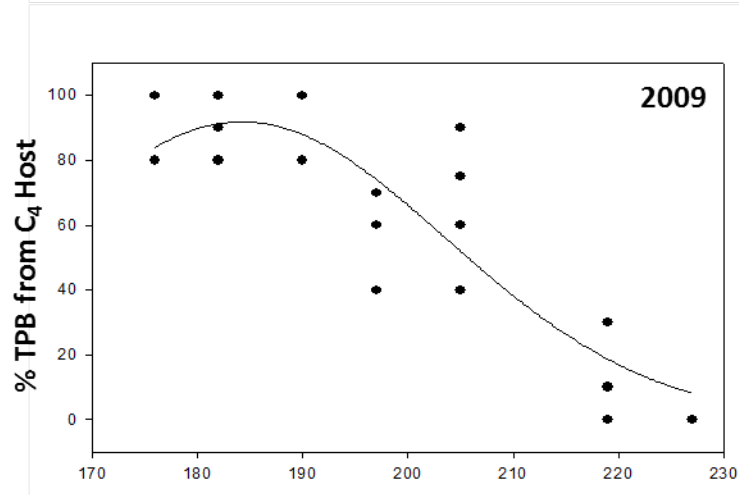
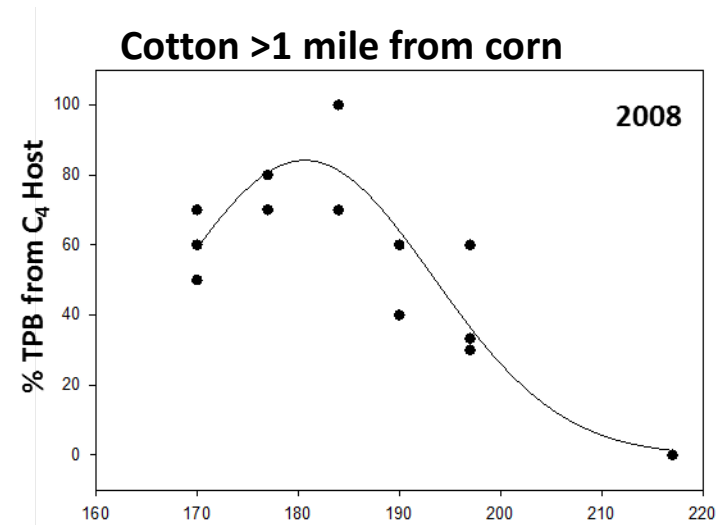
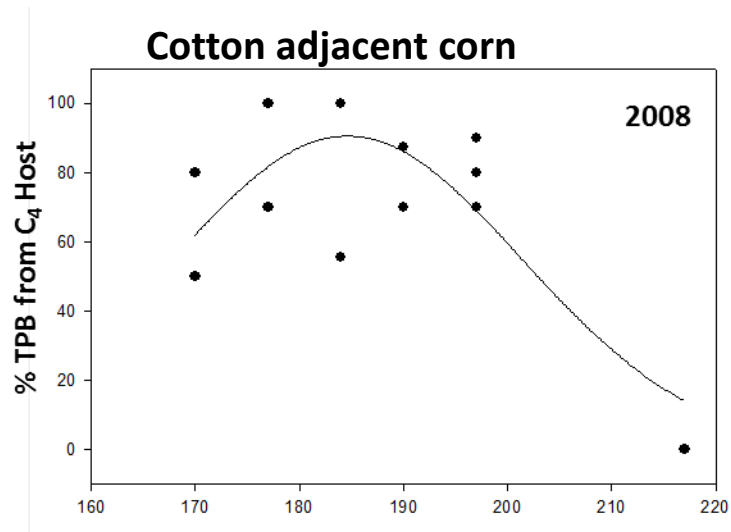
Stable carbon isotopic ratios of host plants of the tarnished plant bug



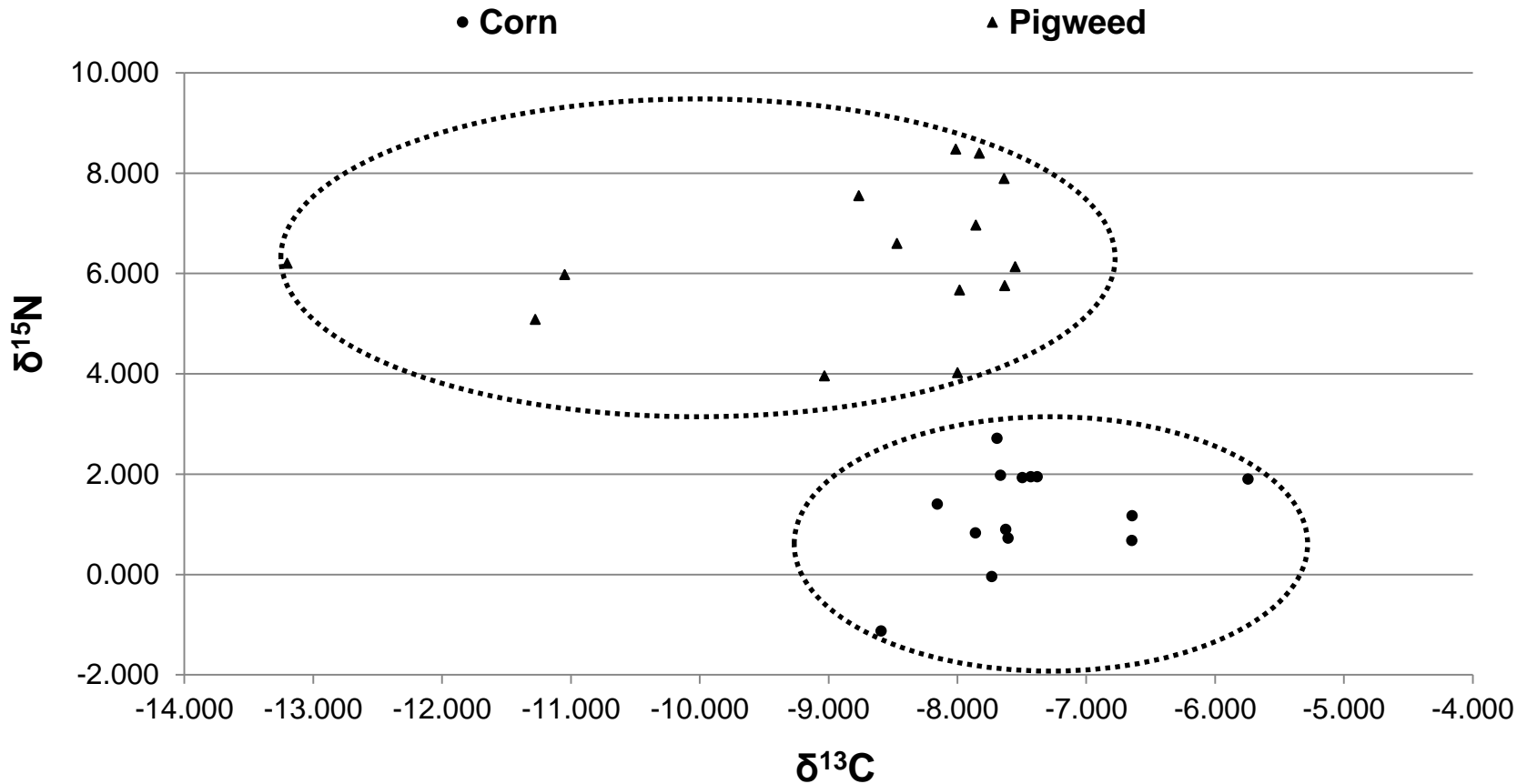
Stable carbon isotopic ratios of tarnished plant bugs reared as nymphs on various plant hosts



TPB adults collected from cotton that developed as nymphs on C₄ hosts in MS Delta

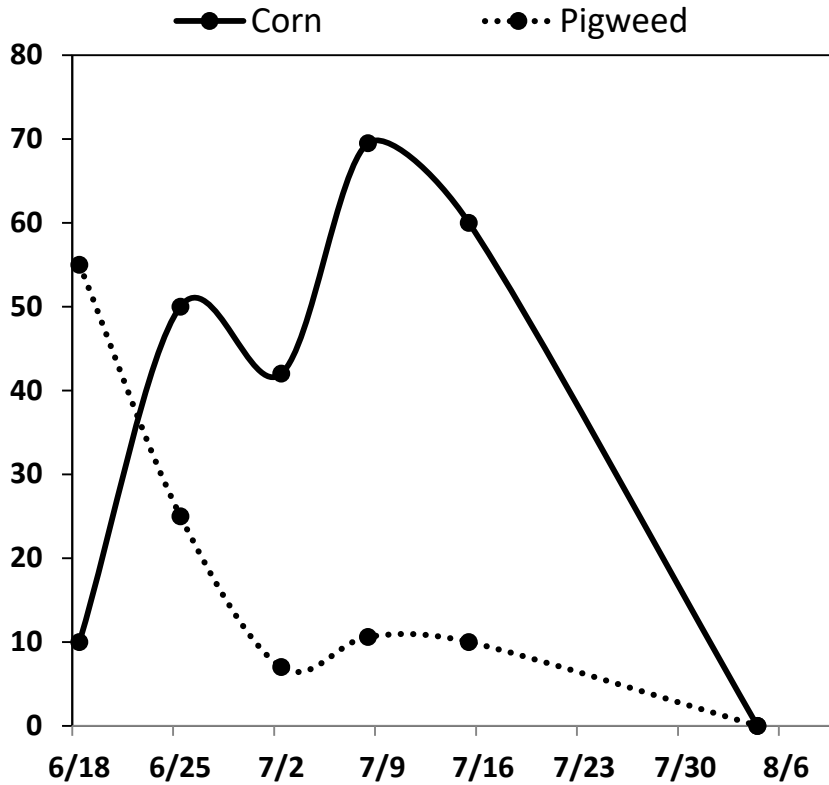


Stable carbon versus nitrogen isotope ratios for tarnished plant bugs reared as nymphs

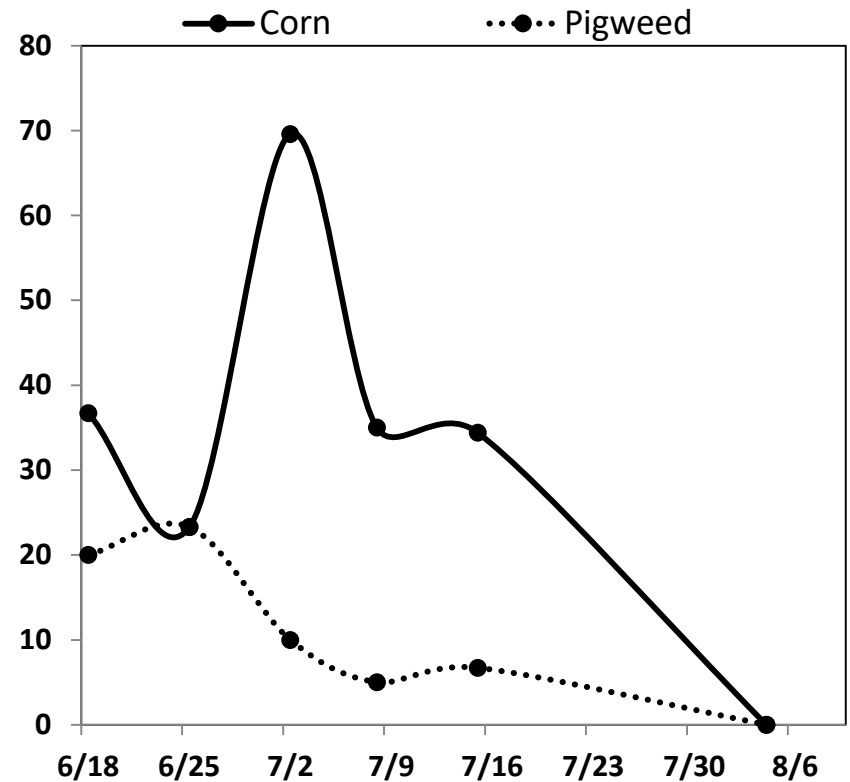


TPB adults collected from cotton that developed as nymphs on either corn or pigweed in MS Delta during 2008

Cotton adjacent to corn

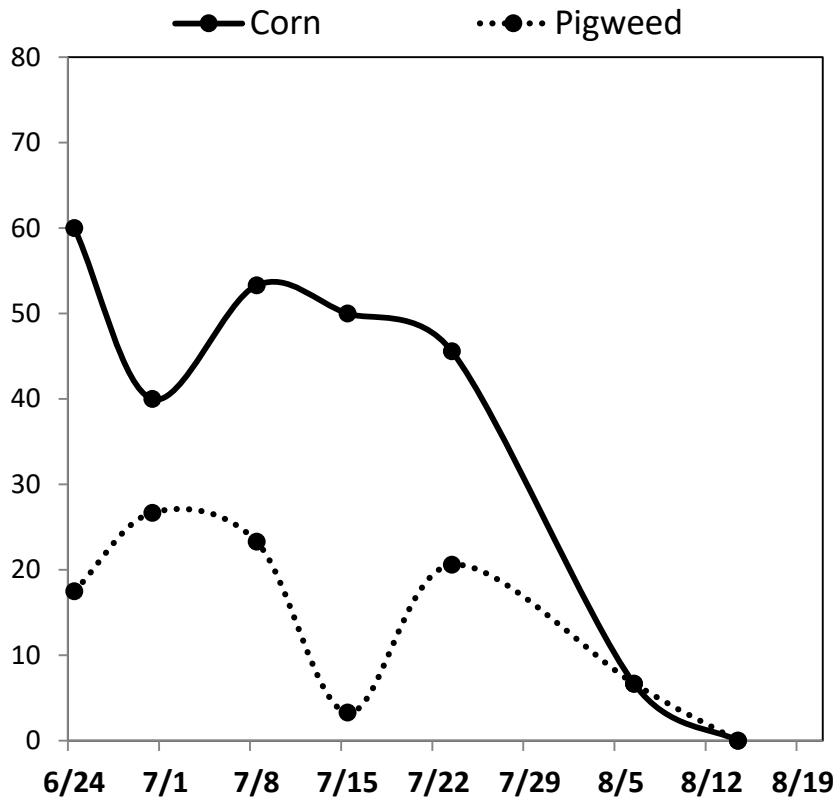


Cotton >1 mile from corn

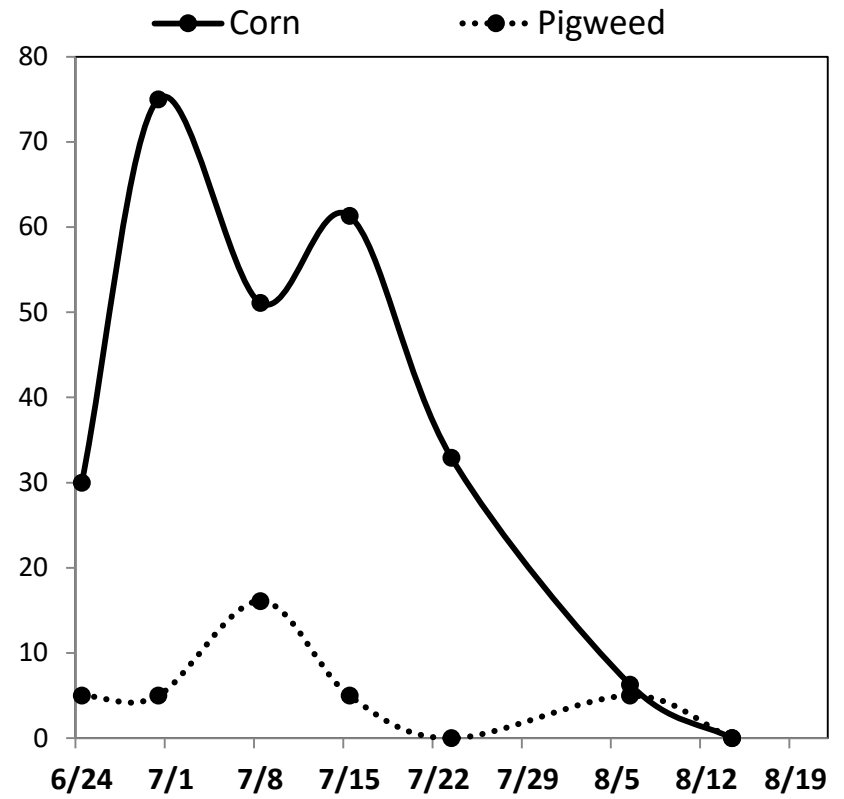


TPB adults collected from cotton that developed as nymphs on either corn or pigweed in MS Delta during 2009

Cotton adjacent to corn



Cotton >1 mile from corn



Summary

- The landscape may have major influence on populations of some insect pests in cotton
- Difficult to measure influence of the landscape
 - Other variables involved
 - Potential long-range movement of insects
 - Unknown source of insects in cotton
- Tarnished plant bug is a better candidate for local landscape management
 - Increased corn acreage has increased difficulty of management

