From boosting bees to recruiting dung recyclers; exploring the ways sustainable pest management practices improve beneficial insect communities

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Where the journey began..

Sustainable cattle grazing management

Grazing intensity and cattle rotation

Dung pat degradation

Dung arthropod community

Quantify dung degradation services

At “deposition” in the field

Pecenka and Lundgren (2018), PeerJ, 10.771/peerj.5220

Quantify dung degradation services

After 4 days

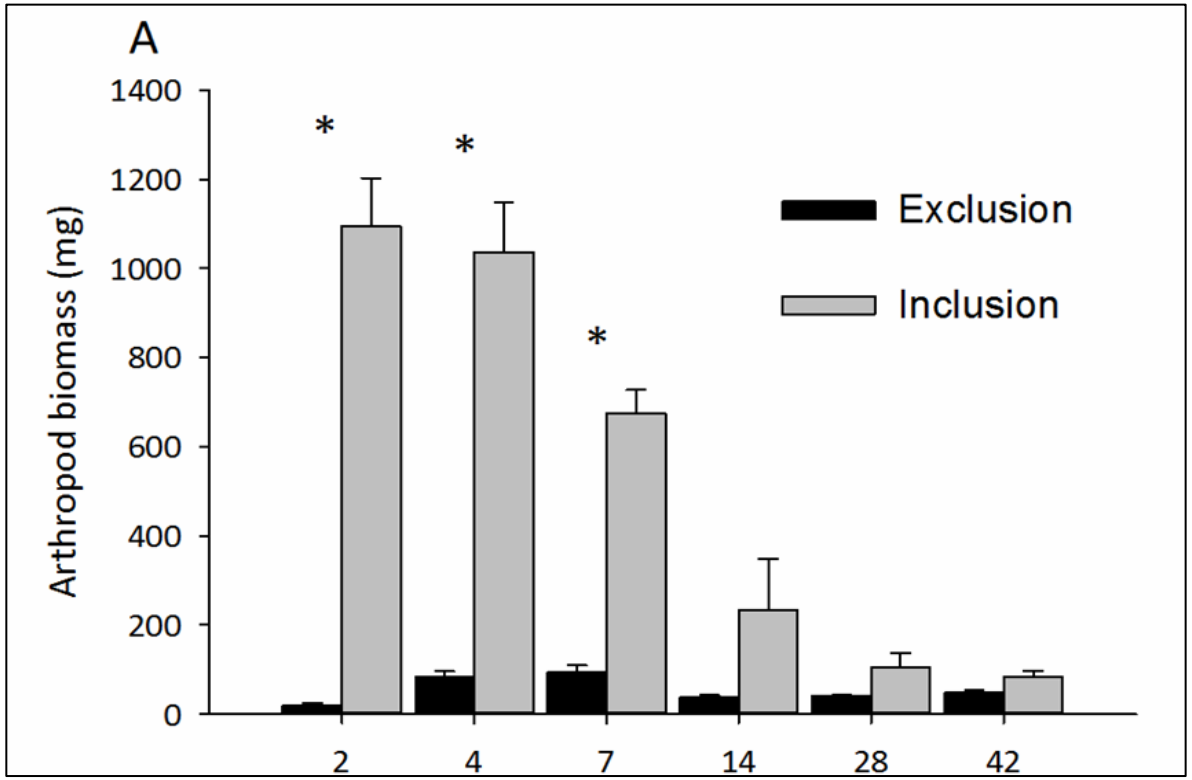
Pecenka and Lundgren (2018), PeerJ, 10.771/peerj.5220

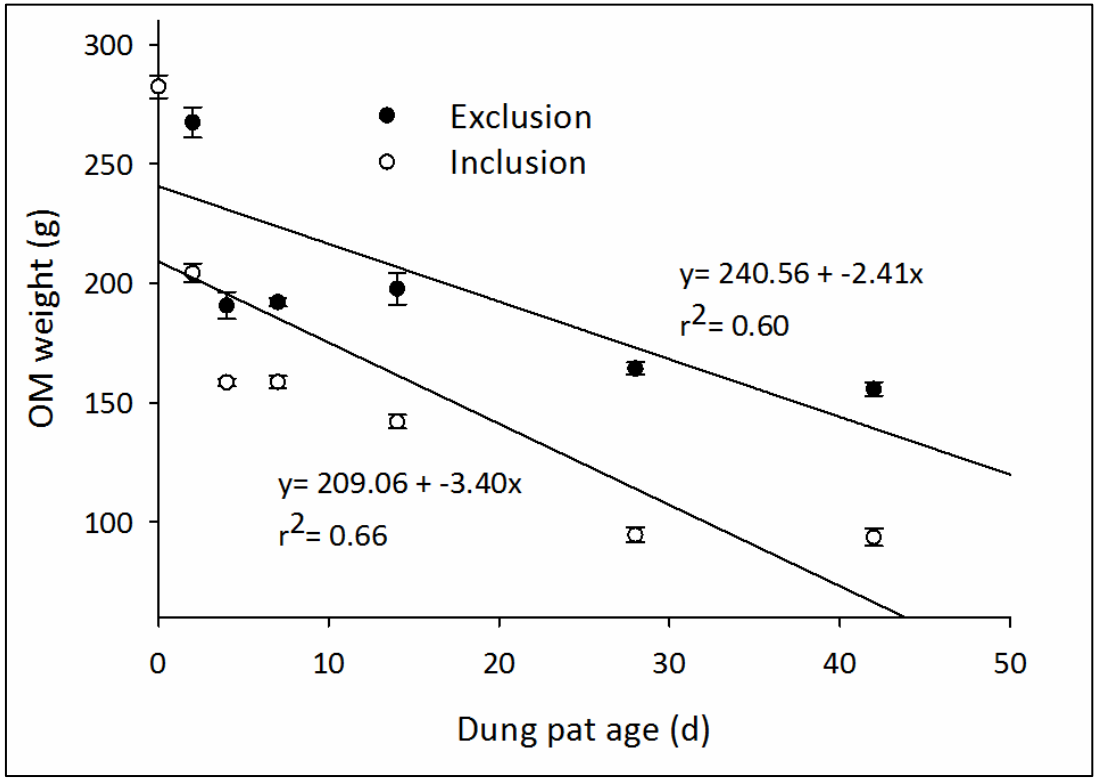
Quantify dung degradation services

After 42 days

Pecenka and Lundgren (2018), PeerJ, 10.771/peerj.5220

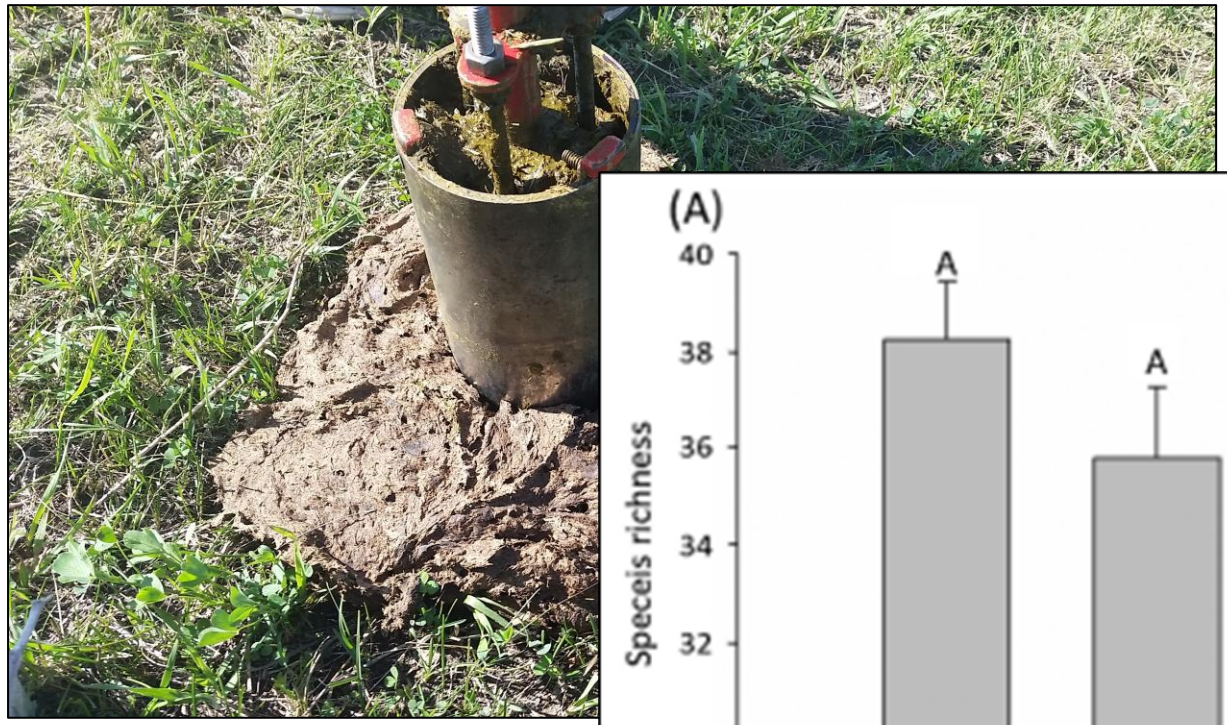
Quantify dung degradation services

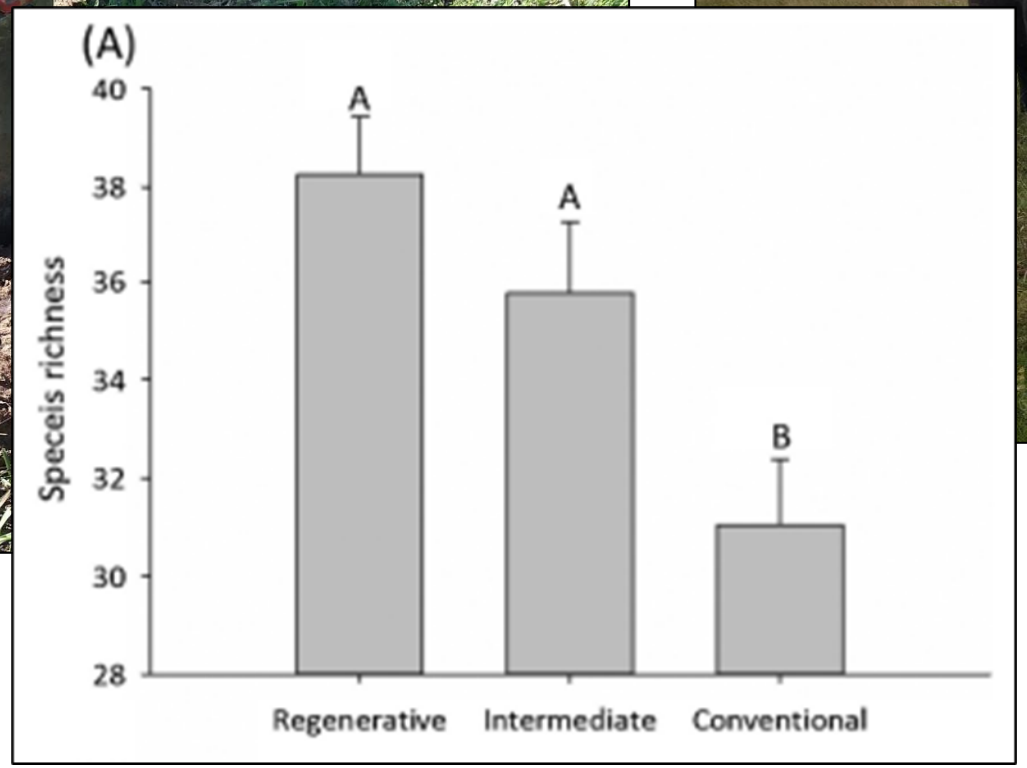




Pecenka and Lundgren (2018), PeerJ, 10.771/peerj.5220

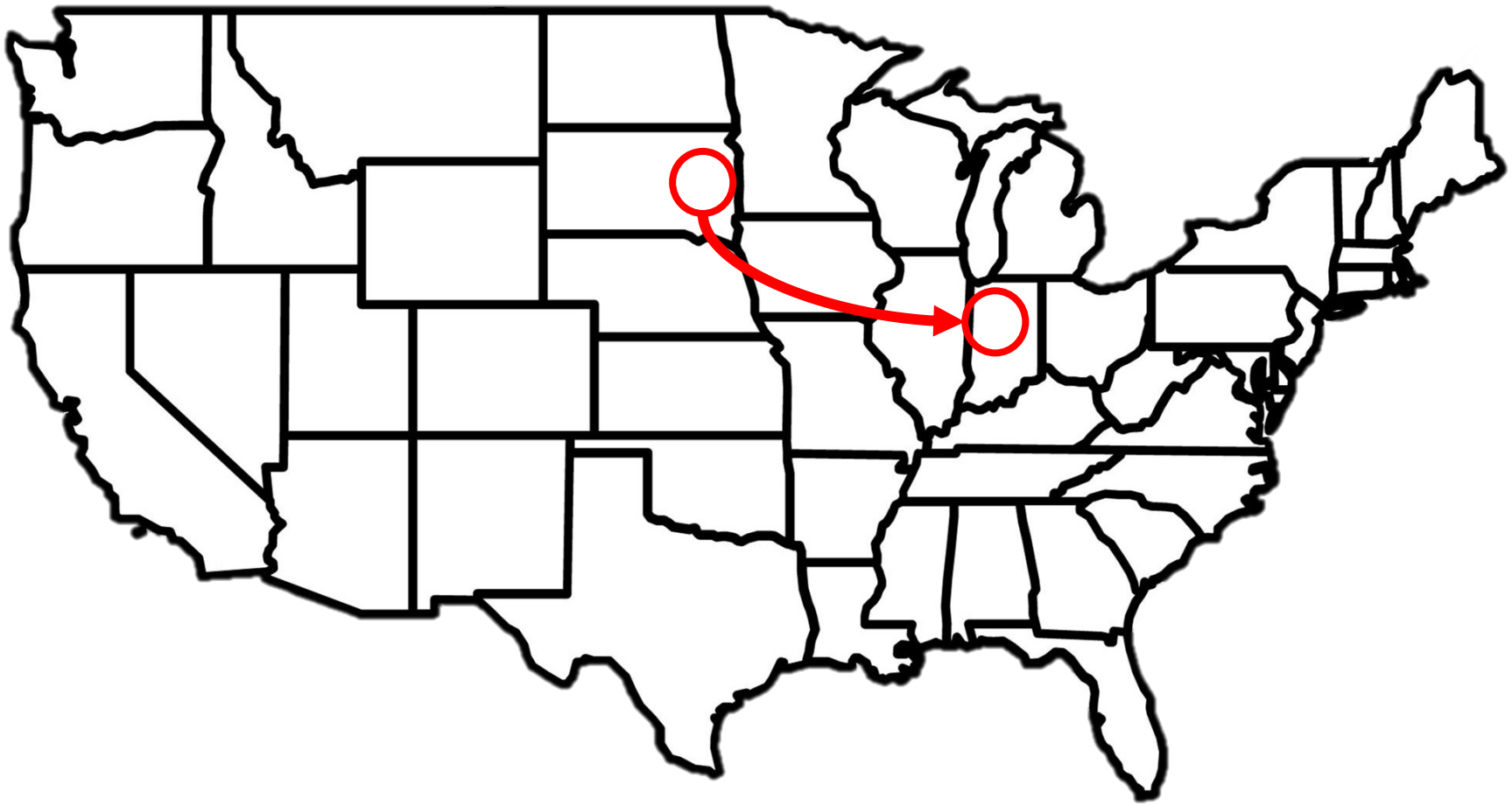
Connecting cattle management to dung arthropod community





Pecenka and Lundgren (2019), Basic and Applied Ecology 40: 19-29

On to something more.. fragrant



Applying IPM to a midwestern agricultural landscape

Pecenka et al. (2021), PNAS 118: e2108429118

An abandonment of IPM

Traditional IPM measures replaced by prophylactic insecticides

- Affordability and ease of sprays
- Adoption of neonicotinoid seed treatments
- Applications without justification

Importance of pollinators; increasing the stakes in seedless melons

Understanding watermelon phenology

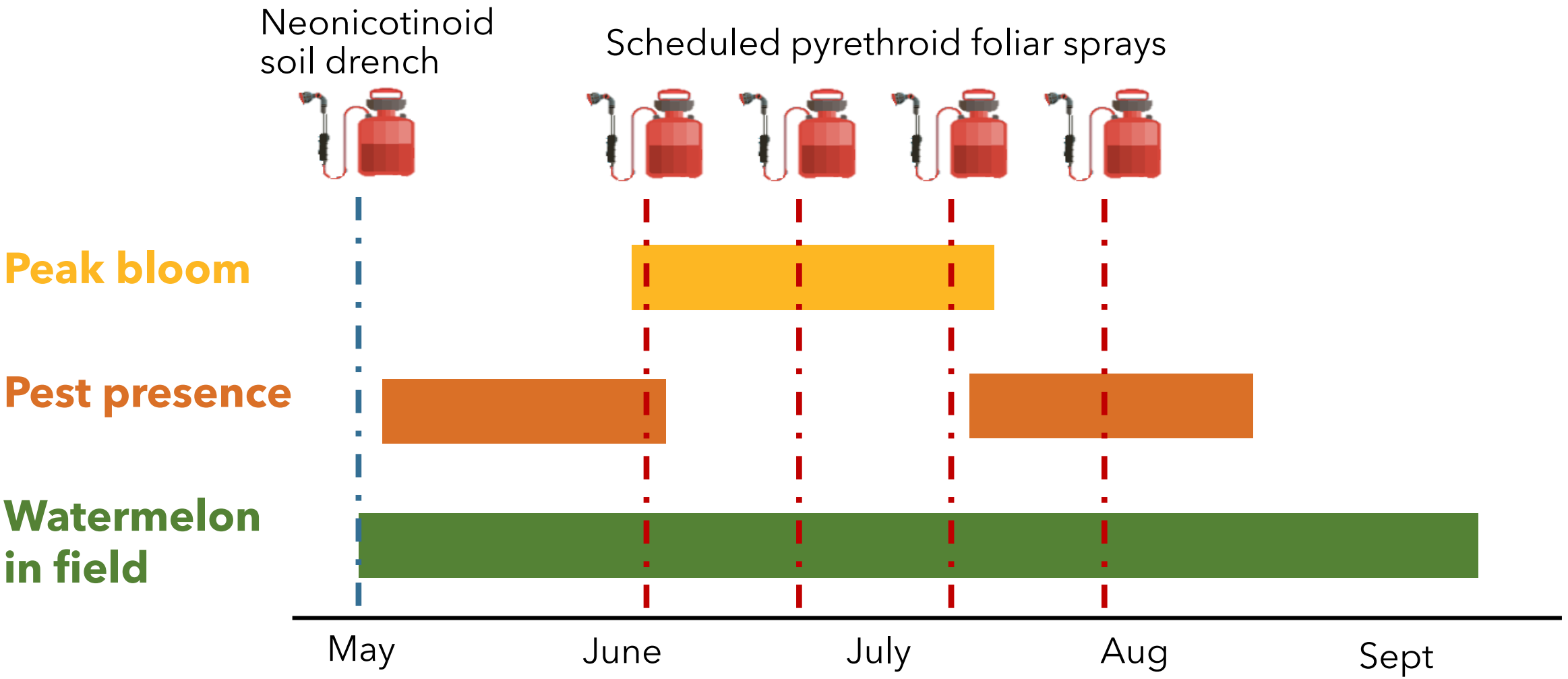
Peak bloom

Pest presence

Watermelon in field

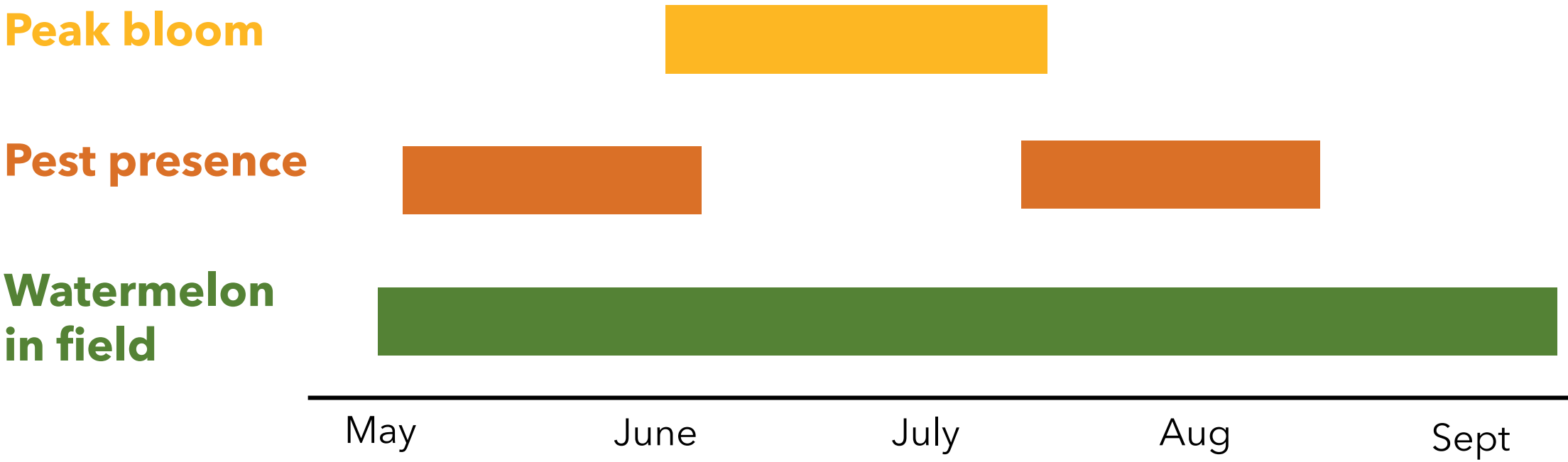
May June July Aug Sept

Conventional Management System



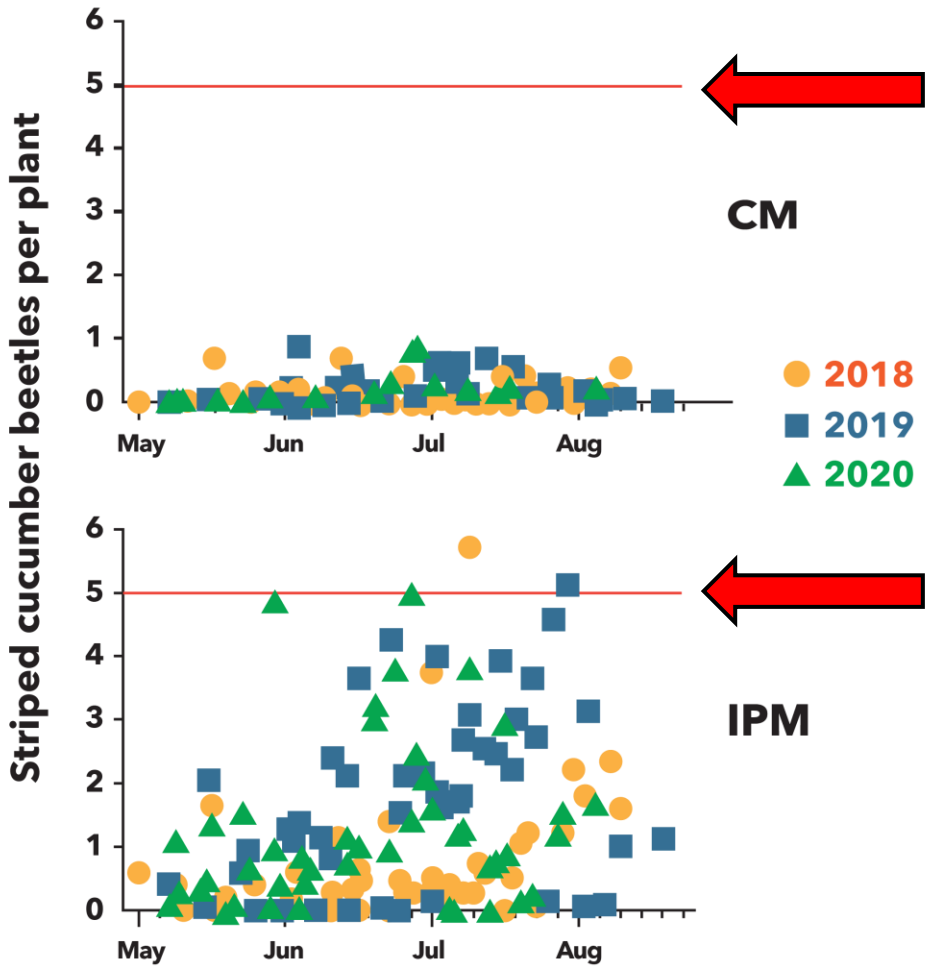
IPM Management System

Pyrethroid foliar sprays based on scouting and economic thresholds



Can scouting track melon pests?

Scouting successfully controlled seasonal pest populations



- IPM fields had 91% increase in pest abundance ($p < 0.001$)
- IPM had only 4 sprays triggered by ET
  - *60 sprays in CM*
- Single application controlled pests through harvest

Pollinator Observations

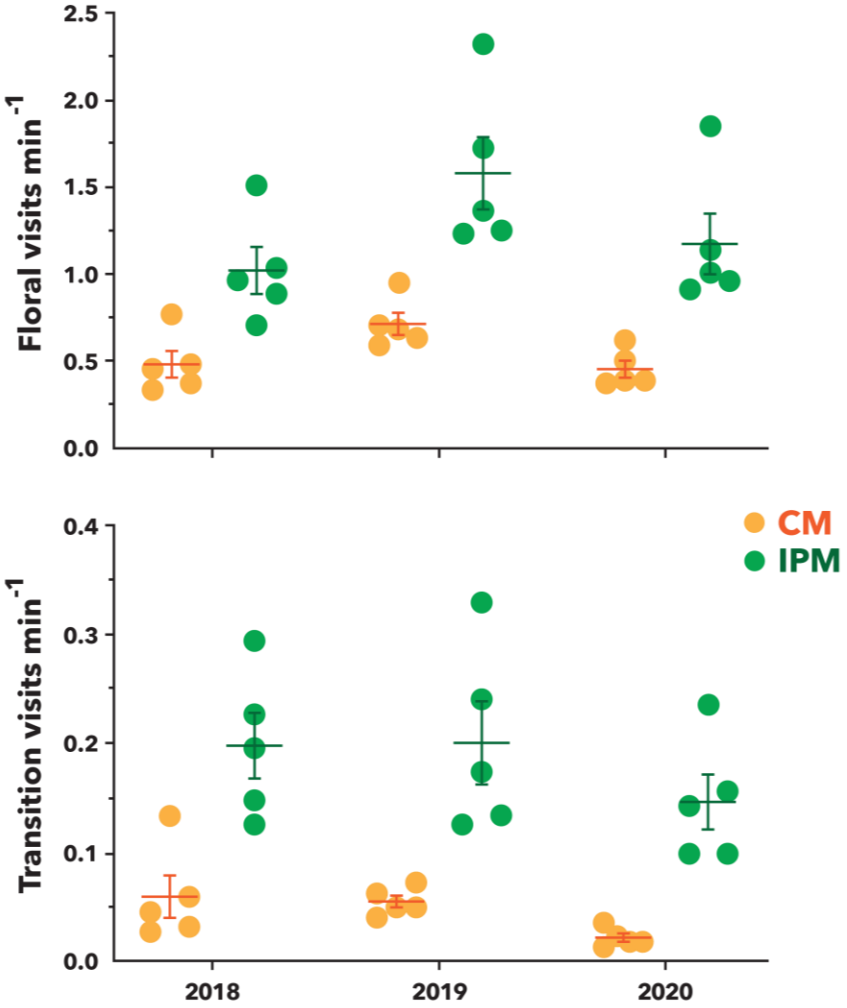
- Observe visitation frequency during peak bloom
- Categorize pollinators into easily identifiable groups

IPM significantly increased pollination

Pest management effect:

Floral visits: $F_{1,16}=180.08$, $p<0.001$

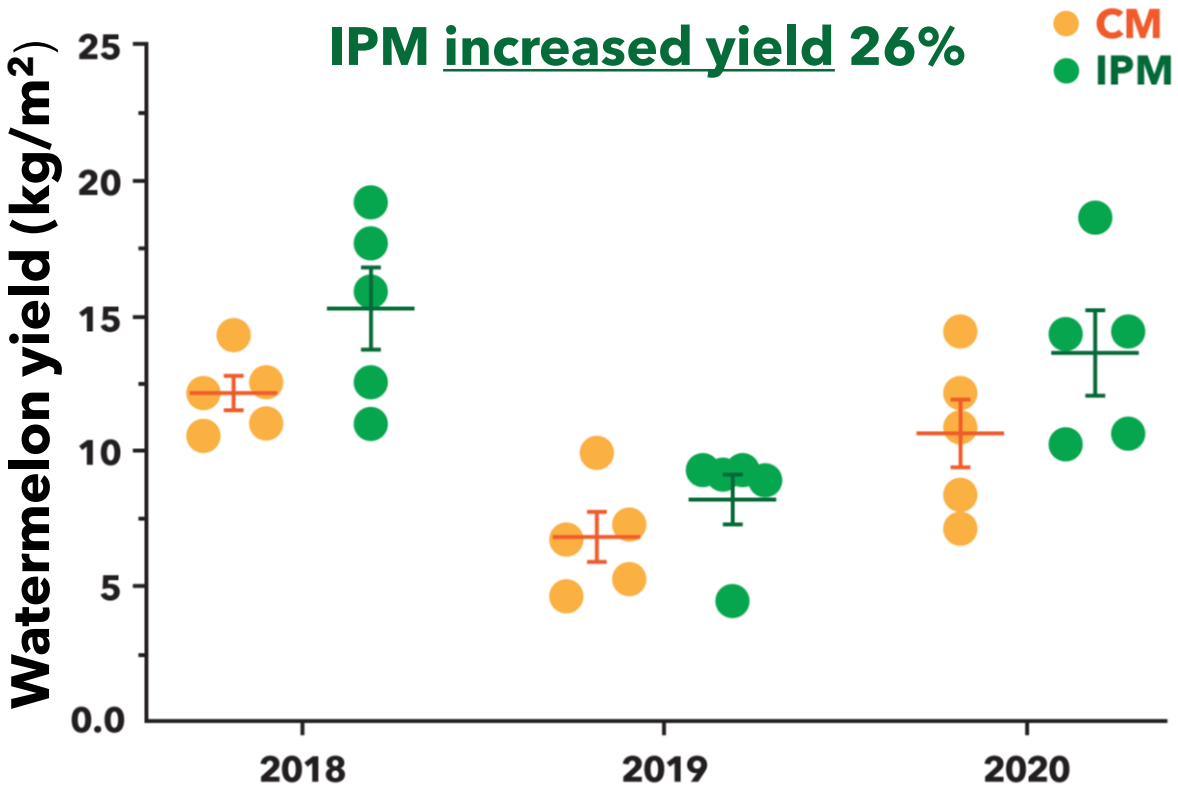
Transition visits: $F_{1,16}=163.21$, $p<0.001$



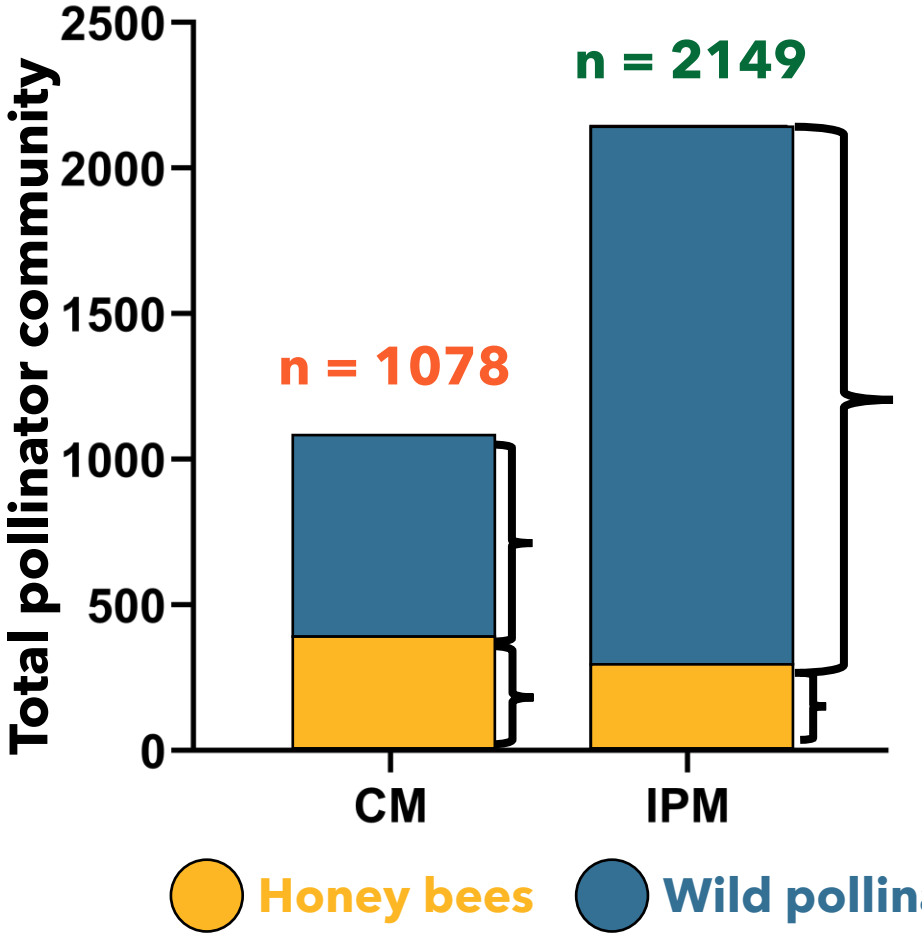
IPM increased 129%

IPM increased 305%

Yield increased after implementing IPM

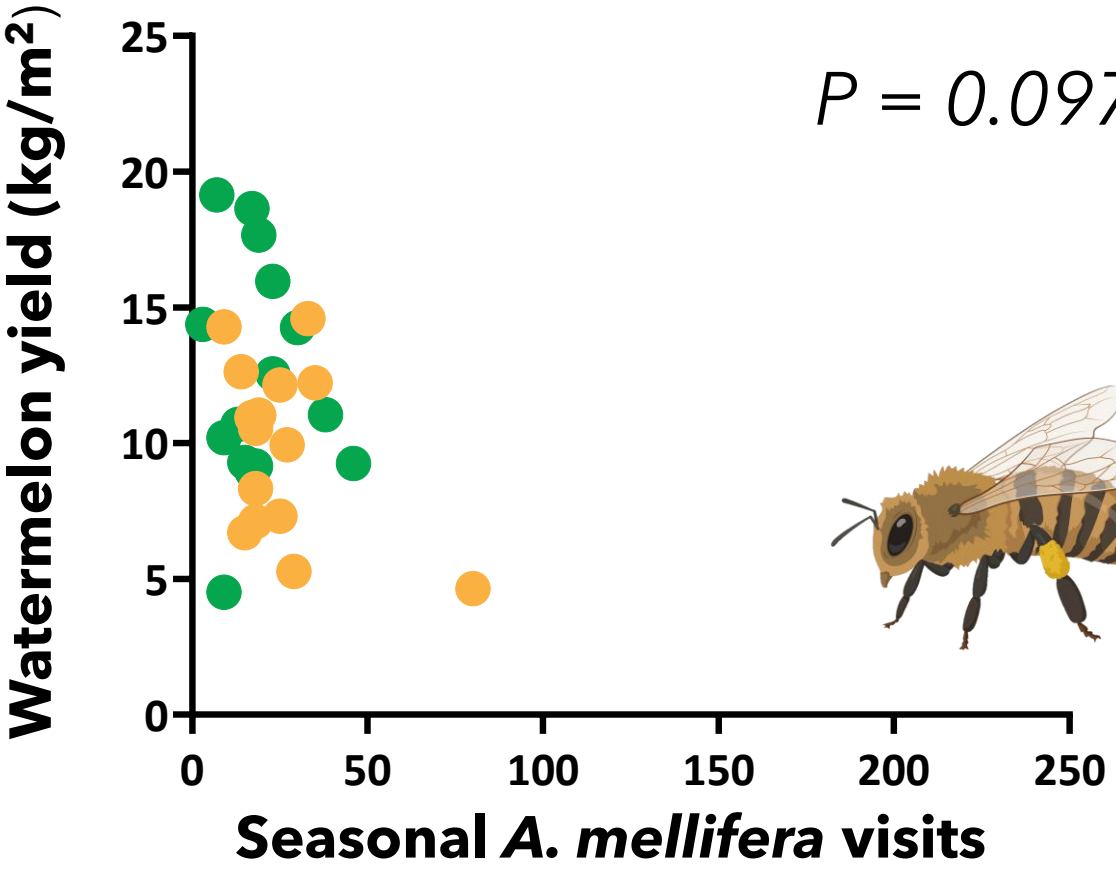


Treatment: $F_{1,16} = 13.72$ P = 0.002



Relationship of visitation and yield

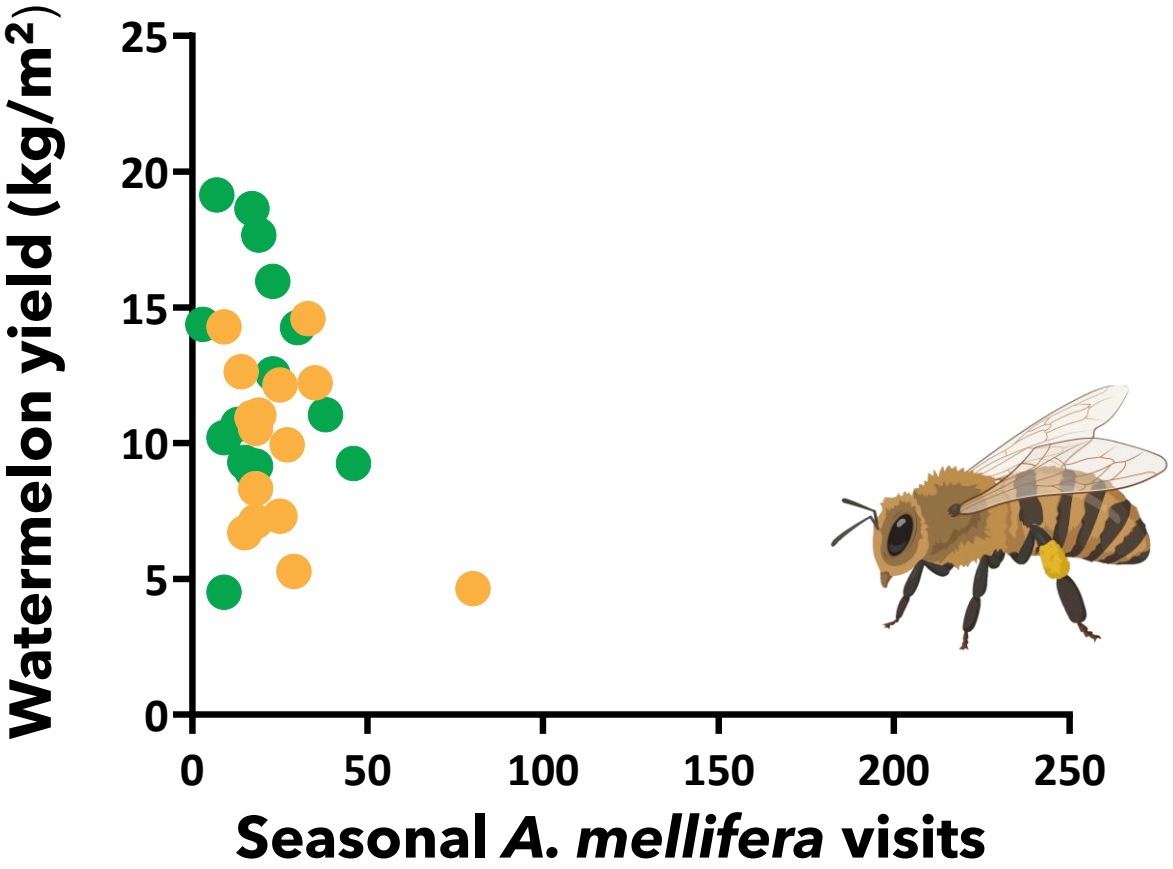
CM
IPM

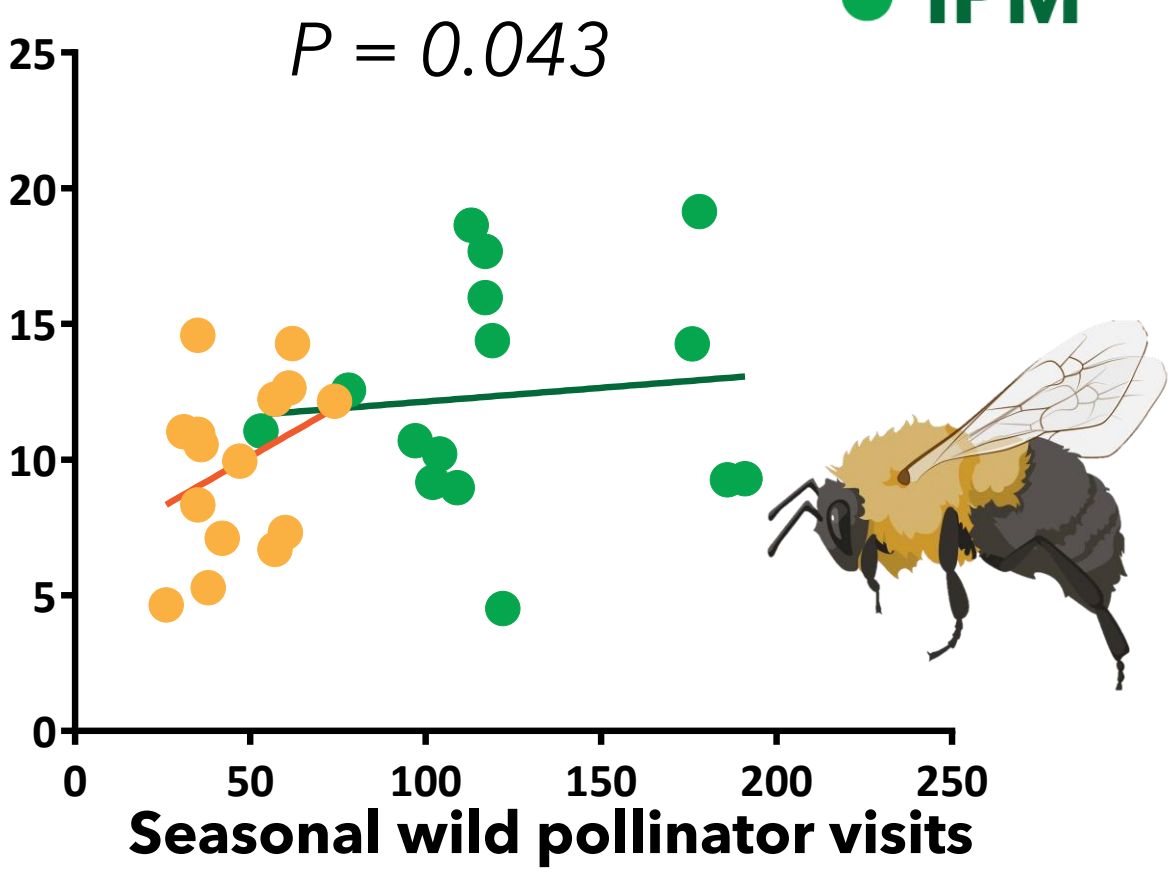


$P = 0.097$

Relationship of visitation and yield

CM
IPM

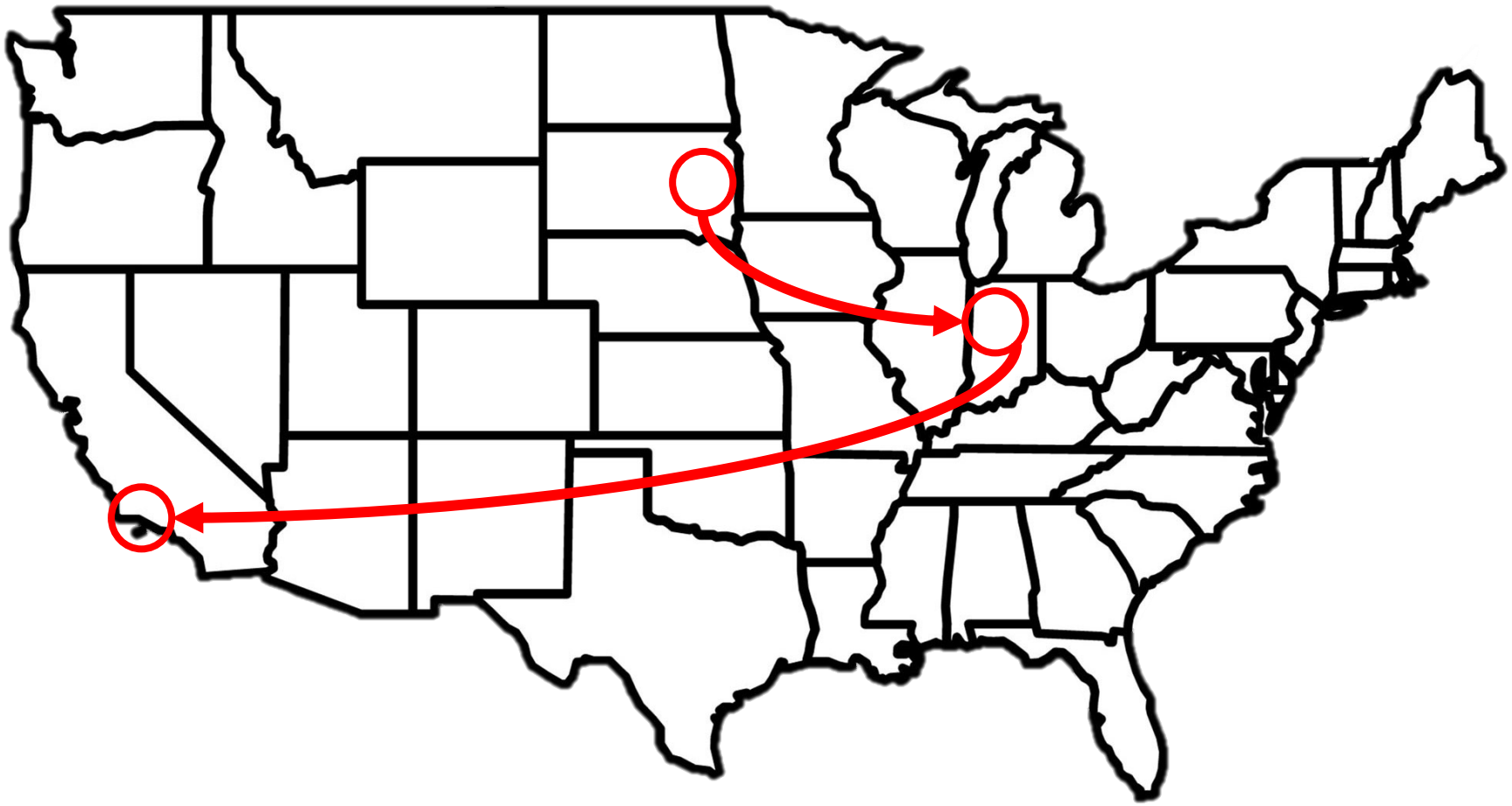




Embracing IPM as a ‘win-win’

- Growers may have a financial advantage through IPM adoption
- Prevented economic damage from pests
- Benefits to both crop production and pollinator health

Final stop to sunnier spaces



Rodale Institute at McGrath Family Farms

Quantify benefit of cover crops for a CA veggie grower

If a grower takes a field out of commercial production for a cover crop, what kind of benefits can a grower hope to recover to offset?

Terminating cover crop may be difficult in some instances…

Cover crop residue can form ideal weed-suppressing mulch

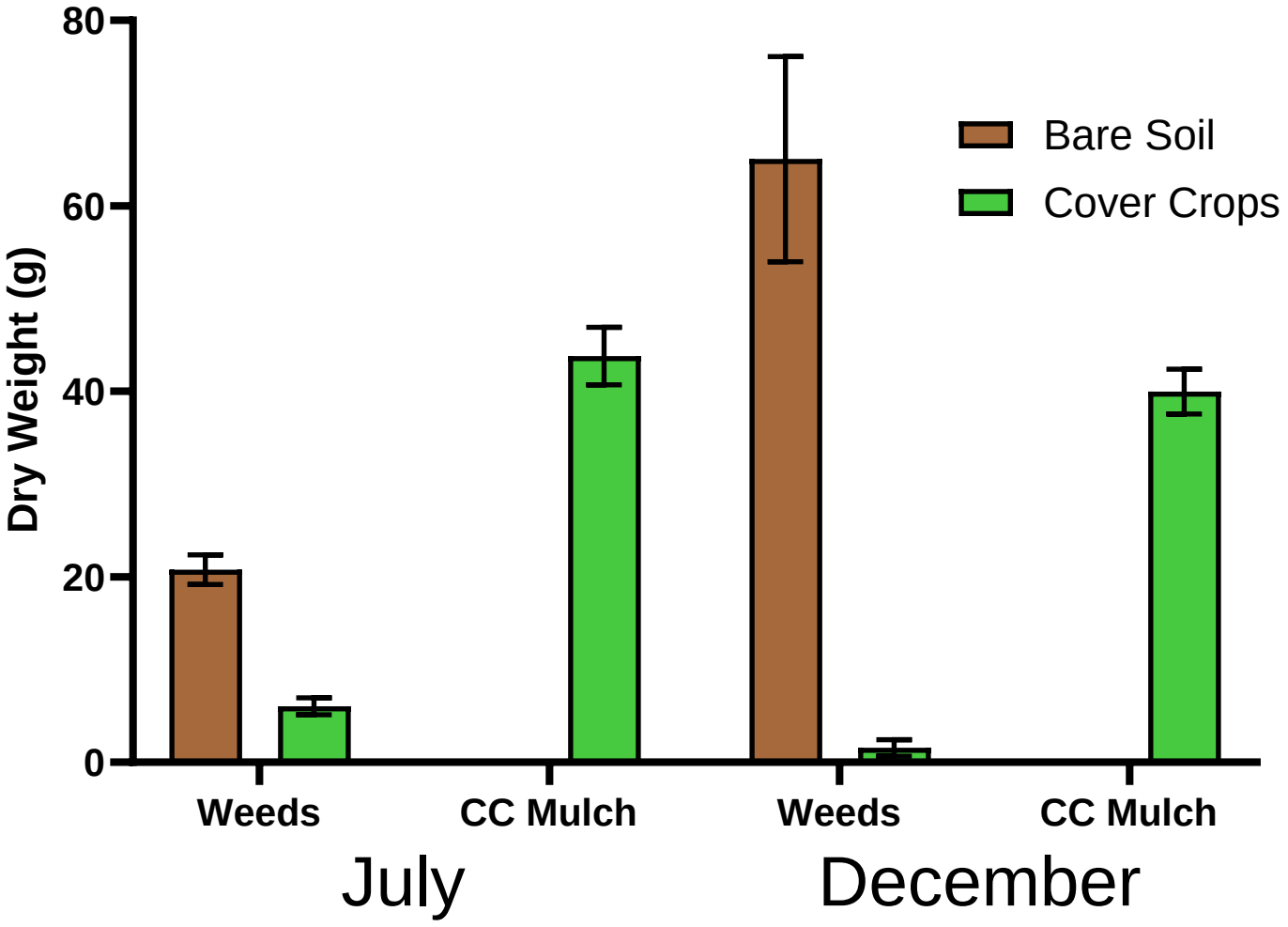
What benefits can different vegetables get from cover crops?

- Contrast cover cropped beds to bare soil beds with conventional tillage practices
- Observe vegetables with short (yellow squash), medium (bell peppers), and long (eggplant) development to see if benefits persist

Cover crops provide weed control for emerging plants

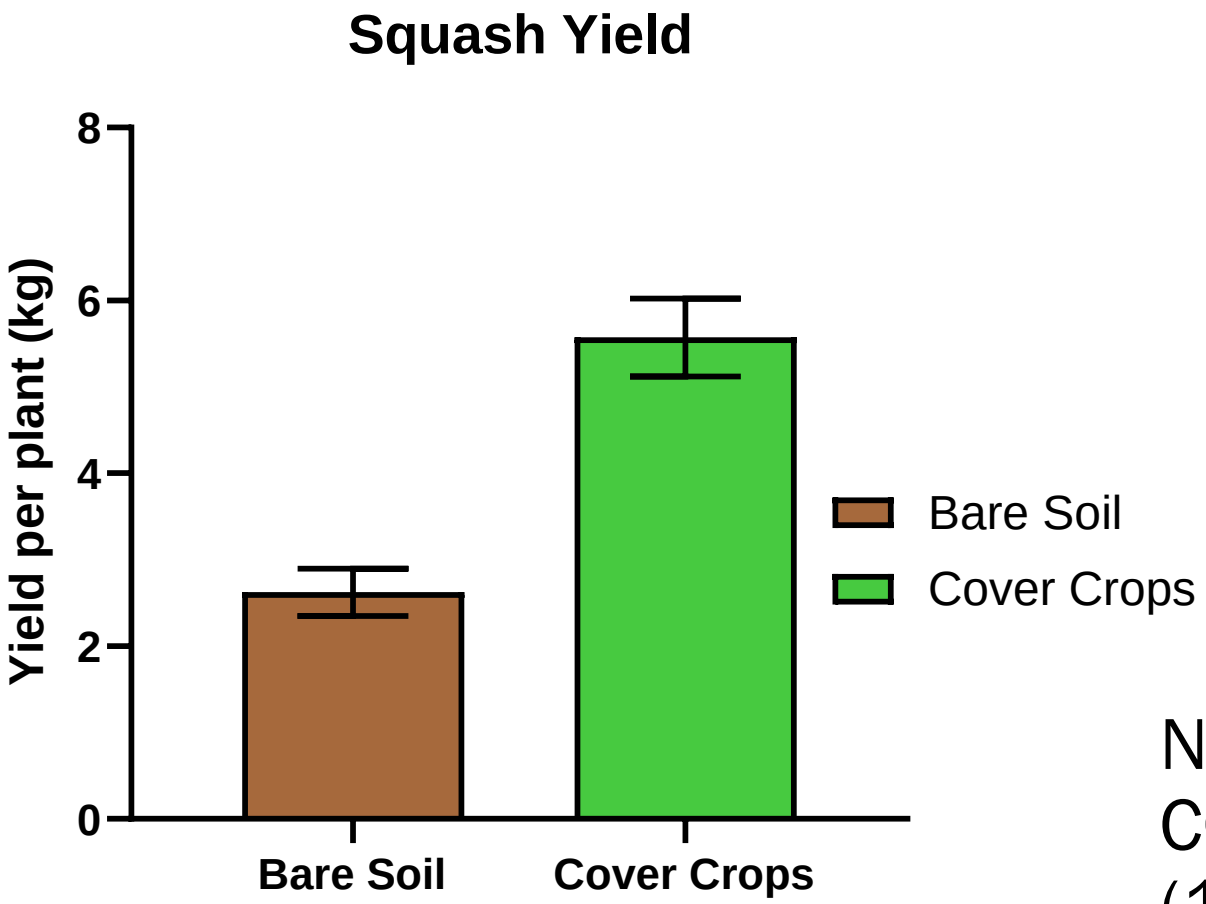
- Without any sort of cover, weeds will grow prolifically around irrigated areas
- With bed of cover crops forming a mulch, transplanted vegetables can grow with reduced competition

Cover crop mulch significantly reduced weed pressure



Ultimately, crop performance will determine adoption

Cover crops resulted in 72% higher weight



Number of squash was 66% higher in CC squash (26 per plant) vs bare soil (12 per plant)

Cover crop impact after 6 weeks

Unfortunately...

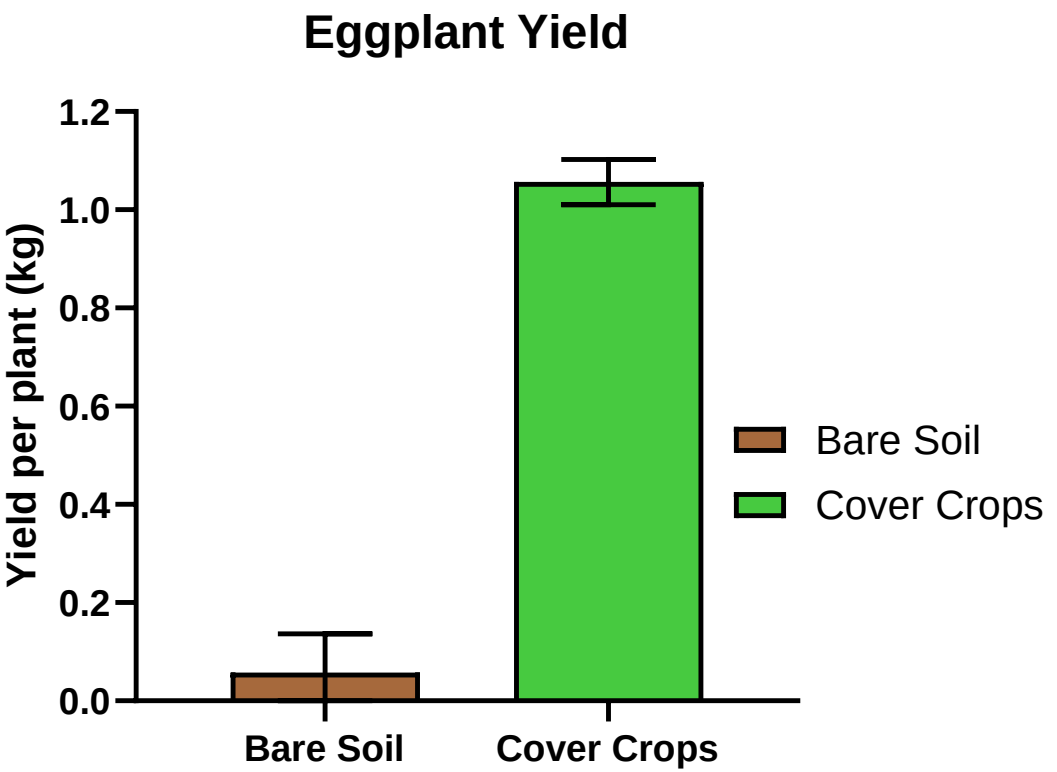
In 2024, IPM strategies lead to improved yield

- Combination of strategies led to a successful harvest in 2024

- After 3 weeks of harvest, 4 kg total harvested from bare soil blocks compared to 32 kg in cover cropped beds; a more than 150% difference!

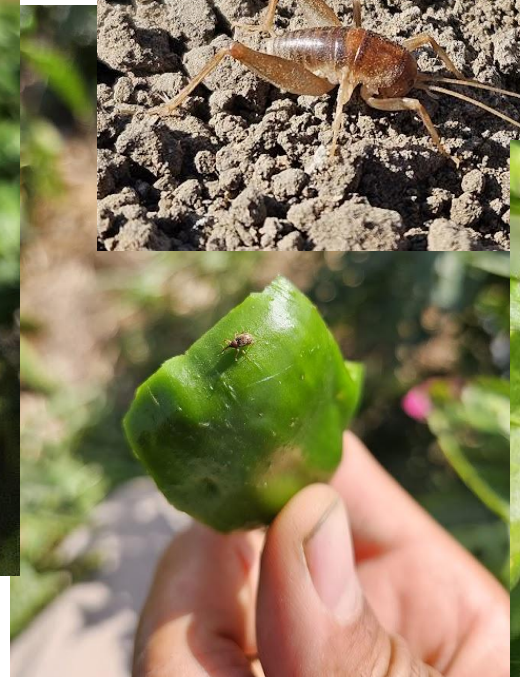
Cover crop impact after 6 weeks

Eggplant Yield

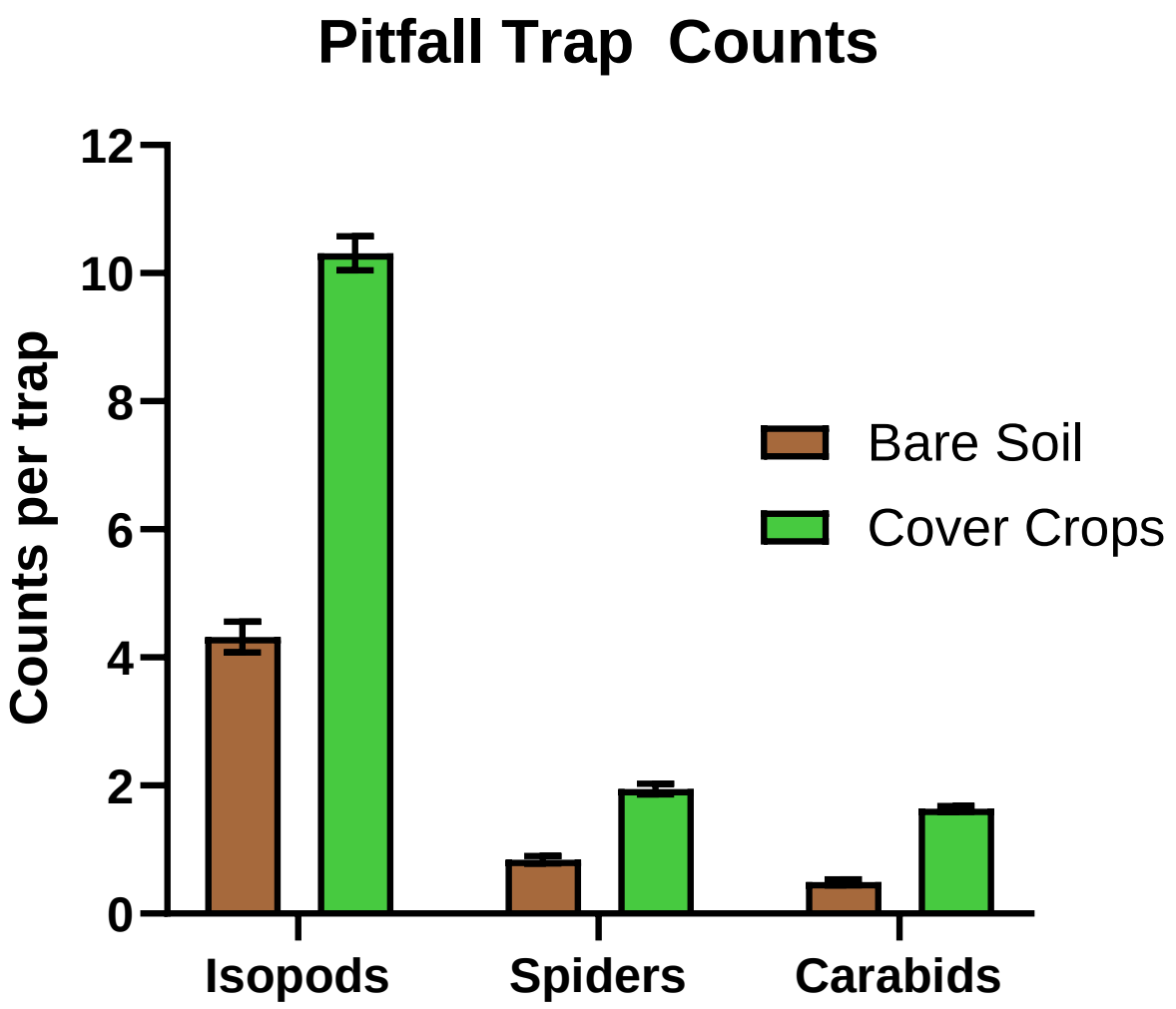


Cover cropped beds had over 38 kg (140 total eggplants) compared to 2 kg from just 8 harvested from the bare soil areas

Regenerative leads to incredible insect diversity



What arthropods use the cover crop residue?



Connecting findings with farmers

- In-field guided tours during:
  - Rodale COC Field Day
  - Ventura County Farm Tour
  - Small Farms Conference
  - Monthly center tours

- Led workshop at 2024 EcoFarm Conference

- Presented findings for Organic Garden Club of Ventura County monthly meeting