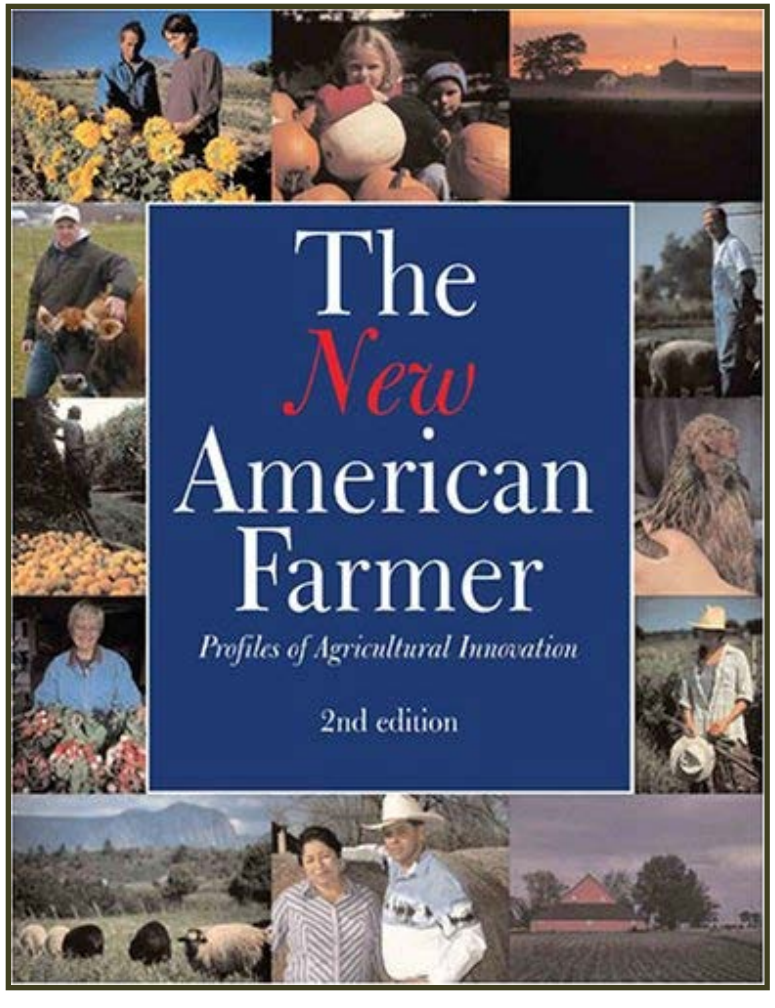
An example of success: **Molly & Ted Bartlett**

Silver Creek Farm (Hiram, Ohio)

- Like any organic farmer, Bartlett has devised a **multi-tiered plan** to manage pests without pesticides
- With lots of **observation**, Molly learned to plant certain crops at different times to avoid seasonal pests
- **Rotation** remains key, as does using products such as fabrics that blanket crops in a protective cover
- They regularly plant a mix of vetch and rye **cover crops**, along with other green manure crops



Focal Point of Operation: Education

PDF of the book included in flash drive

The *PAMS* approach

Prevention, Avoidance, Monitoring and Suppression

- **SUPPRESSION: Four main tactics:**

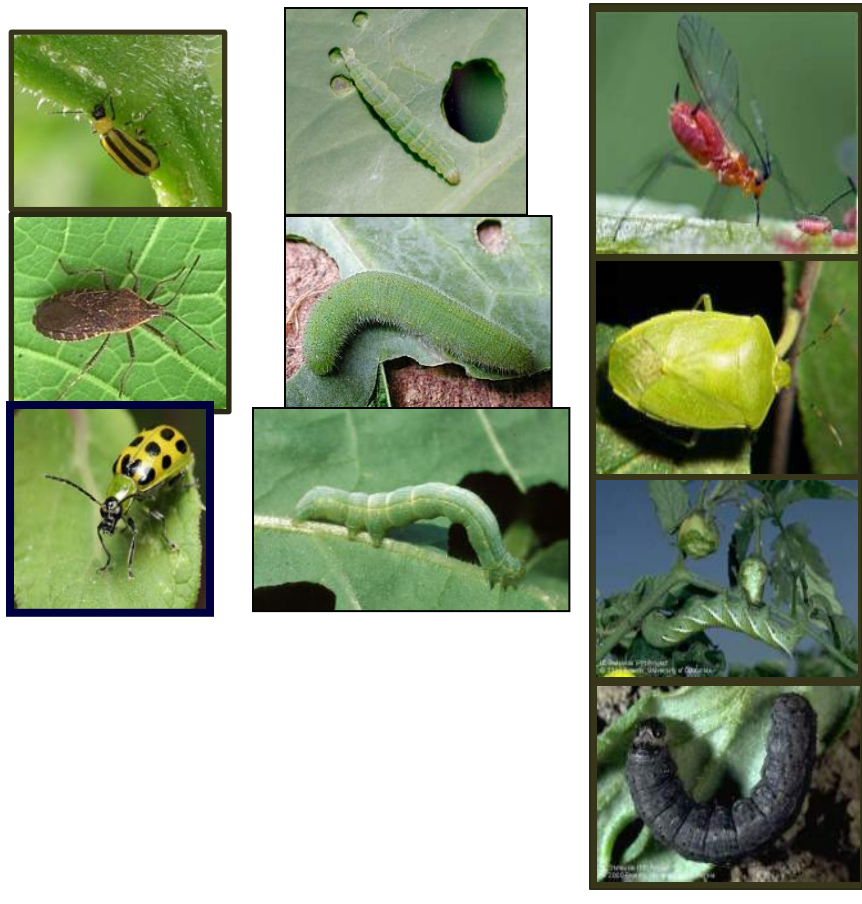
  - **Cultural –** Examples: Crop rotation, tillage, intercropping
  - **Physical**
  - **Biological**
  - **Chemical**

Row covers protecting melons from frost damage, chilling injury and insect pests. Picture: MU Extension

Suppression

Crop Rotation

- Many pests are specific to certain plants or groups of plants:
  - Solanaceous crops (Peppers, eggplants, tomatoes)
  - Cole crops (broccoli, Brussels sprouts, cabbage, cauliflower, collards, kale, kohlrabi)
  - Cucurbits (summer squash, winter squash, watermelon, cucumber, pumpkin, gourd)
  - Legumes (peas and beans)



Suppression

Tillage

- Timely cultivations can reduce or eliminate some insects and weeds
  - Beginning with a clean field and periodically tilling between rows can keep weeds from reproducing
  - No till systems are favorable to many wireworms, cutworms and grubs

Suppression

Intercropping

- Sometimes interplanting some other plant in the same area can confuse, spread and/or concentrate the pests
- Intercropping increases biodiversity and can help increase the number of beneficial insects present
  - CAUTION: Intercropping plants of different families can make proper rotations very difficult

Howard F. Schwartz, Colorado State University, Bugwood.org

Suppression

Adjusted Planting Date

- It is possible to plant either early or late and avoid the most destructive phase of the pest.
  - Using clear plastic mulch and raised beds allows you to plant sweet corn much earlier and avoid corn earworm damage

Suppression

Sanitation

- Removing diseased or infested plants is crucial to prevent the spread of pests

Whitney Cranshaw, Colorado State University, Bugwood.org

The *PAMS* approach

Prevention, Avoidance, Monitoring and Suppression

- **Cultural**
- **Physical**
- **Biological**
- **Chemical**

Row covers protecting melons from frost damage, chilling injury and insect pests. Picture: MU Extension

Floating Row Covers

Striped cucumber beetle aggregations

Larvae tunneling at plant base producing

Zucchini plant infected with bacterial wilt

Scarring of cantaloupe/honeydew skin

Floating Row Covers

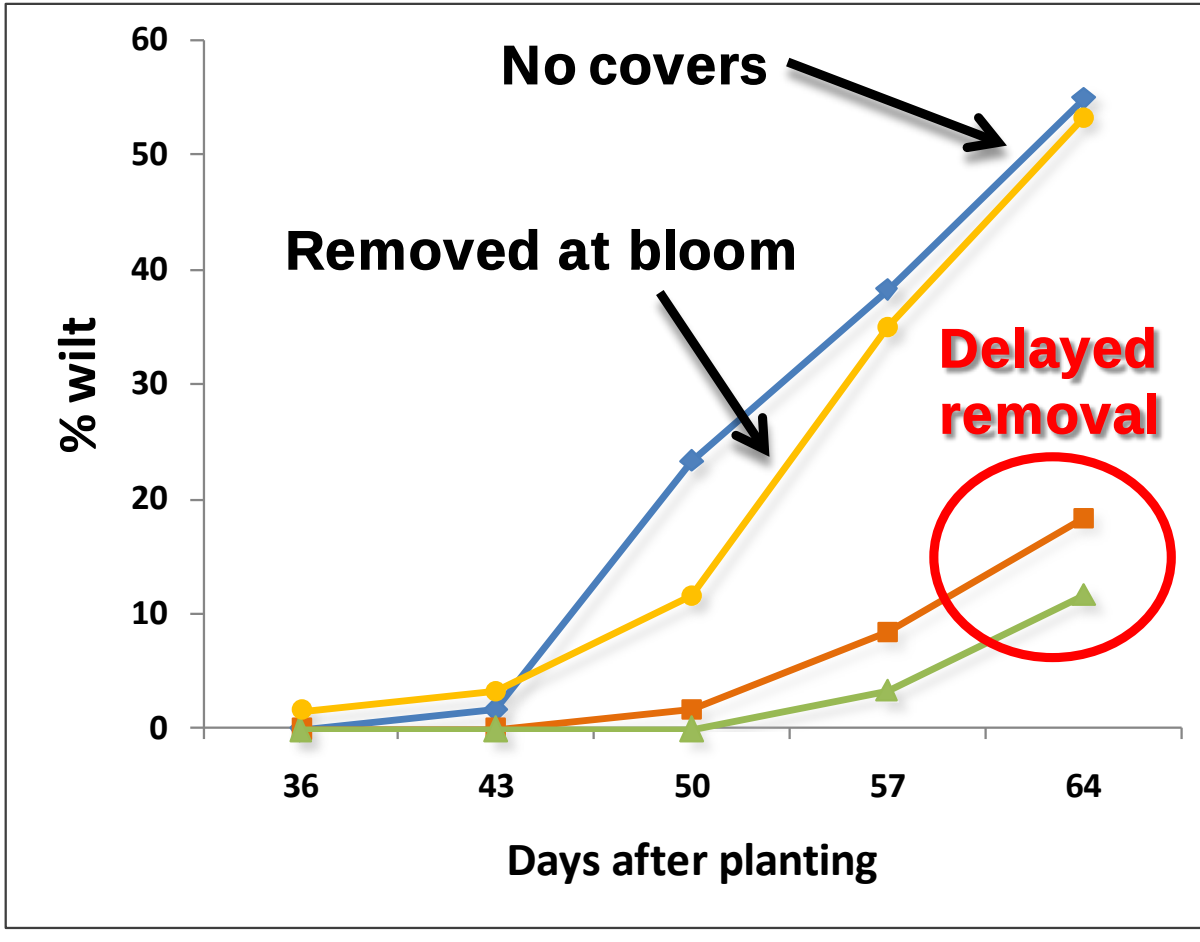
- Effective but costly and labor intensive
- 3-yr study (Dr. Mark Gleason – Iowa State Univ.)
- Four treatments:

1. Row covers were removed at start of flowering
2. Row cover ends were opened at start of flowering to enable pollinator access, and covers were removed 10 days later
3. After a bumble bee hive (Koppert Biological Systems Inc.) was inserted under one end of the row cover at start of flowering, the row cover was re-sealed and then removed 10 days later
4. No row covers (control).

Courtesy of Dr. Mark Gleason – Iowa State Univ.

Row Cover Study Results

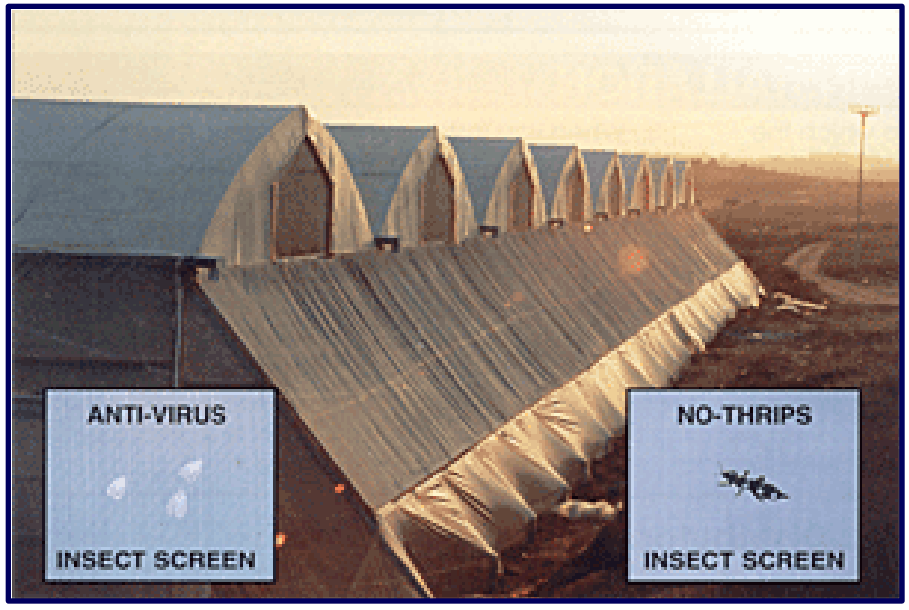
- Delayed-removal row cover significantly **suppressed bacterial wilt** throughout the growing season and **enhanced yield**
- **Recommendation:** Open cover ends and remove row covers 10 days after flowering



- Row cover ends were opened at start of flowering to enable pollinator access, and covers were removed 10 days later
- After a bumble bee hive was inserted under one end of the row cover at start of flowering, the row cover was re-sealed and then removed 10 days later

Other Physical/Mechanical Controls

- Insect screening on intake vents, exhaust fans, and entrances
- Insect Vacuums
- Altering environmental conditions (e.g., temperature and relative humidity) to discourage pest infestation



BIOfumigation

Incorporation of soil amendment (fresh plant mass, manure) into the soil which will release active volatile compounds able to suppress soil-borne pests

- When plants such as broccoli, mustard, rapeseed, horseradish, are damaged, they release biologically active chemicals (e.g., isothiocyanate = ITC)
- ITCs behave like commercial pesticides
- Being adopted by growers in the Pacific Northwest to control nematodes, other soil-borne pathogens and insects
- Biofumigant crop systems: overwintering rapeseed; early spring planted mustards, cover-crop type radishes or turnips; and late spring planted sorghum/sudangrass. Each has the potential to fit different vegetable cropping sequences for early, mid, or late season production

SOLARIZATION

- Solarization is a simple nonchemical technique that captures radiant heat energy from the sun
- This energy causes physical, chemical, and biological changes in the soil, leading to control or suppression of soilborne plant pathogens such as ***fungi, bacteria, nematodes, and pests along with weed seeds and seedlings.***
- **For information on how to solarize soil:**

http://vric.ucdavis.edu/pdf/soil_solarization.pdf

Solarization is most effective when done in June and July. However, depending on your geographic location, solarization may also be effective in May, August, and September. The plastic should be left in place for 4-6 weeks.