Alabama Vegetable IPM Project
Scout Without Doubt

Organic Vegetable Pest Management: Focus on Pest Exclusion Systems

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The Very Hungry Caterpillar Complex in Alabama!

Beet armyworm
Spodoptera exigua

Fall armyworm
S. frugiperda

Frank Peairs, Bugwood.org

Yellowstriped armyworm
S. ornithogalli

Whitney Cranshaw, Colorado State University, Bugwood.org

Southern armyworm
S. eridania

Central Science Lab., Harpenden, British Crown, Bugwood.org

Corn earworm
Helicoverpa zea

Tomato hornworm
Manduca quinquimaculata

Cabbage looper
Trichoplusia ni

Soybean looper
Chrysdeixis includens

John C. French Sr., Retired, Universities: Auburn, GA, Clemson and U of MO, Bugwood.org

Major Vegetable Moth Species

Fall armyworm, *Spodoptera frugiperda*

Wingspan = 3.8 cm

William Lambert, University of Georgia, Bugwood.org

Beet armyworm, *S. exigua*

Wingspan = 3.0 cm

Paul Harris, Bugwood.org

Yellowstriped armyworm, *S. ornithogalli*

Wingspan = 4.0 cm

John Capinera, University of Florida, Bugwood.org

Southern armyworm, *S. eridania*

Wingspan = 3.8 cm

Central Science Laboratory, Harpenden, British Crown, Bugwood.org

Corn earworm, *Helicoverpa zea*

Wingspan = 3.5 cm

Steve L. Brown, University of Georgia, Bugwood.org

Tomato hornworm, *Manduca quinquimaculata*

Wingspan = 10 cm

Cabbage looper, *Trichoplusia ni*

Wingspan = 3.5 cm

Keith Naylor, Bugwood.org

Dr. A. Majumdar, ACES

Pickleworm

Brown moth with dark wing edges

Images: A. Majumdar, ACES

Older larvae lose the spots!

Larva pupate in leaf fold.

Squash Vine Borer

Images: Bugwood.org (used with permission)

Larva pupate in soil.

Melonworm

Female moth – whitish wings with dark edges

Several larvae may feed together with some webbing

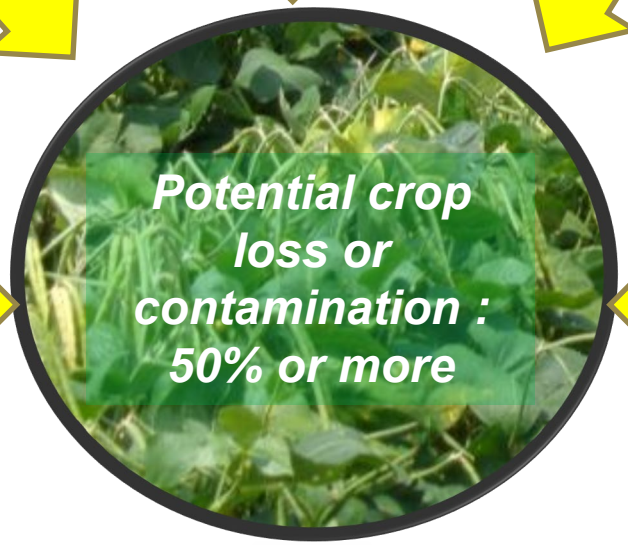
ACES Blog: https://www.aces.edu/blog/topics/crop-production/how-to-identify-squash-vine-borers-pickleworms-melonworms/ Dr. A. Majumdar, ACES

Frequent pests of southern pea

Aphids
(Aphis spp.)

Leaffooted bugs
(Phyllopus spp.)

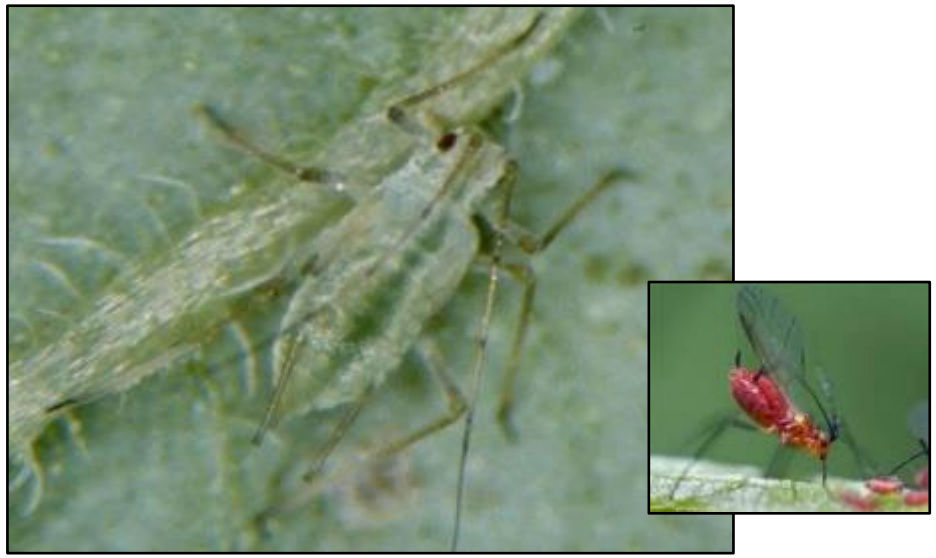
Caterpillars
(various species)



Cowpea curculio
(Chalcodermus aenus)

Common aphid species on vegetables ('micro bugs')

Green peach aphid *(Myzus persicae)*
Jim Baker, Bugwood.org

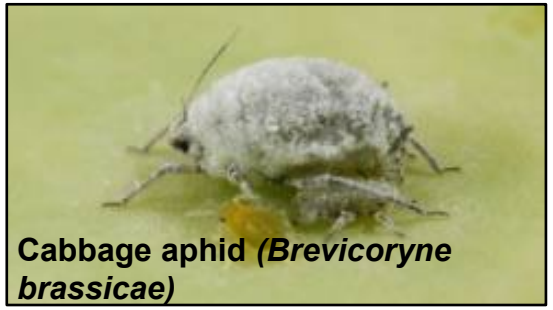


Potato aphid – two forms *(Macrosiphum euphorbiae)*
Whitney Cranshaw, Bugwood.org; David Cappaert, UF

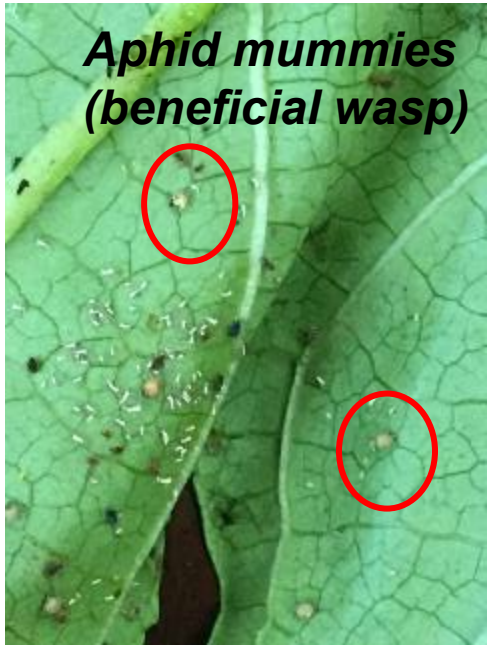
Outbreak – too late!

Cotton or melon aphid *(Aphis gossypii)*
Mississippi State University, Bugwood.org

Cowpea aphid *(Aphis craccivora)*
Whitney Cranshaw, Colorado State University, Bugwood.org



Cabbage aphid *(Brevicoryne brassicae)*
Lyle Buss, University of Florida



Why are sucking insect pests so difficult to kill?

Brown stink bug *(Euschistus servus)*

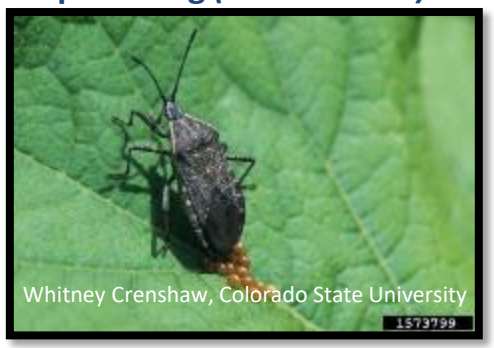
Brown marmorated stink bug *(Halyomorpha halys)*

Direct losses on tomato & cotton

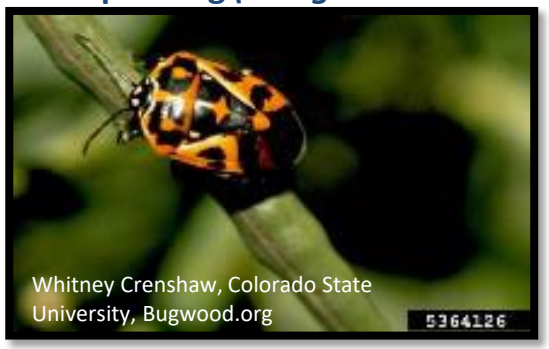
Southern green stink bug *(Nezara viridula)*

Leaffooted bug *(Leptoglossus spp.)*

Squash bug *(Anasa tristis)*



Harlequin bug *(Murgantia hirtrionica)*



Difficulties with these large pests:

- Hard exoskeleton, sucking mouthparts!
- Vast host range
- Excellent mobility
- Aggregation pheromones
- Overlapping generations feeding together
- Low impact of natural enemies
- Insecticide tolerance (?):
  - Prolonged exposure to old chemicals
  - Excessive use of old chemistries
  - Environmental backlash

"Think outside the box!"

Dr. A. Majumdar, ACES

Turnips as perimeter trap crop

Direct leaf feeding on small turnips from the yellowmargined leaf beetles can severely reduce yields!

CREC, Clanton, Spring 2022

What is IPM?

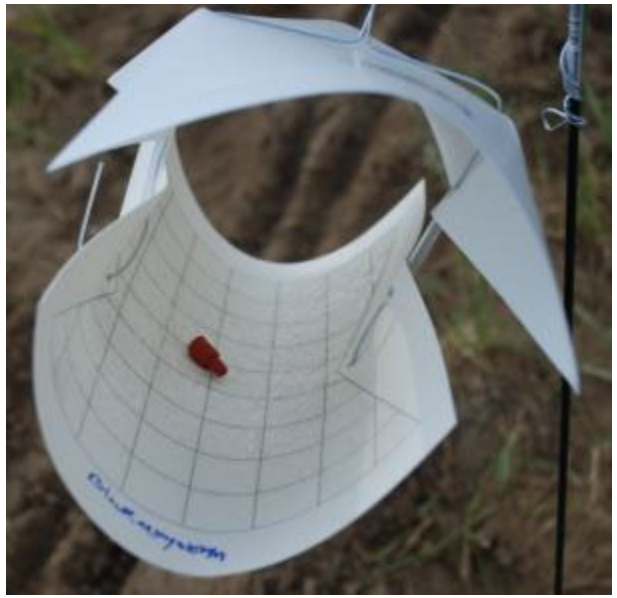
- IPM = Integrated Pest Management
- IPM is a decision-making system based on economic thresholds to control insect pests.
- IPM uses a variety of pest management techniques for optimum control:

Systems-based practices	Mechanical control methods	Pesticides as last resort
• Vigorous varieties • Planting time • Proper growth	• Insect screens • Pest Exclusion • Vacuuming	• Organic • Non-organic • Conventional

First step to IPM:
Pest Scouting/Monitoring

- Use pheromone traps for improved scouting
- Trap Catch = Pest Density X Pest Activity
- Very cost effective…perfect for beginning farmers!!
- Develop site-specific IPM strategies

Sticky wing trap



Z-trap

Sentinel trap (camera)

Moth counts from sticky wing pheromone traps

Monitoring locations: 20+ commercial farms & research stations across AL each year

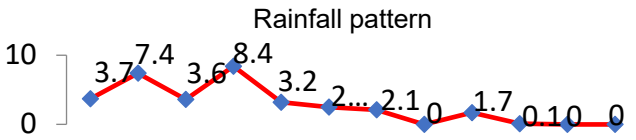
Monitoring traps: Sticky wing pheromone traps for generating population trend data

Species	2022 (wet spring, dry summer)	2021 (very wet year)	2020 (wet year)	2019 (flash drought)	2018 (wet year)	2017 (flood year)	2016 (prolonged drought)	2015 (wet year)
Beet armyworm (BAW)	807	1320	1240	890	592	1200	955	1200
Fall armyworm (FAW)	252	2490	370	656	933	528	574	807
Southern armyworm (SAW)	441	1020	563	N/A	N/A	N/A	N/A	N/A
Yellowstriped armyworm (YSA)	97	153	141	N/A	N/A	N/A	N/A	N/A
Cabbage looper (CL)	889	735	568	517	297	714	464	134
Soybean looper (SL)	263	481	342	356	577	755	501	559
Corn earworm (CEW)	315	353	254	113	77	424	119	184
Tobacco budworm (TBW)	103	174	65	75	311	130	172	60
Lesser cornstalk borer (LCB)	7389	4710	7150	6360	5190	6790	4890	4950
Squash vine borer (SVB)	1205	1230	623	1140	530	987	630	565
Totals>>>	11,761	12,666	11,316	10,100	8,507	11,528	8,305	8,459

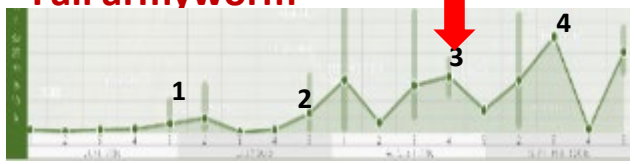
Supported by funds from the USDA-NIFA BFRD, SARE Research & Education/PDP, CPPM/EIPM, OREI, and ADAI Specialty Crops Block Grant Programs.

REMINDER: Weather can challenge IPM plans!

Summer 2016 (Prolonged drought)



Fall armyworm



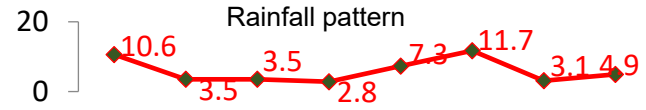
Beet armyworm

Squash vine borer

Cabbage loopers

Red arrows indicate major increase in moth activity due to prolonged drought!

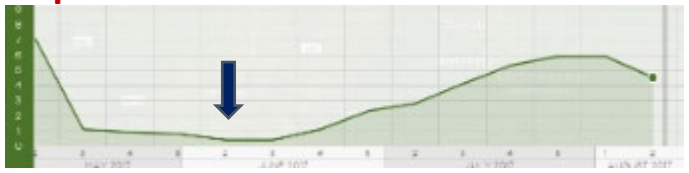
Summer 2017 (Wet year)



Fall armyworm

Beet armyworm

Squash vine borer



Cabbage looper

Blue arrows indicate major decrease in moth activity due to excessive rainfall!

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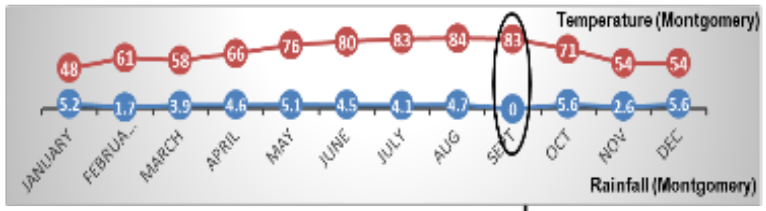
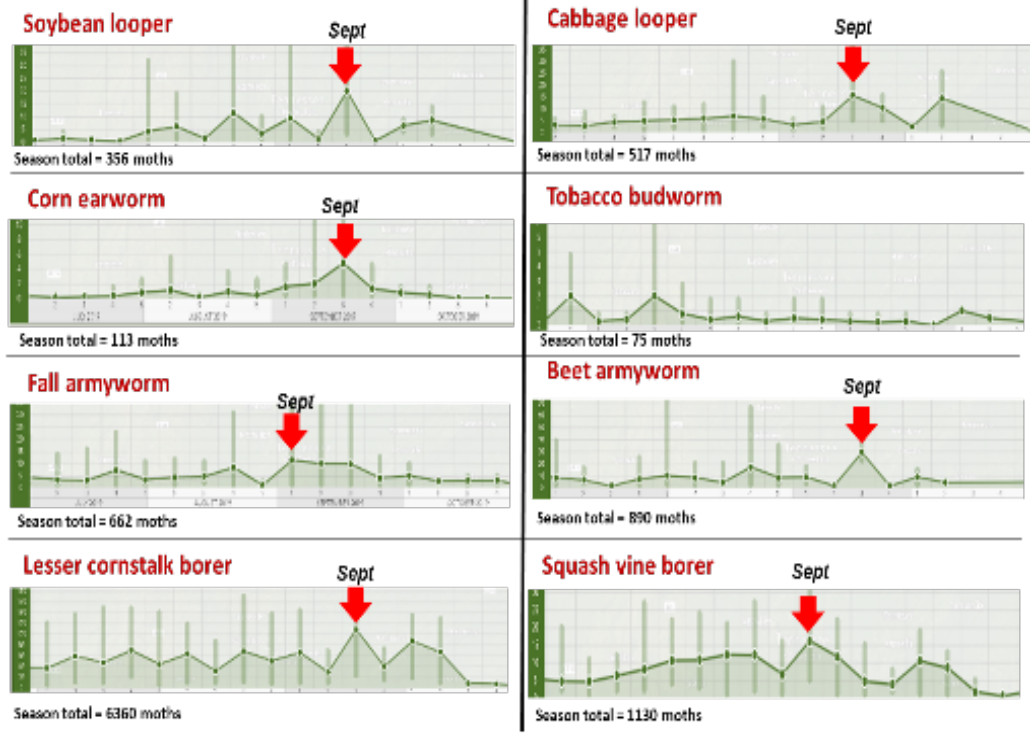
Summer 2019 (Flash drought)





Red arrows indicate a <u>sudden increase</u> in moth activity due to flash drought!

Flash drought can cause >70% crop loss in late-season tomatoes!!

Sustainable IPM Practices (Overview)

Natural enemy/pollinator conservation

IPM Level 1: Systems-based practices

Host plant resistance (variety selection)
Sanitation & Weed control
Irrigation & water management
Trap crop/intercropping

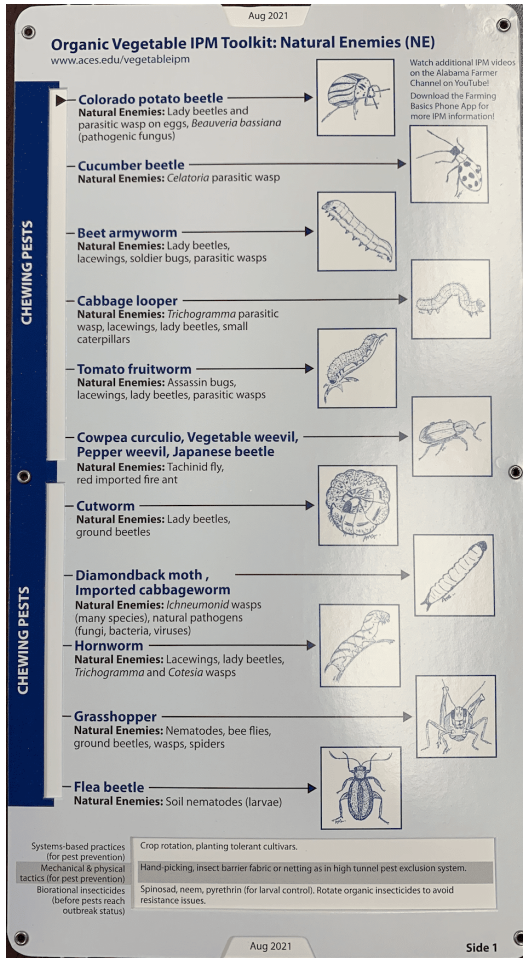
IPM Level 2: Pest exclusion/removal practices

Temporary pest exclusion system: Open field crop or market gardens
Permanent pest exclusion systems: High tunnel IPM
Manual or mechanical pest removal

IPM Level 3: Insecticides

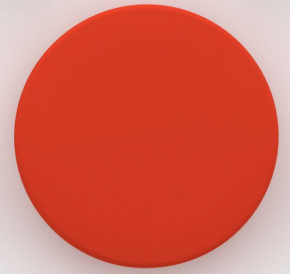
Conventional insecticides
Biorational insecticides

Prevent Insecticide Resistance & Pest Resurgence



IPM Approaches: PAMS Model

Commonly used by USDA Agencies (1998)



- **P**revention (sanitation, GMP)
- **A**voidance (sanitation, weed control)
- **M**onitoring for hot-spots (crop scouting and sampling, pheromone traps)
- **S**uppression (chemical or organic methods)

Organic Vegetable/Sustainable IPM Recommendations

Open field crops

High tunnel crops

Market gardens/ Small farms

Fixed frame

Movable frame

Prevention tactics

Therapeutic tactics

Trap crops

Bioinsecticides

Permanent pest exclusion system (HTPE)

Bioinsecticides

Temporary pest exclusion system

Bioinsecticides

Conserve and/or augment natural enemies

IPM Level 1. Trap crops evaluated in Alabama

There is no universal trap crop. Choice depends on the target insect.
Success depends on careful planning and environmental conditions.

- Leaffooted bugs
  - Sorghum (NK300)
  - Sunflower (Peredovik)

- Stink bugs
  - Sunflower
  - Browntop millet
  - Pearl millet

- Aphids
  - Okra
  - Bell peppers
  - Ornamentals

- Squash insects
  - New England Hubbard squash
  - Baby Blue Hubbard squash

- Brassica insects
  - Yellowmargined leaf beetle: Turnips

Trap Crop Publications (in multiple languages)


Pest Management in the Southern Region

SOUTHERN SARE
Sustainable Agriculture Research & Education

Trap Cropping in Vegetable Production: One Tool for Managing Pests

What is SARE?

The Southern Region

Managing crop pests on a farm can be challenging, especially for orga
or those who simply choose to use fewer insecticides or no chemical a
at all.

One proven practice of cultural pest control is trap cropping, a techni
plants attractive to insect pests to lure them away from the cash crop.

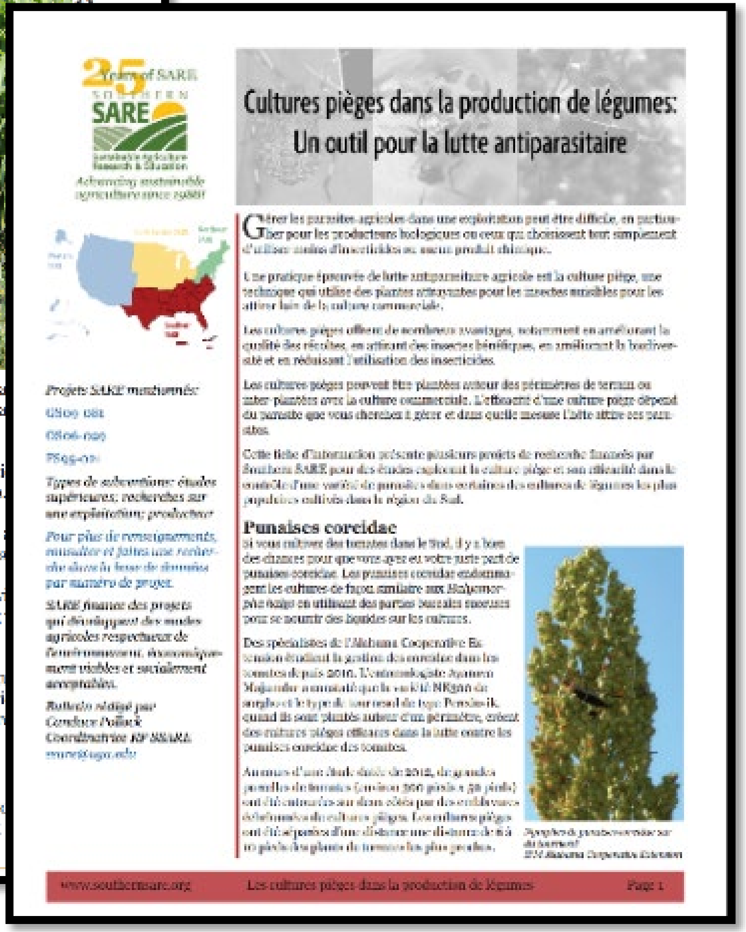
Trap crops provide many benefits, including increasing crop quality,
beneficial insects, enhancing biodiversity and reducing insecticide us

Trap crops can be planted around field perimeters or inter-planted w
crop. A trap crop's effectiveness depends on what pest you are trying
and how desirable the host is for those pests.

This fact sheet showcases several Southern SARE-funded research st
have explored trap cropping and its effectiveness in controlling a vari
in some of the more popular vegetable crops grown in the Southern r

Leaf-footed Bugs

If you grow tomatoes in the South, chances are you have dealt with y
of leaf-footed bugs. Leaf-footed bugs damage crops similarly to stink
ing sucking mouthparts to feed on crop fluids.


25 Years of SARE
SOUTHERN SARE
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Advancing sustainable agriculture since 1988!

Cultures pièges dans la production de légumes: Un outil pour la lutte antiparasitaire

Punaises coreidae

www.southernsare.org Les cultures pièges dans la production de légumes Page 1


INNOVATIONS IN SUSTAINABLE AGRICULTURE

CONTENTS

Also available at http://www.southernsare.org.

SOUTHERN SARE
Sustainable Agriculture Research & Education

Innovations in Large-Scale Trap Cropping for Reducing Insect Pests

Integrated Pest Management or IPM is an ecological and multi-faceted pest reduction system aimed at providing economic, environmental and health benefits to society. Trap cropping is a unique pest prevention system that uses insect behavior to deter pest feeding. Trap crops work well for migratory insects that show a strong edge effect. That is, insects that land on the perimeter of fields to explore habitats.

There are two parts to the trap crop system, namely, the trap crop – generally a sacrificial crop (but there are exceptions!), and the main crop – one that growers want to protect. Trap crops are usually planted ahead of the main crop on good ground so that they become attractive to target pests. Insect pests land on the trap crop and stay there for food and oviposition (egg laying).

There is no universal trap crop that would attract all pests, so each system has to be carefully designed and managed with the insect's feeding preference in mind. Growers have to consider the biology of the insect along with the ecological conditions around the farm for maximum benefits.

As this bulletin demonstrates, perimeter trap crops can be used relatively easily on small to medium sized farms. Benefits of trap cropping not only include effective pest management, but trap crops can also increase biodiversity, conserve natural enemies and reduce wind damage to main crops.

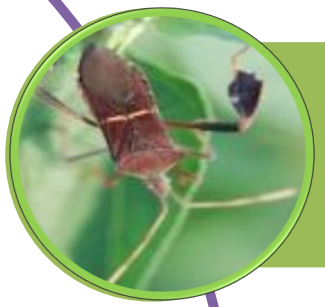
We encourage producers to refer to the work done at their local institution, and contact their Extension service for developing an IPM plan for their farm.

SOUTHERN SARE.ORG 1

IPM Level 2.
Pest Exclusion Systems

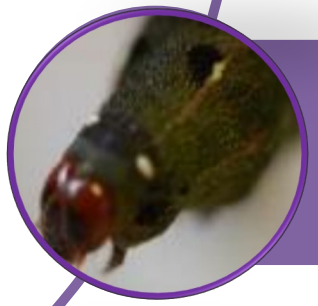
Goal: Pest prevention, pest establishment

Principles of Insect Pest Exclusion



Separate insect pest from host plant

Protect specific crop growth stage or universal exclusion



Careful planning required – material and design are both important

Pest Exclusion System Components

High Tunnel Pest Exclusion System:
A novel strategy for
organic crop production in the South

SOUTHERN SARE Sustainable Agriculture Research & Education

This bulletin provides preliminary data and information about the use of shade cloths as a more permanent barrier system around high tunnels. Such tunnels are also known as low-cost 'net houses', which are sealed structures designed to exclude insect pests.

The information in this bulletin is provided, in part, through the results of Southern SARE-funded Producer Grant: FS13-978: *Insect Exclusion Using Woven Shade Cloth.*

Additional data is made possible through efforts associated with the Southern SARE Professional Development Program.

For more information, go to www.southernsare.org/Project-Reports and search the database by project number.

SARE funds projects that develop environmentally sound, economically viable and socially acceptable agricultural methods.

Bulletin written by Agnessa Majumder, Extension Entomologist and State SARE Coordinator, Alabama Cooperative Extension, Auburn University

Will Martin, Local Appetite Growers, Silverhill, AL

Published March 2015; Photo credits: Alabama Cooperative Extension

Introduction

Insect pests are one of the major problems in organic production systems. Crop damage from insect pests can occur via direct feeding or egg-laying, contamination with feces, or disease transmission; loss in yield or marketability of vegetables in the absence of Integrated Pest Management (IPM) can be nearly 100 percent. Organic IPM practice consists of a three-tiered approach consisting of systems-based practices, mechanical tactics, and biorational insecticides. Mechanical tactics encourage the use of physical barriers for pest exclusion. Some popular pest exclusion tactics include the use of floating row covers for protection against flying insects, bagging fruits, and installing metallic collars around transplants to protect them from cutworms and armyworms. In all these cases, a barrier is created between the insect pest and the host plant for short-term protection.

This bulletin provides preliminary research data and field observations about the success of shade cloths as a more permanent barrier system around high tunnels; this is a high tunnel pest exclusion (HTPE) system that has been developed by Alabama Cooperative Extension at Auburn University, and is an immediately useful technology for small producers in the southeast. Such modified high tunnels may resemble 'net houses' which are sealed structures designed to exclude insect pests.

www.southernsare.org — Pest Exclusion Using Net Houses — Page 1

https://southern.sare.org/sare-in-your-state/alabama/high-tunnel-pest-exclusion-system-htpe/

Design

- Sturdy
- Manageable

Material

- Low-cost
- Longevity

Side-effects?

MAXIMUM EFFECTIVENESS/LOW COST

eXtension

TEMPORARY PEST EXCLUSION SYSTEM

Temporary Pest Exclusion System

- Short-term solution – goal is to prevent infestation
- Fabric on fixed or movable frames
- Ease of use, minimal training needed
- Perfect for small scale agriculture, market gardens
- Make sure all sides seal well and transplants are insect free!
- Examples: Super-Lite Insect Barrier, AgroFabric Pro-19, Covertan Pro-19, Proteknet

Benefits: Rapid plant growth, wind reduction, early season pest protection,
Challenges: Hard to scout, weeds, heat trap, disease, poor fruit set if kept on too long!

Temporary Pest Exclusion System in Tomatoes
CREC, Clanton (Summer 2022)

Celebrity tomatoes
Transplanted on June 15, 2022
4 treatments (2 rows)
4 replications
Covered immediately, except untreated check plots.
Covers removed on Aug 4 (7-week cover period)
Fruit ratings done on Sept 7

Temporary Pest Exclusion System CREC, Clanton (Summer 2022)

Celebrity tomatoes
Transplanted on June 15, 2022
4 treatments, 4 replications
Covered immediately, except untreated check plots.
Covers removed on Aug 4 (7-wk)
Fruit ratings done on Sept 7

T1: Untreated check (no cover)
Average pest damage:
Caterpillar feeding = 12%
Stink/Leaffooted bug feeding = 40%
Average 10-fruit weight = 1769 g (3.9 lb)
Fruit condition = Red ripening stage
Fruit size = Consistent

T2: Super-Lite Insect Barrier (Gardens Alive)
Average pest damage:
Caterpillar feeding = 0%
Stink/Leaffooted bug feeding = 20%
Average 10-fruit weight = 993 g (2.2 lb)
Fruit condition = Green fruiting stage
Fruit size = Inconsistent

T3: Agrofabric Pro 19 (Johnny Seeds)
Average pest damage:
Caterpillar feeding = 12%
Stink/Leaffooted bug feeding = 3%
Average 10-fruit weight = 926 g (2 lb)
Fruit condition = Green fruiting stage
Fruit side = Inconsistent

T4: Proteknet (Forestry Distributing)
Average pest damage:
Caterpillar feeding = 8%
Stink/Leaffooted bug feeding = 13%
Average 10-fruit weight = 1165 g (2.6 lb)
Fruit condition = Green fruiting (80%), red fruits (20%)
Fruit size = Consistent

Pest Exclusion Demonstration Plot

Fairhope, AL (2014)

Egg plants protected by **Super-light insect barrier** reduced flea beetle, grasshopper, and armyworm damage. Also notice the **vigorous growth of plants under fabric (left)** compared to open field plants (right). Photos were taken on the same day.

Eggplants Protected by Pest Exclusion!

Pro19 Fabric by Covertan (85% light penetration)

Flea beetle feeding on open field crop

Eggplant protected by netting

Temporary Pest Exclusion on Brassica Crops

Keeps out moth pests!

Use taller hoops to lift up the fabric off the plant!

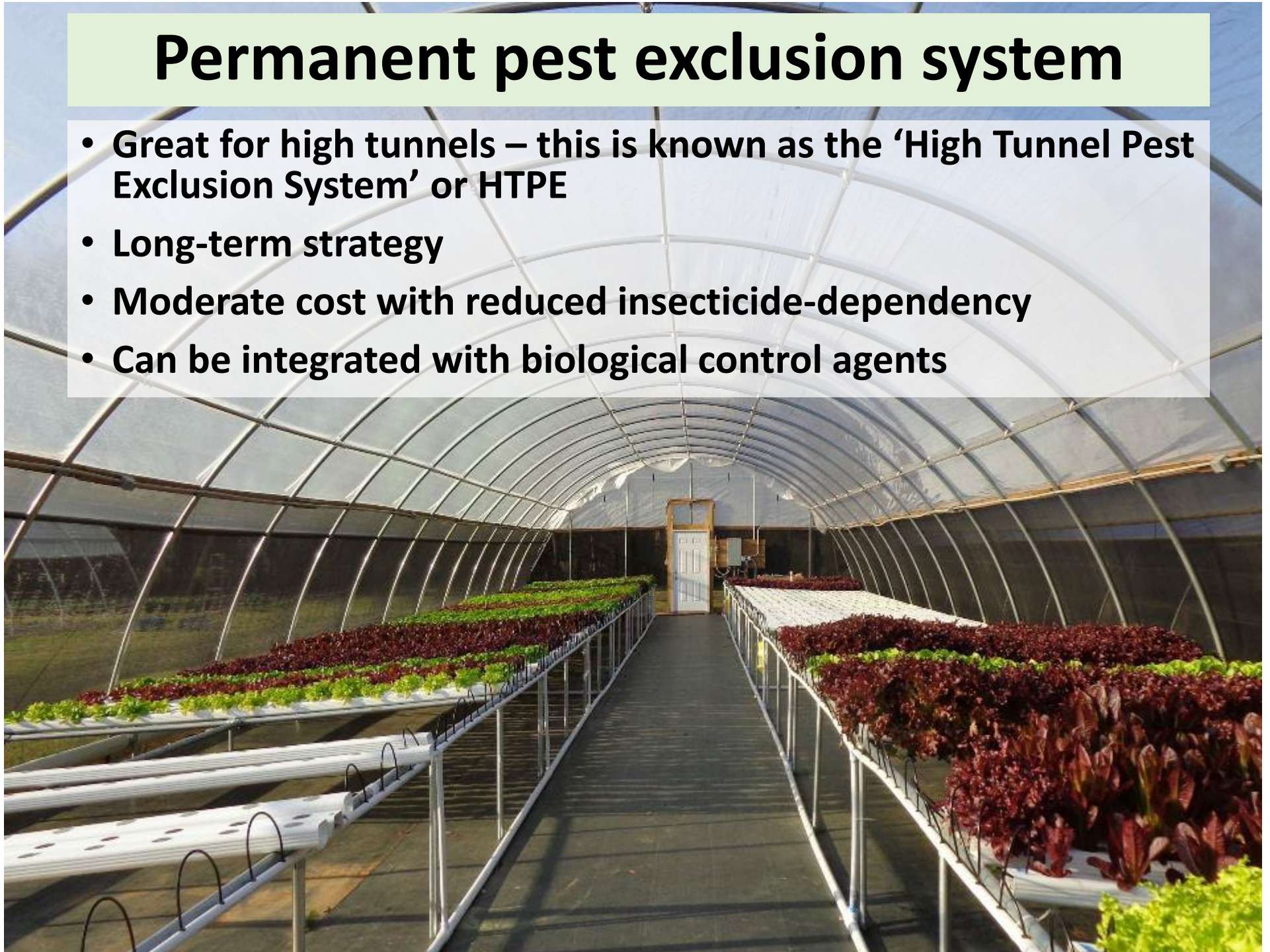
Bella Rosa tomato plants under temporary pest exclusion system (low tunnels)

Take the fabric off when plants are too big, start touching the fabric, or are flowering!
Control weeds regularly!

PERMANENT PEST EXCLUSION SYSTEM

Permanent pest exclusion system

- Great for high tunnels – this is known as the ‘High Tunnel Pest Exclusion System’ or HTPE
- Long-term strategy
- Moderate cost with reduced insecticide-dependency
- Can be integrated with biological control agents



High tunnel pest exclusion (HTPE) models: Woven shade cloth with wide openings

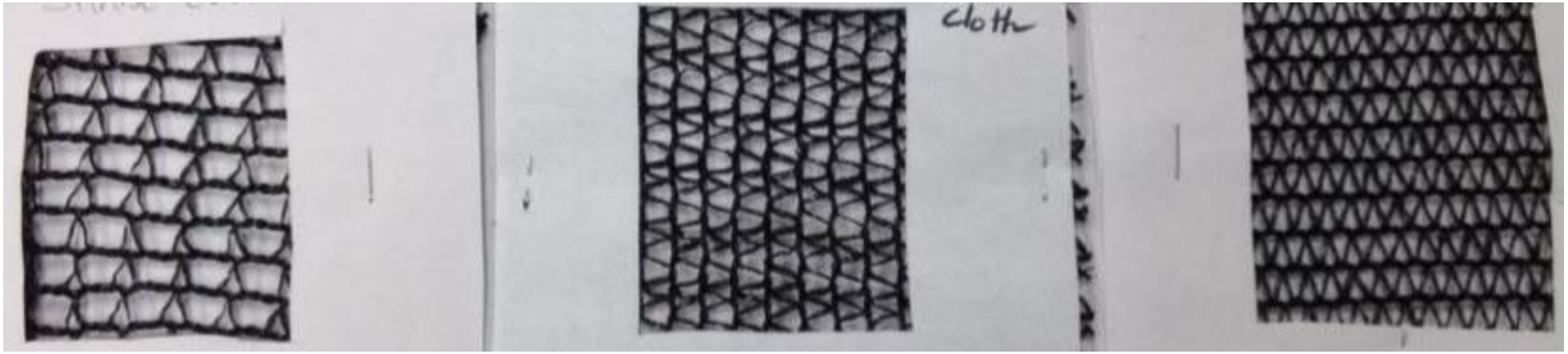
50% Green-Tek/Poly-Tex

40% Poly-Tex

30% Grainger

Super Light Insect Barrier (low-tunnels)

Woven shade cloths

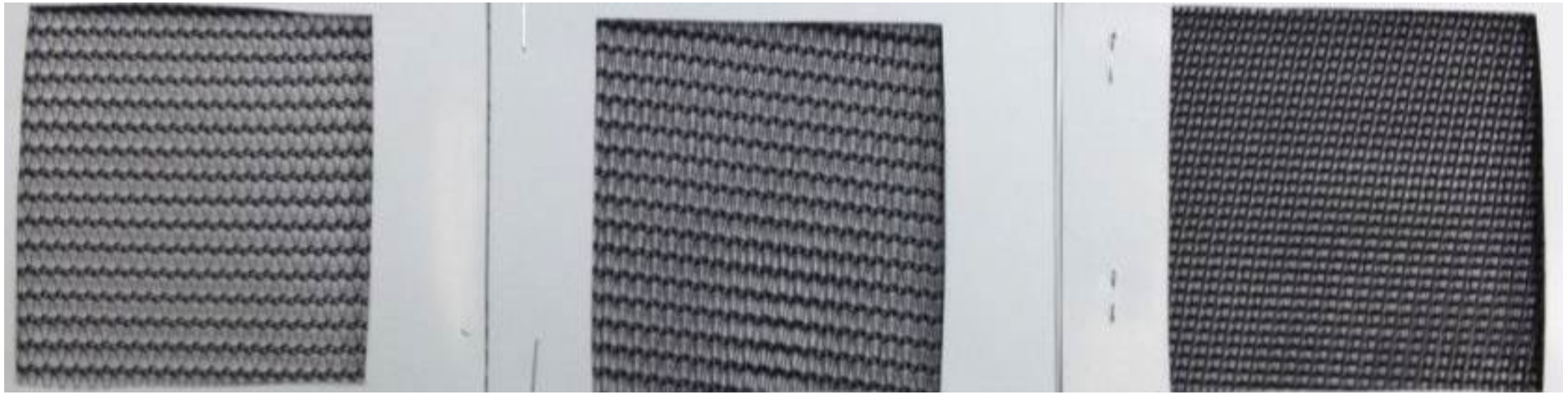


30% Grainger (IL)

40% Poly-Tex (MN)

50% Green-Tek (WI)

Monofilament shade cloths



30% FarmTek Sunblocker

40% FarmTek Sunblocker

50% FarmTek Sunblocker

High Tunnel Pest Exclusion (HTPE) System

Shade cloth is permanently installed under the side walls

Part of the end wall may be closed with shade cloth (like a curtain)

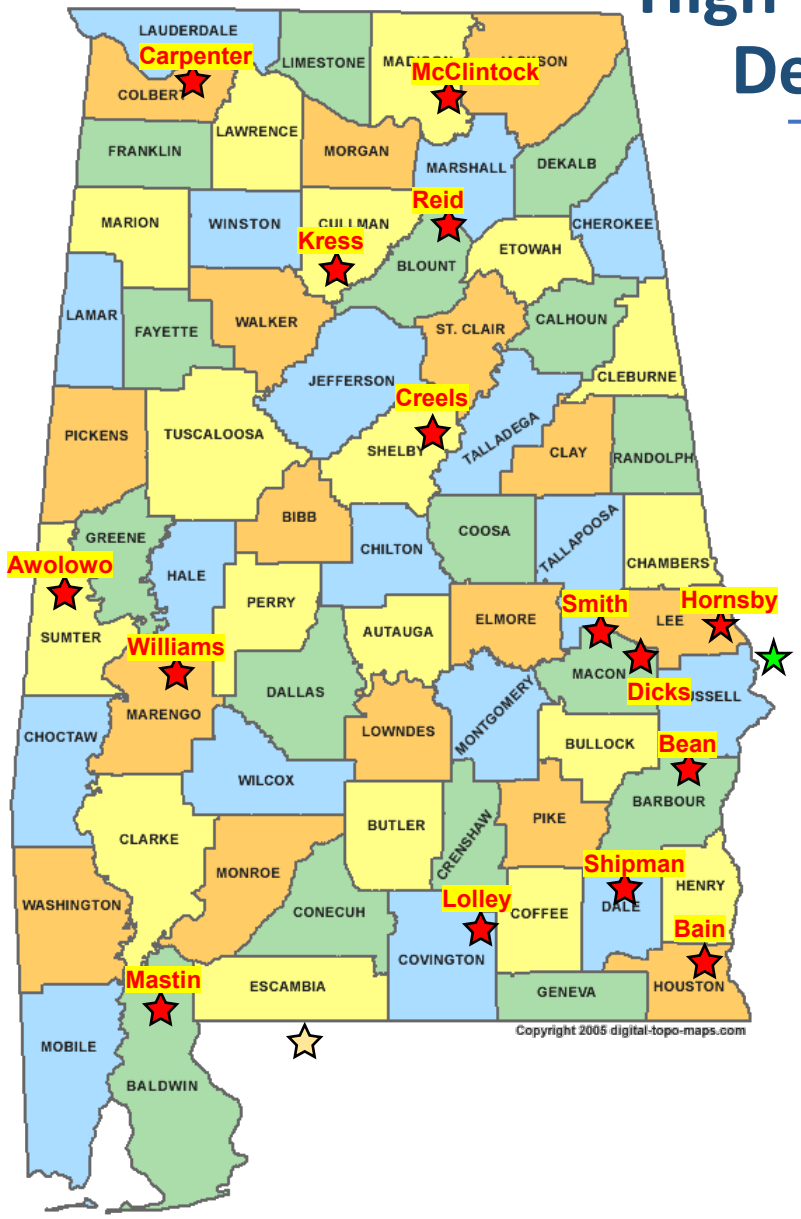
A permanent exclusion system to prevent pest establishment

Shade cloth is a low-cost option and easily available

HTPE System (50% Shade Cloth)

Hanceville, AL

High Tunnel Pest Exclusion (HTPE) System Demonstration Sites (2014-current)



Supported by USDA-NIFA BFRD, SARE Research & Education, Organic Transitions, ADAI Specialty Crops Block Grant Programs.

Will Mastin, Local Appetite Growers, Silverhill, AL (2014)

Steve Carpenter, Jack-O-Lantern Farms, Muscle Shoals, AL (2015-2019)

Russell and Jewel Bean, S&B Farms, Eufaula, AL (2016)

Joshua and Beth Hornsby, Hornsby Farms, Auburn, AL (2016)

Andrew Williams, Deep South Food Alliance, Thomaston, AL (2016)

Barbara Shipman, Cottage House Program, Ariton, AL (2017)

Marguerite McClintock, Alchemy Farms, Huntsville, AL (2017)

Sheila Dicks, Shorter, AL (2018)

Allison & Kirk Creel, Blue Rooster Farms, Sterrett, AL (2018)

Gregg Lolley, Opp, AL (2018)

Travis Kress, Wallace State Community College, Hanceville, AL (2019)

Dawn Smith, Notasulga, AL (2019)

Yawaha Awolowo, Cuba, AL (2019)

Teresa & Jimmy Reid, Hayden, AL (2020)

Sheen Bain, Dothan, AL (2021)

☆ Wendy & Thomas Aliff, McDavid, FL (2021)

★ Jenny & Chris Jackson Sun Farm, Pine Mountain, GA (2021)

HTPE Installation Techniques (Various Farms)

50 percent woven shade cloth

Grommet and nail installation system

Fabric installation using drip tape and nail or staples to secure the shade cloth

Netting installation on end-walls



Fans & vents for air movement!

Common High Tunnel Macro-Pests

Fruitworms,

Armyworms,

Loopers

Stink bugs

50% or more crop loss

Hornworms

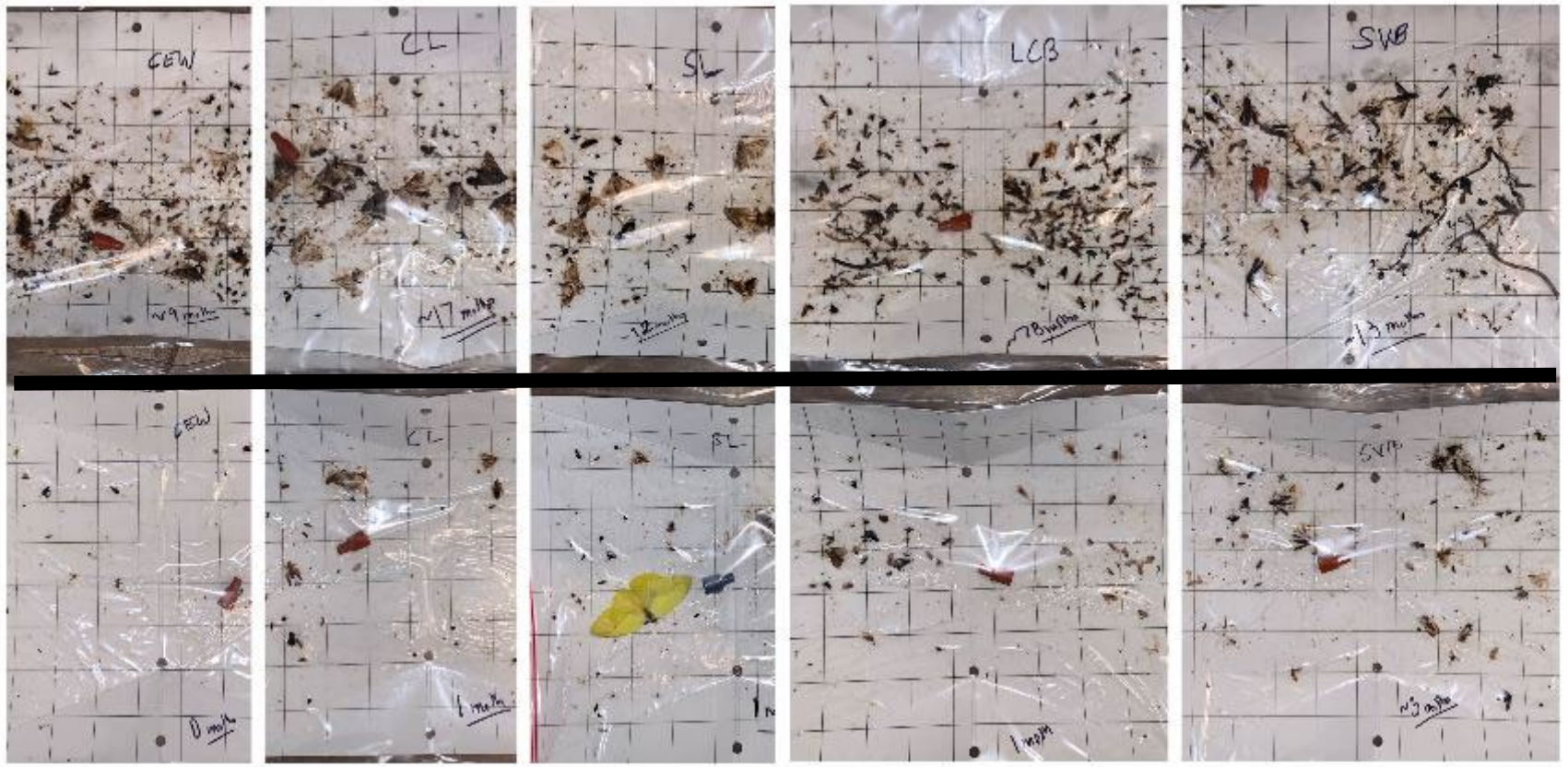
Leaffooted bugs

Favorable environment for pests: Close planting, crop diversity, heat and humidity buildup

High Tunnel Pest Exclusion (HTPE) Demonstration:

Open Field (Top Row) vs. Netted Tunnel (Bottom Row)

50 percent black shade cloth on side- & end-walls



Corn earworm (9 vs. 0 moths) | *Cabbage looper (17 vs. 1 moth)* | *Soybean looper (12 vs. 1 moth)* | *Lesser cornstalk borer (78 vs. 1 moth)* | *Squash vine borer (13 vs. 3 moths)*

Armyworms on the move!

Aug 2020

2019 HTPE Demonstration at Joy Haven Farm, Shorter, AL

50% Shade Cloth in Drought Year

High tunnel crop production field day (Oct 4, 2021, Pine Mt, GA)

Jenny Jack Farms – Crops Survey

by Dr. Robert Westerfield, UGA

- Report gathered on Nov 4, 2021
- Crops grown: Bell Peppers, Jalapeno, and Chili Peppers, garlic
- Overall, 50% improvement on crops with significant reduction in bacterial spot
- 85% reduction of insects
- $3500 in additional revenue with increase in yield and quality
- Challenges noted temperature increase, plastic cover deterioration, and air circulation. Grower interested in continuing the study with modifications.

Peer-to-Peer Learning at HTPE Field Day, Hanceville, AL (May 17, 2022)

Average Moth Reduction at HTPE Locations

(Percent reduction of moths with 50% shade cloth fabric)

	2017	2018	2019	2020	2021	Overall reduction
Weather condition>>	*Wet/rainy*	*Very wet*	*Prolonged drought*	*Flash drought*	*Wet spring, dry summer*	
No. of locations>>	*4*	*4*	*4*	*6*	*4*	*22 loc. (5 years)*
Tobacco budworm*	100	100	83	73	*79*	*87%*
Tomato fruitworm*	100	100	100	94	*97*	*98%*
Beet armyworm*	100	87	96	94	*89*	*93%*
Fall armyworm*	100	82	100	91	*94*	*93%*
Yellow-striped armyworm*	NA	NA	NA	93	*100*	*97% (2-yr. av.)*
Southern armyworm*	NA	NA	NA	95	*83*	*89% (2-yr. av.)*
Cabbage looper*	80	0	98	94	*89*	*72%*
Soybean looper*	100	93	85	89	*97*	*93%*
Squash vine borer*	100	80	90	93	*90*	*91%*
Lesser cornstalk borer*	94	83	85	96	*97*	*91%*
Tomato hornworm**	100	100	100	100	*100*	*100%*
Leaffooted bugs**	82	80	70	64	*65*	*72%*

**Based on season-long sticky wing pheromone trap counts inside/outside netted tunnels!*

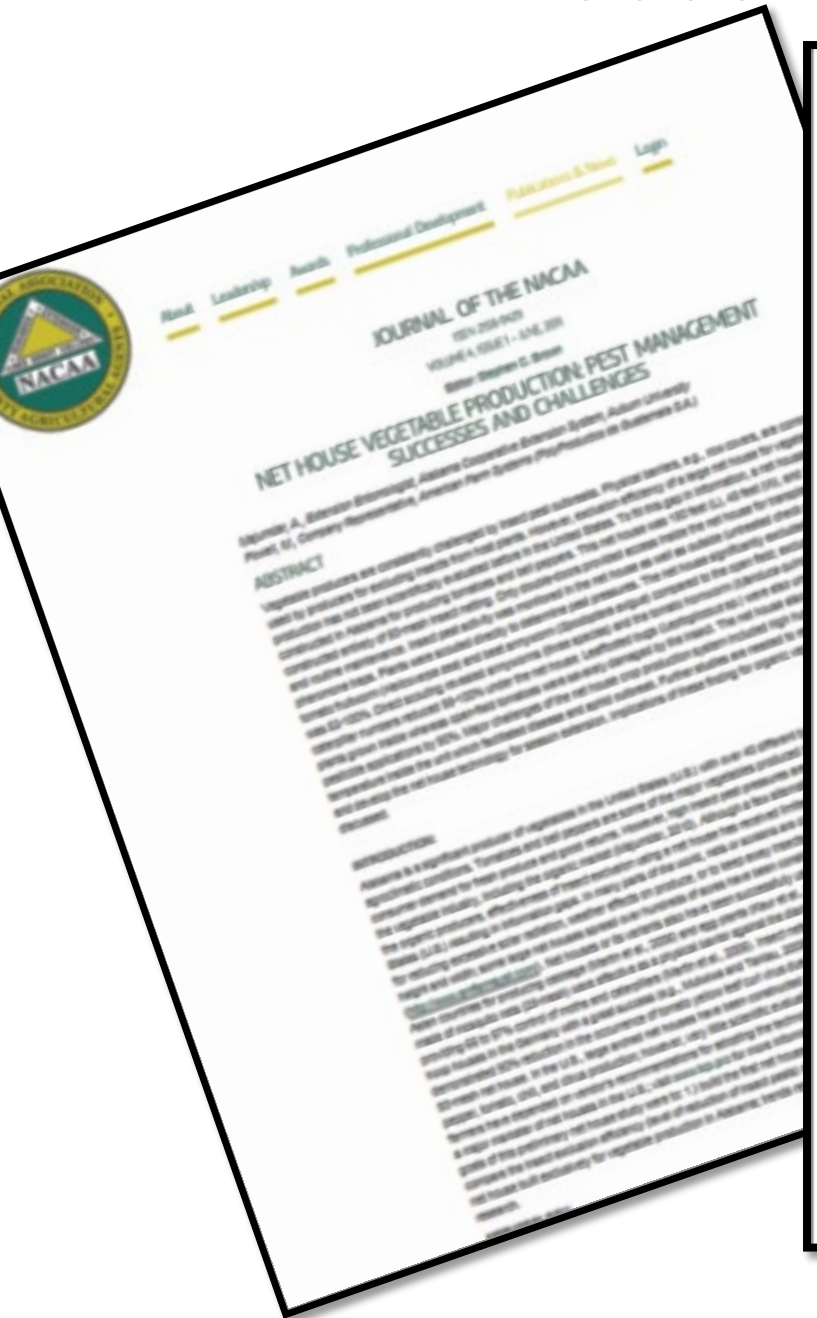
***Based on physical scouting of vegetable crops.*

Supported by funds from the USDA-NIFA BFRD, SARE Research & Education/PDP, CPPM/EIPM, OREI, and ADAI Specialty Crops Block Grant Programs.

Overall HTPE recommendations

- **50% Poly-Tex woven shade cloth works well (wide V-openings)**
- **Cost estimate: $0.27 to 0.43 per square foot**
- **Install netting before planting crops, remove weeds, sanitation!**
- **Fittings have to be tight for stink/leaffooted bug control!**
- **Reduce traffic inside tunnels – insects hitchhike!**
- **Challenges:**
  - ***Small pest insects* >> Use Super-Lite Insect Barrier**
  - ***Use beneficial insects for aphids, whiteflies***
  - ***Air movement* >> Install fans, vents, adjust planting density/trellis system**
  - ***Pollinators* >> Use bumblebee boxes**
  - ***Bioinsecticides* >> Use as needed!**

HTPE Technical Resources



JOURNAL OF THE NACAA

NET HOUSE VEGETABLE PRODUCTION: PEST MANAGEMENT SUCCESSES AND CHALLENGES

SOUTHERN SARE Sustainable Agriculture Research & Education

High Tunnel Pest Exclusion System:
A novel strategy for
organic crop production in the South

This bulletin provides preliminary data and information about the use of shade cloths as a more *permanent barrier* system around high tunnels. Such modified high tunnels are also known as low-cost 'net houses', which are sealed structures designed to exclude insect pests.

The information in this bulletin is provided, in part, through the results of Southern SARE-funded Producer Grant: FB13-075, *Insect Exclusion Using Woven Shade Cloth.*

Additional data is made possible through efforts associated with the Southern SARE Professional Development Program.

For more information, go to www.southernsare.org/Project-Reports and search the database by project number.

SARE funds projects that develop environmentally sound, economically viable and socially acceptable agricultural methods.

Bulletin written by Aparna Majumdar, Extension Entomologist and State SARE Coordinator, Alabama Cooperative Extension, Auburn University

Will Martin, Local Appetite Growers, Silverhill, AL

Published March 2015; Photo credits: Alabama Cooperative Extension

Introduction

Insect pests are one of the major problems in organic production systems. Crop damage from insect pests can occur via direct feeding or egg-laying, contamination with feces, or disease transmission; loss in yield or marketability of vegetables in the absence of Integrated Pest Management (IPM) can be nearly 100 percent. Organic IPM practice consists of a three-tiered approach consisting of systems-based practices, mechanical tactics, and biorational insecticides. Mechanical tactics encourage the use of physical barriers for pest exclusion. Some popular pest exclusion tactics include the use of floating row covers for protection against flying insects, bagging fruits, and installing metallic collars around transplants to protect them from cutworms and armyworms. In all these cases, a barrier is created between the insect pest and the host plant for *short-term* protection.

This bulletin provides preliminary research data and field observations about the success of shade cloths as a more *permanent barrier system* around the high tunnels; this is a high tunnel pest exclusion (HTPE) system that has been developed by Alabama Cooperative Extension at Auburn University, and is an immediately useful technology for small producers in the southeast. Such modified high tunnels may resemble '*net houses*' which are sealed structures designed to exclude insect pests.

SOUTHERN SARE Sustainable Agriculture Research & Education

High Tunnel Pest Exclusion System Part II:
Lessons from on-farm demonstrations

This bulletin provides data and information from on-farm demonstrations on the use of high tunnel pest exclusion (HTPE) systems. HTPE systems use shade cloths as a more permanent barrier system around high tunnels to exclude insect pests. Mention of company names and/or products doesn't mean an endorsement.

The information in this bulletin is provided through the results of the Southern SARE Professional Development Program for the Alabama Cooperative Extension Model State Plan.

Learn more about HTPE systems through the bulletin, High Tunnel Pest Exclusion System: A novel strategy for organic crop production in the South.

SARE funds projects that are economically profitable, environmentally sound, and improves the social and economic health of farm communities.

Author: Aparna Majumdar, Extension State Entomologist and SARE Coordinator, Alabama Cooperative Extension, Auburn; majudon@auburn.edu

Co-authors: James Miles, Alabama Cooperative Extension, Mobile, AL; Wade Dutton, Alabama Cooperative Extension, Thorsby, AL; Chris Becker, Alabama Cooperative Extension, Athens, AL

Farmer Cooperators: Will Martin, Local Appetite Growers, Silverhill, AL; Russell and Jewel Bean, 568 Farms, Eufaula, AL; Steve Carpenter, Jack-O-Lantern Farms, Muscle Shoals, AL; Andrew Williams, Deep South Food Alliance, Thomaston, AL; Barbara Shipman, Arden, AL; and Joshua and Beth Hornsby, Hornsby Farms, Auburn, AL

Published 2017; Photo credits, Alabama Cooperative Extension

With the increasing demand for local foods across the Southeast, an increasing number of beginning, as well as experienced producers are producing vegetable crops for direct and whole sale markets. For example, in Alabama, there are a large number of producers with single or double high tunnels who sell locally at the farmers markets and on-farm retail. There are also some new farmers that have multi-bay high tunnel crop production systems who sell a variety of crops at wholesale prices.

Fueled by the increasing consumer awareness about organic foods, high tunnel producers have shifted to alternative pest management systems. In the organic farming model, pests (insects, weeds, and pathogens) are known as the yield-limiting factors that must be managed. Uncontrolled levels of pests result in over 50 percent crop loss. High tunnels not only extend the production season for the producer, but they also extend the life cycle of insect pests that may linger on longer compared to open field (check out the pest management section of the High Tunnel Crop Production Handbook). From the insect management perspective, it is extremely critical to adopt pest prevention practices; the high tunnel pest exclusion (HTPE) system is one of the best relatively-low cost pest preventive practices. This HTPE technology uses a variety of shade cloths for a relatively permanent pest prevention strategy.

USDA

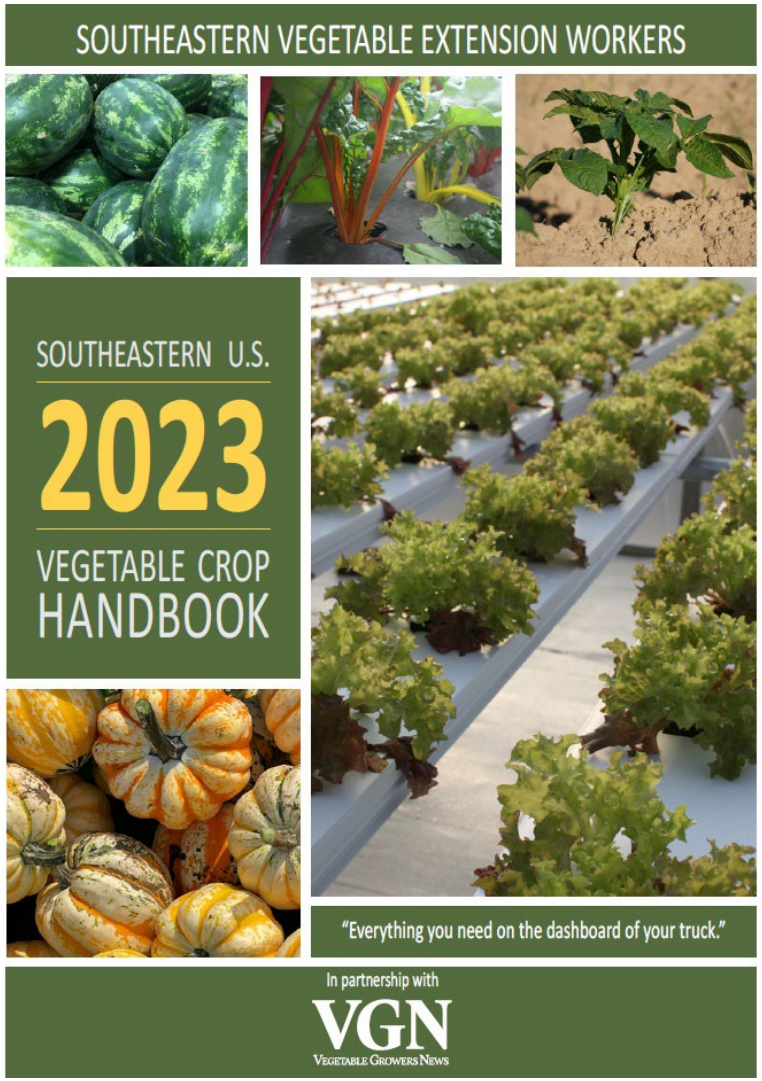
Sustainable IPM Basics

*Use the **Farming Basics** App for your IPM needs!*

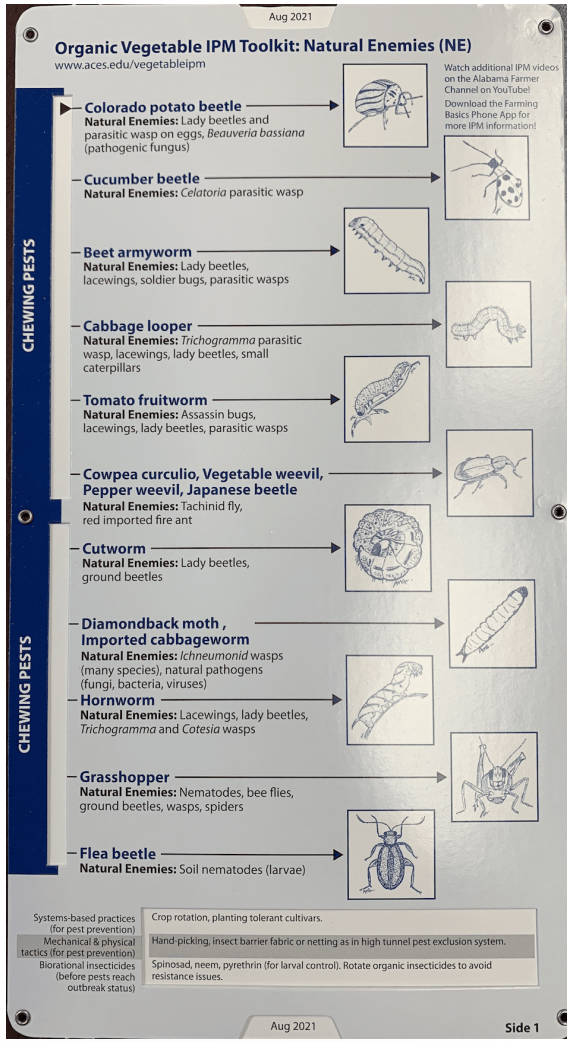
- Scout, scout, scout!
- Pest prevention is better than cure!
- Manage insect pests when they are small or in low numbers!
- Protect or augment natural enemies!
- Integrate, integrate, integrate!

Commercial Horticulture/IPM Resources

SE Vegetable Production Handbook (New!)



Organic Vegetable IPM Slide Chart (updated!)



Urban Farm/Garden IPM Toolkit

Email bugdoctor@auburn.edu for free copy of slide charts, or attend an Extension event near you!

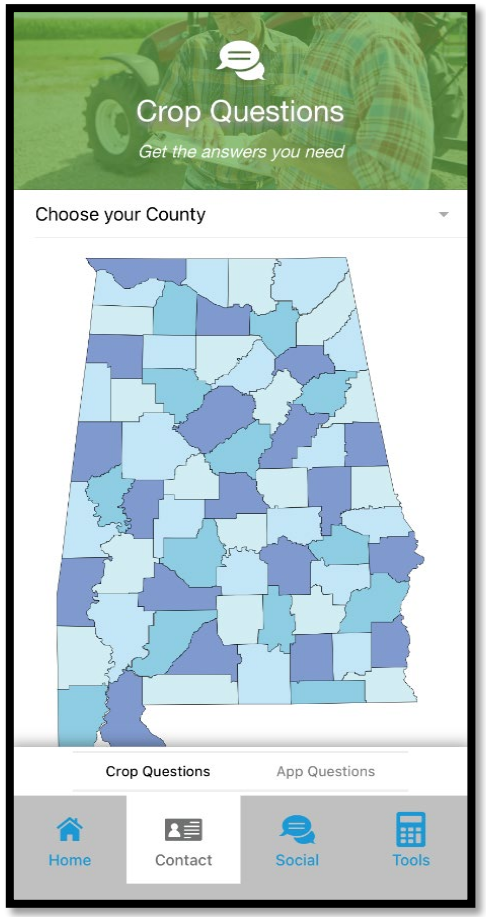
Farming Basics App

FARMING BASICS MOBILE APP!

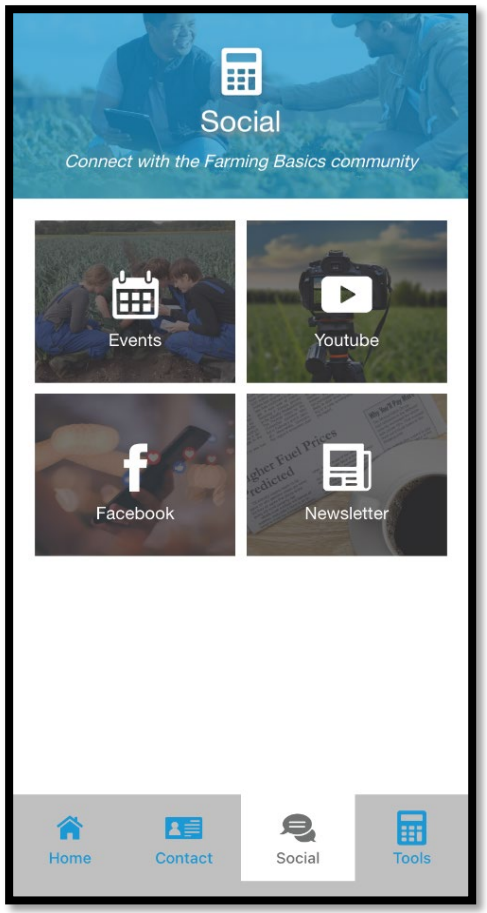
Dr. A
(251) 331-8416
bugdoctor@auburn.edu

About app
Impact survey

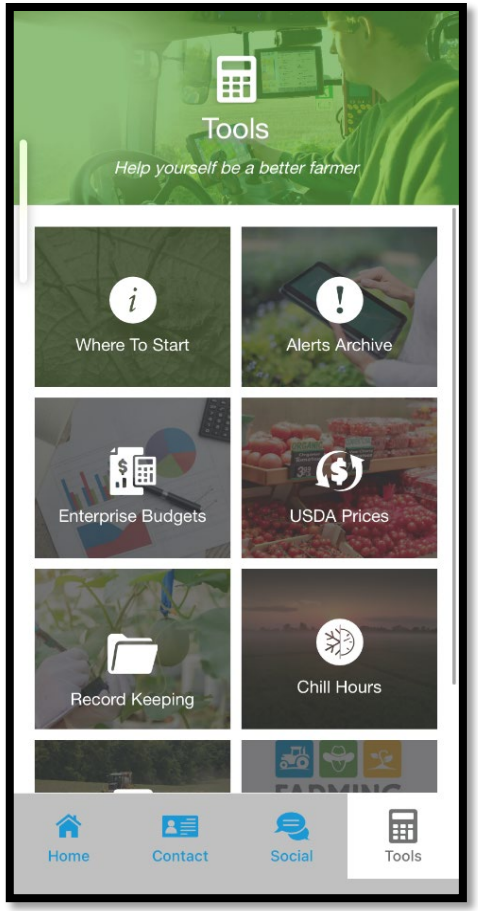
Learn about critical crops, insect pests, diseases, and weeds plus organic & conventional control methods!



Call a Regional Extension Agent for assistance by selecting your location!



Communication Tools: *Find educational events, grower videos on YouTube, Facebook, and Alabama IPM/Sustainable AG newsletter archive, Farming Basics Podcast*



Beginning Farmer Tools: *'Where to Start' Blog, Push Alerts, Record Keeping, Enterprise Budgets, Commodity Prices, Chill hours, Farming Basics Online Course, Irrigation/Fertilizer Calculators*