

Opportunities and Resources for Small Fruit and Strawberry Production

Jeff Kindhart, *University of
Illinois*

Marketing Opportunities

- Nationally in 1994 to 2010 number of farmers markets tripled from 1,755 to 6,132
- Locally in Illinois in 1997 there were 97 farmers markets that has tripled to nearly 300

THE PACKER

Retail

Fruit consumption drops slightly

By [Tom Karst](#)

Published on 12/03/2010 12:04PM

Though blueberries and avocados boasted strong gains, U.S. per capita use of fresh fruit has declined slightly in the last five years, according to the latest data from the U.S. Department of Agriculture Statistics released in November showed that per capita use of fresh fruit was 101.3 pounds in 2009, off from 102.8 pounds in 2004 but up from 97.1 pounds in 1995.....

....

One exceptionally strong recent performer in the fruit category is fresh blueberries, Perez said. The blueberry category has nearly doubled in five years, from 0.56 pounds per person in 2004 to 0.96 pounds per person in 2009

Other strong performers include strawberries, which rose from 5.5 pounds in 2004 to 7.2 pounds in 2009. Per capita numbers for pineapple rose from 4.4 pounds to 5.1 pounds in the last five years.

Fresh blueberries: Supply and disappearance

Year	U.S. population, July 1 ¹	Supply			Disappearance			
		Production ²	Imports ³	Total supply ⁴	Exports ³	Shipments to U.S. territories**	Food consumption ⁴	
							Total	Per capita availability
								Farm Factor = .92

Millions

----- Million pounds -----

-

----- Pounds -----

2005	295.994	123.5	58.1	181.6	49.8		131.8	0.4	0.4
2006	298.766	147.3	71.9	219.2	50.6		168.5	0.6	0.5
2007	301.714	150.3	77.4	227.7	50.6		177.0	0.6	0.5
2008	304.483	194.1	114.9	309.0	64.2		244.8	0.8	0.7

Fresh strawberries: Supply and disappearance¹

FILENAME: FRUITFR									
Year ²	U.S. population, July 1 ³	Supply			Disappearance				
		Production	Imports	Total supply ⁴	Exports	Shipments to U.S. territories**	Food disappearance ⁴		
							Total	Per capita availability	
								Farm	Retail <i>CF = 0.92</i>
Millions		----- Million pounds -----					----- Pounds -----		
2001	<i>285.267</i>	1,259.7	70.7	1,330.4	128.1		1,202.3	4.2	3.9
2002	<i>288.028</i>	1,406.3	89.9	1,496.2	156.9		1,339.3	4.7	4.3
2003	<i>290.704</i>	1,642.4	90.3	1,732.7	194.8		1,537.9	5.3	4.9
2004	<i>293.310</i>	1,694.4	94.4	1,788.8	182.6		1,606.3	5.5	5.0
2005	<i>295.994</i>	1,811.0	122.7	1,933.7	207.6		1,726.1	5.8	5.4
2006	<i>298.766</i>	1,910.9	153.4	2,064.3	229.1		1,835.2	6.1	5.7
2007	<i>301.714</i>	1,973.3	157.7	2,131.0	240.3		1,890.7	6.3	5.8
2008	<i>304.483</i>	2,091.1	143.0	2,234.1	269.2		1,964.9	6.5	5.9

Here's the list of the top 20 food sources of antioxidants, based on their total antioxidant capacity per serving size:

<i>Rank</i>	<i>Food item</i>	<i>Serving size</i>	<i>Total antioxidant capacity per serving size</i>
1	Small Red Bean (dried)	Half cup	13727
2	Wild blueberry	1 cup	13427
3	Red kidney bean (dried)	Half cup	13259
4	Pinto bean	Half cup	11864
5	Blueberry (cultivated)	1 cup	9019
6	Cranberry	1 cup (whole)	8983
7	Artichoke (cooked)	1 cup (hearts)	7904
8	Blackberry	1 cup	7701
9	Dried Prune	Half cup	7291
10	Raspberry	1 cup	6058
11	Strawberry	1 cup	5938
12	Red Delicious apple	One	5900
13	Granny Smith apple	One	5381
14	Pecan	1 ounce	5095
15	Sweet cherry	1 cup	4873
16	Black plum	One	4844
17	Russet potato (cooked)	One	4649
18	Black bean (dried)	Half cup	4181
19	Plum	One	4118
20	Gala apple	One	3903

Researchers also found that cooking method also had a significant effect on the antioxidant content of the foods tested, but

Brambles

Plant Morphology

Growth Habit

- ◆ Perennial roots
- ◆ Biennial shoots:
 - primocane (first year)
 - floricane (second year)

Phenology

Plant Life Cycle

◆ First year

- Canes grow but do not produce fruit*
- Called primocanes

◆ Second year

- Canes produced last year bear fruit and die
- Called floricanes (fruiting canes)

* Primocane fruiting brambles are the exception

Biennial Life Cycle of Canes

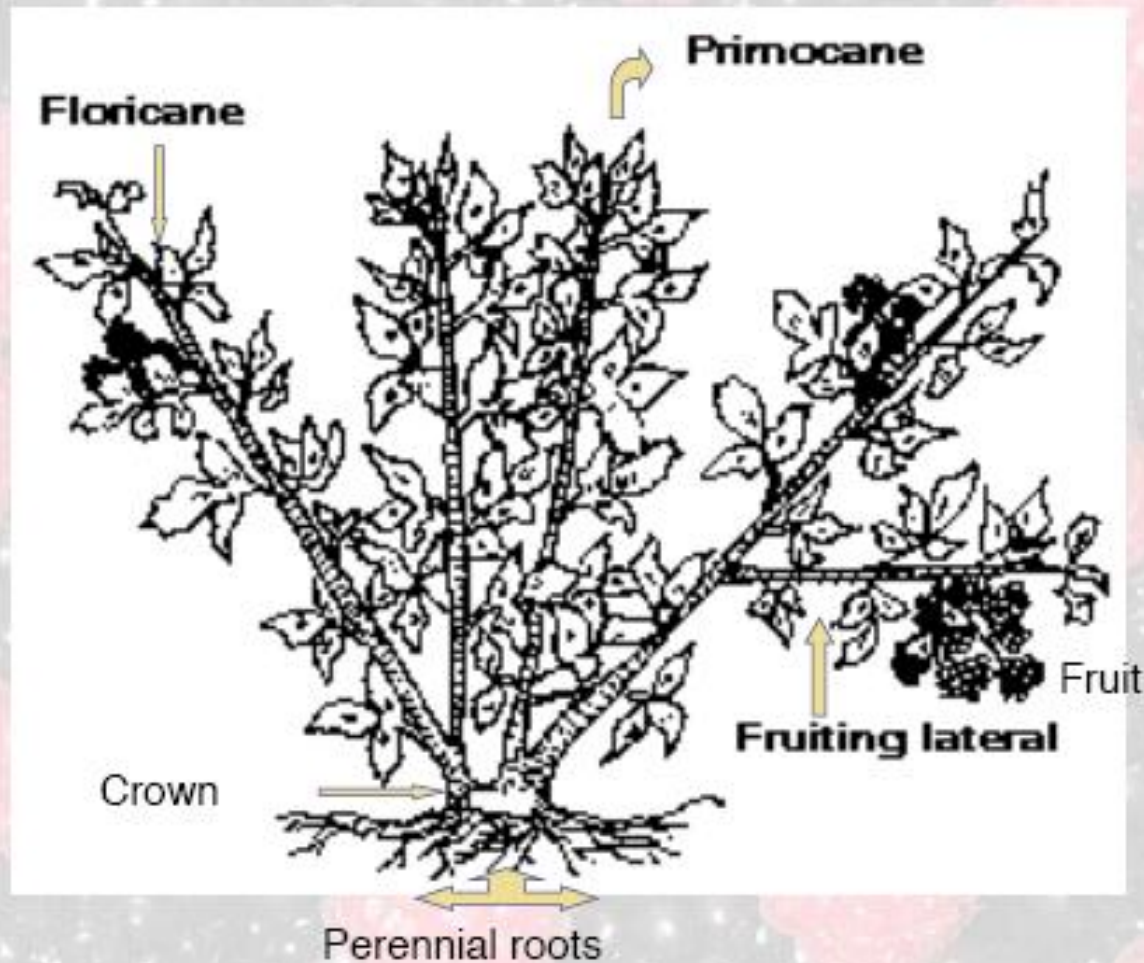
- **Primocane Year**

- Cane grows throughout summer
- Fruit bud initiation occurs in late summer to early fall

- **Florican Year**

- Fruit bud initiation is completed
- Bloom
- Fruiting
- Cane death

Plant growth - plant parts



Primocane Fruiting

Raspberries and Blackberries

◆ First year

- Canes grow and produce fruit on tips of cane in late summer to fall of first year
- Usually pruned in winter to ground

◆ Second year

- If canes are not pruned in winter, fruiting will commence in spring from mid section down
- 10% of total yield

Climatic requirements

◆ Raspberries

- Cool temperate summers, sustained winter temperatures, winter injury -20°F

◆ Blackberries

- Warm temperate summers, tolerates fluctuating winter temperatures, winter injury at 0°F

Summer Temperatures

◆ Raspberries

- 70°F optimum

◆ Blackberries

- ~80°F optimum

◆ Heat, bright sun and low humidity

- ◆ Reduce fruit size and yield
- ◆ Sunscald fruit

Growth Habit of Brambles

- **Thorned** – Black Butte, Chickasaw, Choctaw, Illini Hardy, Kiowa, Shawnee
- **Thornless** – Apache, Arapahoe, Black Satin, Chester, Hull, Navaho, Ouachita, Triple Crown
- **Erect** – Apache, Chickasaw, Kiowa, Navaho, Ouachita, Shawnee
- **Semi-trailing** – Chester, Hull, Triple Crown

Erect, Thorny Blackberries

- Arching, spiny canes
- Winter hardy
- Large, flavorful fruit
- Suggested varieties
 - Cherokee
 - Illini Hardy
 - Shawnee
 - Kiowa

Everbearing Blackberry

- Two crops
- Varieties so far are thorny
- Recommended for home owners and limited trial for commercial growers
- Varieties
 - Prime-Jan
- larger fruit
- Prime-Jim
- higher overall yield
- Limited availability

Semi-erect thornless Blackberries

- Smooth canes
- Erect to trailing habit
- Large fruited
- Productive late
- Less hardy
- Suggested varieties
 - Dirksen
 - Chester
 - Triple Crown
 - Navaho
 - Arapaho

Black Raspberries (Black Caps)

- Suggested varieties
 - Bristol
 - Allen
 - Jewel
 - Haut

Red Raspberries

- Suggested varieties
 - Boyne
 - Titan
 - Heritage (everbearing)
 - Southland (everbearing)
 - Ruby (everbearing)

Purple Raspberries

- Suggested varieties
 - Brandywine
 - Royalty

Yellow Raspberries

- Suggested varieties
 - Goldie (everbearing)
 - Fall Gold (everbearing)

Site Selection



Soil - Desirable Ranges for Bramble Production

pH	5.8 to 6.2
Organic Matter	2 to 4%
Phosphorus	40 to 50
Potassium	280 to 320
Magnesium	200 to 250
Boron	1.5 to 2.0
Zinc	8 to 10

Spacing and Planting

- Red and yellow raspberries and erect blackberries spread by root suckers and naturally form a hedgerow
 - Black and purple raspberries seldom spread by root suckers
- Spacing recommendations
 - Hill or Linear system (black and purple raspberries and blackberries)
 - Plants 2 to 4' apart, rows 7 to 12' apart
 - Thornless blackberries spaced 8' apart with rows 10 to 12' apart
 - Hedgerow system (red raspberries)
 - Plant 2.5 to 3' apart, rows 8 to 12' apart

Summer Bearing vs. Everbearing Raspberries

- Summer bearing:
 - one crop of berries on 2 year old canes in early to midsummer
- Everbearing:
 - 2 crops of fruit on each cane
 - 1st crop at tips of cane in fall of 1st year
- Largest crop
 - 2nd crop on rest of cane following summer

Why Prune?

- Lessen Pest Problems:
 - cane removal
 - Increase light, air, spray penetration throughout canopy
- Increase yields and quality of fruit
- Ease of management

Pruning – Reds & Yellows

- Summer bearing (single crop):
 - Spring – thin out weak canes
 - Do not summer top new shoots
 - After harvest – remove old fruiting canes
- Everbearing:
 - Spring – remove weak canes & tips that bore fruit last fall
 - Summer – remove canes that bore summer crop
 - Alternative for fall crop (everbearing types) only: Mow all canes during winter

Pruning Red & Yellow Raspberries



Annual Pruning Sequence – Floricane-Bearing Varieties (established plantings)

- Floricane removal after harvest
- Tip floricane
- Head laterals
- Thin canes
- Narrow rows
- Remove laterals on lower 12 – 18” of canes

Primicane suppression?

Pruning Floricane-fruiting Brambles

Tip Primocanes
Remove Floricanes



Summer



Lateral Branching



Winter



Floricanes bloom,
Fruit & die



Head Laterals.
Remove laterals
on lower 12 -
18" of canes.
Remove excess
canes.

Florican Removal

- **When:**

- After harvest – disease
- Winter – support

- **Why:**

- Lessen carryover of pest problems
- Increase light in canopy
- Ease of management

Tipping Primocanes

- **Why:**

- Stops cane elongation
- Stiffens cane (maintains erect growth habit)
- Induces lateral branching (increases yields)

- **When:**

- After primocanes exceeds desired height by 4 in. for blackberry, 2 ½ to 3 in. for raspberry
- (requires multiple passes through planting)

Pruning Primocane Bearers

- **Fall Crop Only:**
 - During late winter/early spring – mow planting
- Lessens disease carryover
- Increases size of fall crop
- **Primocane & Floricane Crop:**
 - (optional: remove dead tips after fall harvest)
 - remove entire cane after floricane crop

Advantages of a Single-Cropping System

- Cane thinning, detailed pruning & tying are eliminated
- Cold injury to buds is eliminated
- Winter damage from voles & rabbits is eliminated
- Spur blight, anthracnose, cane blight & several other diseases are reduced
- Sap beetle problems are reduced, many other insect problems are eliminated
- Application of fertilizers & pesticides is easier

Pruning – Black & Purple Raspberries, and Erect Blackberries

- Summer – top or pinch new growth back 3 to 4 inches
 - Without support
 - Black raspberries at 24 ”
 - Purple raspberries and erect blackberries at 30 to 36”
 - With support
 - Can grow 6 to 8” more before pinching
- Spring – shorten laterals
 - Black raspberries 8 to 10”
 - Purple raspberries and erect blackberries 12 to 18”
- Fall – remove canes that fruited

Pruning Trailing Blackberries (Thornless)

- Spring
 - Select the best 8 to 16 canes
 - Tie to support
- Cut back to 4 to 6 feet (height of stake)
- Remove fruit canes after harvest

Blackberries



08/07/2007

<u>Variety</u>	<u>Total Primocane Yields</u>
	(lbs/Acre)
Prime Jan	6379.3
APF 27	4500.9
APF 40	4274.0
APF 46	2976.4
APF 41	2214.2
Prime Jim	2141.6

2008 Total Harvest Yields		2009 Total Harvest Yields	
<u>Variety</u>	<u>(lbs/Acre)</u>	<u>Variety</u>	<u>(lbs/Acre)</u>
Natchez	12160.6	Natchez	13122.5
Prime Jan	14683.4	Prime Jan	12142.5
A 2215	12523.6	A 2215	11290.4
APF 41	14883.1	APF 41	7964.6
Prime Jim	12414.7	Prime Jim	7933.8
A 1937	15155.4	A 1937	7898.4
A 2315	10672.3	A 2315	7477.3
APF 40	5916.9	APF 40	7429.2
APF 27	7804.5	APF 27	6763.2
APF 46	5299.6	APF 46	4757.7







Blueberry Production

J. D. Kindhart





10/27/2004



10/27/2004



10/27/2004



Blueberry Basics Requirements

- Acidic soils (pH 4.8 –5.2)
- Good air drainage
- Good soil drainage
 - Surface
 - Internal
- Mulch
- Irrigation



Site Selection

- Soil pH of 4.8 – 5.2
- Good air drainage
- Good moisture drainage
- Access to water for irrigation
- Access and parking if U-Pick
- Cropping history



Drainage

- Blueberries are not tolerant of wet feet
 - Slope
 - Ridges



Pre-Plant Consideration

- Preparation for blueberries should begin at least one full year prior to planting
- Soil test and make amendments
- Control perennial weeds
- Tile drainage
- Dig pond or well



Cultivars

Varieties suggested for particular areas of Illinois
listed in order of ripening

Crop	Southern	Central	Northern
Blueberries	Collins Patriot Bluegold Bluecrop Bluejay Blueray Jersey Nelson Berkeley Herbert Coville Lateblue	Collins Patriot Bluegold Bluecrop Bluejay Blueray Jersey Nelson Berkeley Herbert Coville Lateblue Elliott	Collins Patriot Bluegold Bluecrop Bluejay Blueray Jersey Nelson Berkeley Herbert Coville Lateblue Elliott

Field Layout

- Alternate blocks of 2–4 rows to receive benefits of cross pollination
- Ideally run rows north and south
- Do not create series of dams with raised beds
- Allow drive alleys about every 200'
- Arrange field so that ripening proceeds in a orderly fashion

Plant Spacing

- In row spacing is normally 4' – 6'
- Between row spacing is 10' – 14'
 - Allow enough room for equipment
 - What seems like very wide spacing at planting time can grow to be too narrow in time





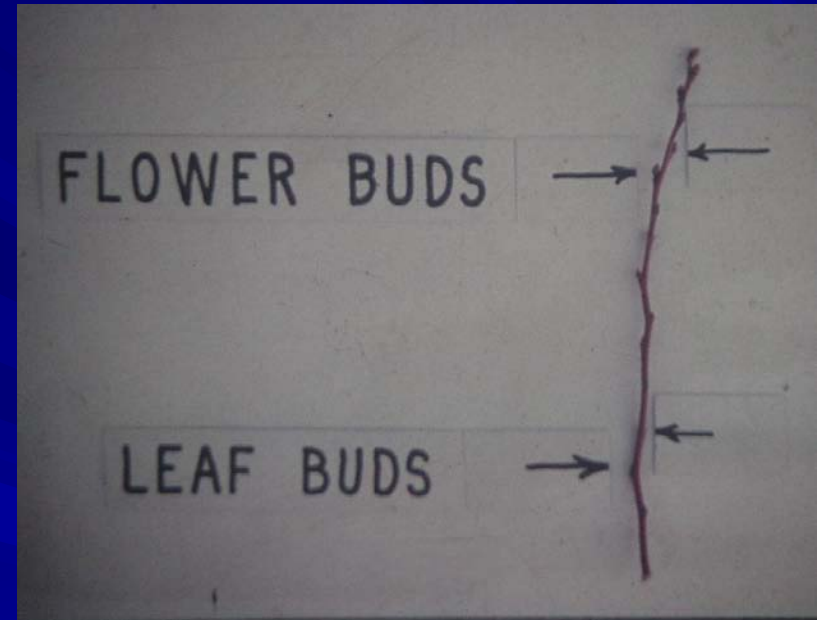
Ridging



- If drainage is a concern ridges may be formed to plant on
- Ridges while reducing losses from wet feet tend to make plants more likely to have drought stress so irrigation is increasingly important in ridged plantings

Culture After Planting

- Water plants in
- Prune plants back
....especially important on bare root planting stock
- Remove flower buds (can be rubbed off)
- Apply fertilizer after plants become established(2 oz. ammonium sulfate)
- Control weeds, apply mulch and irrigate as required



Mulching

- Mulch should be applied shortly after planting
- Mulch is beneficial in Illinois throughout the life of the planting
- Various material can be satisfactorily used although sawdust or sawdust combined with wood chips performs best

Establishment Culture and Beyond

- Fertilize with 2 oz ammonium sulfate year 2 and 4 oz year 3 and 4.
- Plantings over 4 years in age receive 8 oz of ammonium sulfate per year
- Control weeds, apply mulch and irrigate as needed

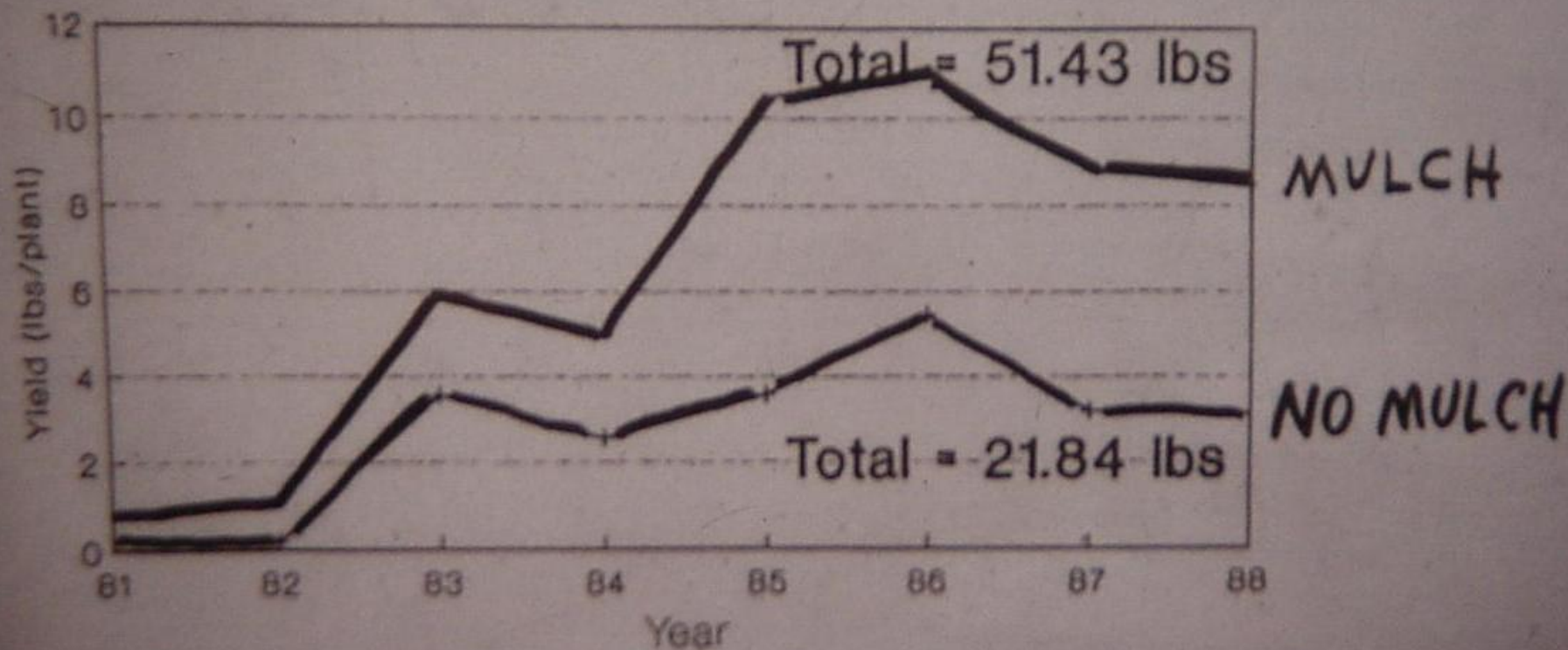




Benefits of Mulch

- Help conserve soil moisture
- Increase organic matter
- Moderate soil temperatures
- Weed control ????

BLUEBERRY YIELDS, URBANA



Mulching Materials

- A well weathered sawdust mulch is often cited as best
- Sawdust
- Sawdust + wood chips
- Corn stalks

The Effect of Various Mulches on Blueberry Yields (Urbana, IL)

<u>Treatment</u>	<u>8 Year Total Yield</u>
Sawdust	58.84
Leaves	56.50
Cornstalks	53.00
Wood Chips	44.64
Wheat Straw	44.16
No Mulch	21.85
No Trickle No Mulch	12.86

Irrigation

- Blueberries are shallow rooted and easily subjected to drought stress
- Typically drought stress comes during flower bud initiation in August and results in substantially reduced yields the following season

Pest Control

- Blueberries are relatively free of insect and disease problems if they are planted onto a suitable site and properly maintained
- Bird depredation can represent a substantial loss in some areas. Losses can be as high as 70% or more in small young plantings

Pest Control

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Bird Control





*Extends Protected Area
in All Directions*



The ROTOMAT is a chain driven revolving platform that rotates in a complete circle. Mount any equipment on the ROTOMAT and extend

...the ... need for
... use. Carrier is approx-
... 4' by 2' and attaches to
... with straps and hooks.
... adjust up, down and
... around for maximum effect.



The Scare-Away System

...
...
...
...

... ..



... all electronic components are enclosed in a weather-
... sound container. Unit consists of built-in cassette tape player
... and electronic sound generator. An auxiliary input allows
... sounds, other than bird cries, to be amplified through the



Our NEW . . .

ELECTRONIC SCARE-AWAY

*Frightens birds away with their own
alarm and distress calls*

What better way to frighten birds and pests than to use their own cries of alarm and distress? Actual frightened bird cries have been carefully recorded on high fidelity sound tapes by William C. Hinman, PhD, PE. These sounds are amplified through 4 speakers mounted on the roof of a vehicle.

The ELECTRONIC SCARE-AWAY is a mobile means of dispersing birds. The 4 speakers broadcast the bird cries in all directions as the vehicle travels through the protected area.

There is no operating or maintenance cost for the ELECTRONIC SCARE-AWAY so when equipment costs are prorated over several years this means of dispersing pests is very economical.

1-800-647-5554

Read Leaflet

Scare Devices











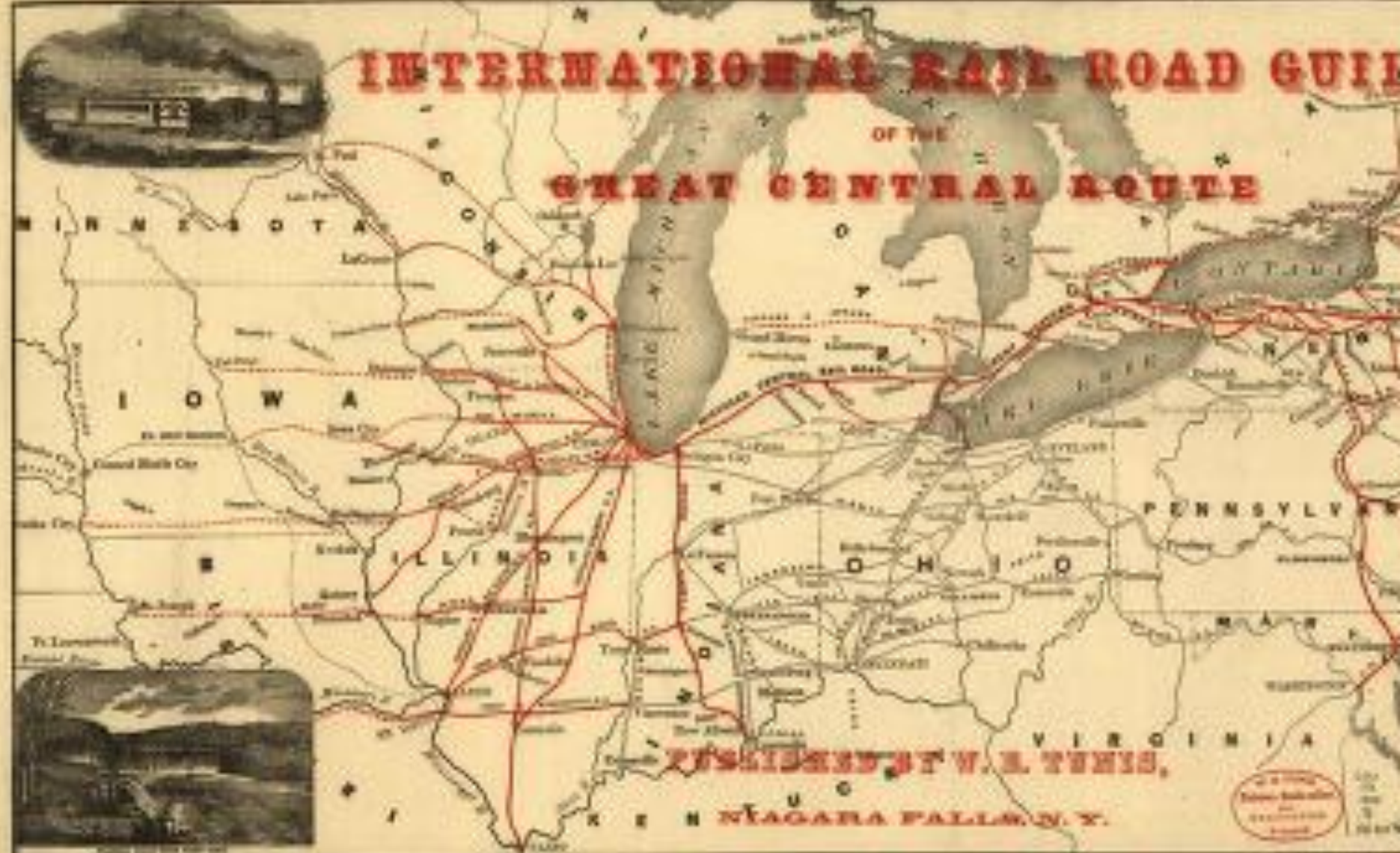
Strawberry Production Matted Row vs. Plasticulture



Department of Natural Resources
and Environmental Sciences

UNIVERSITY OF ILLINOIS AT URBANA-CHAMPAIGN

INTERNATIONAL RAIL ROAD GUIDE OF THE GREAT CENTRAL ROUTE





The first ice-cooled car designed to prevent shipments from spoiling in transit was introduced by a meat-packing firm in Chicago in 1857. The first shipments of fruits under refrigeration were from southern Illinois to Chicago in 1866.

To Parker Earle, an enterprising fruit grower of Cobden, Ill., goes the credit for pioneering in this development. After several unsuccessful efforts to ship strawberries to Chicago without their spoiling on the way, Mr. Earle hit upon an idea.

During the winter of 1865-66 he harvested a large quantity of ice, which he packed in sawdust in his barn so it would keep well into the summer. Then he built several large wooden chests with double linings. Each chest was fitted with two compartments.

When the berry-picking season arrived Mr. Earle packed one compartment of each chest with ice and the other compartment with strawberries. Then he shipped them by railroad to Chicago.

The strawberries arrived in the Chicago market in perfect condition - several days before local berries ripened - and Chicago housewives and hotels eagerly bought them for as high as \$1 a quart! Parker Earle reaped a handsome profit from his crop.









Why plasticulture?

- Earlier and longer harvest season
- Cheaper harvest cost
- Very high quality and consumer acceptance
- Get away from black root rot problems

Why Plasticulture



RESULTS MAY EXCEED GROWTH PROJECTIONS.

CAMEROSA



Chandler



CAMEROSA



ALLSTAR



HONEOYE

Matted Row

Plasticulture

- Plant Spring

- Straw

- 14 months until return on investment

- \$2,200 plus fumigation

- 8,000 – 10,000 #/A

- 3 – 4 year harvest ???

- Plant Fall

- Spun bound rowcover

- 9 months until return on investment

- \$4,500 plus fumigation

- 10,000 – 20,000 #/A

- 1 year harvest

Matted Row

■ Plants 5.5 @ 150	825
■ Fertilizer	400
■ Straw 125 @ 2	250
■ Hoeing	???
■ Total	1,475

Plasticulture

■ Plants 15,000 @ .20	3,000
■ T-tape 1 roll	150
■ Plastic Mulch 3 rolls	300
■ Fertilizer	400
■ Row cover (1/3 of 2100)	700
■ Total	4,550

Equipment

■ Matted Row

- Tractor
- Disk
- Harrow
- Transplanter
- Cultivator
- 14 hoes
- Friday spreader etc.
- Rotovator

■ Plasticulture

- Tractor (bigger)
- Disk
- Field cultivator
- Tractor Rotary Tiller
- Bed Shaper/Mulch Layer
- Transplanter
- Plastic Lifter

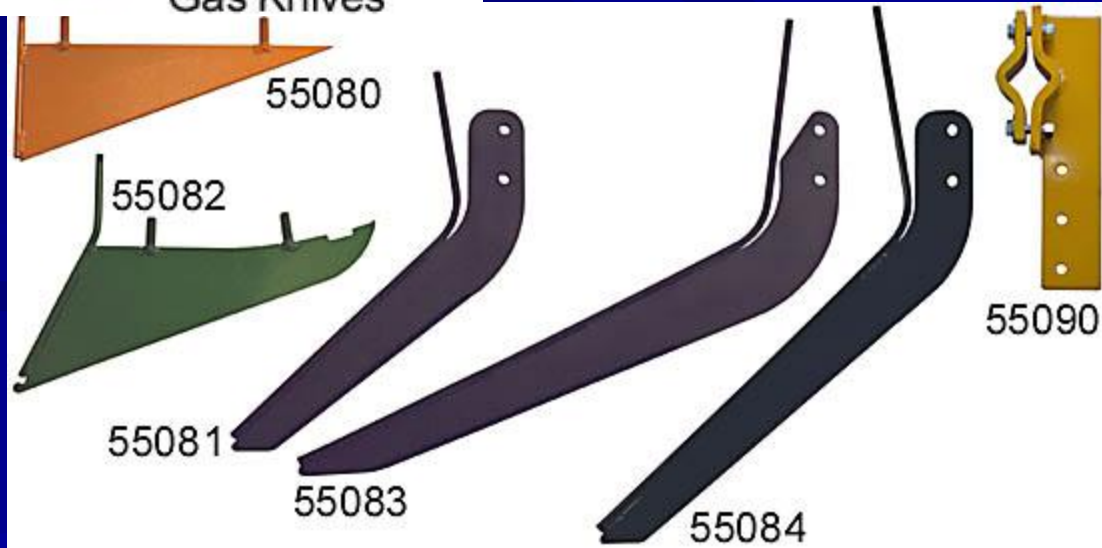






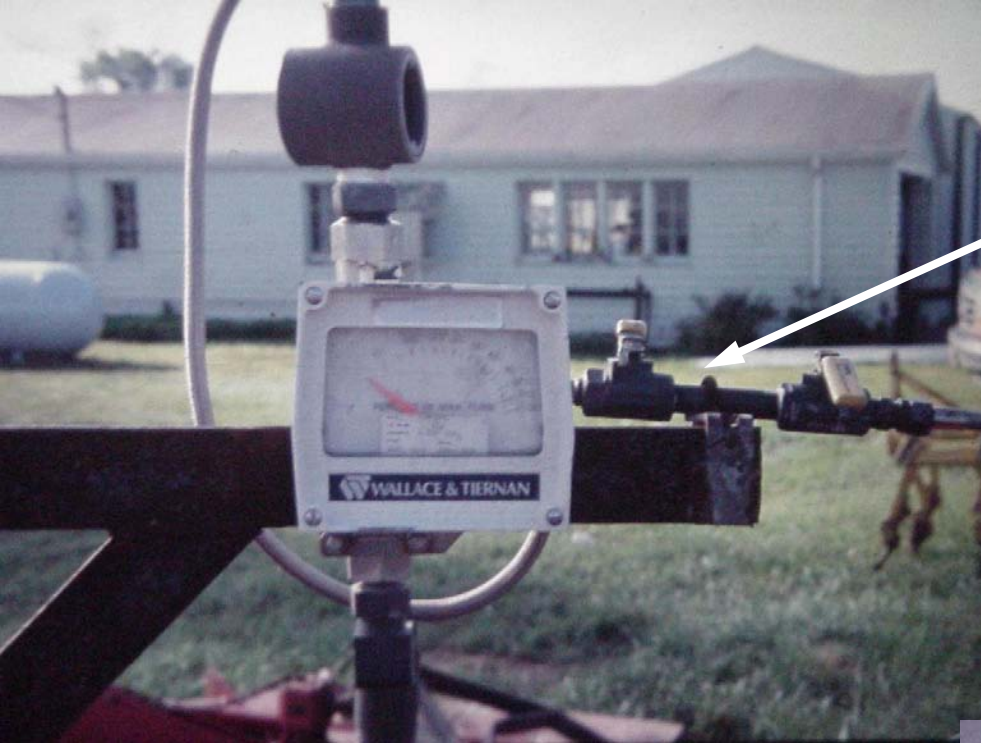


Press Pan
Gas Knives





Flow Control Meter and Valves



Nitrogen Tank and Regulator



Methyl Bromide Tank











Increases
efficacy of
fumigant

Improves soil
moisture

Extends growing
season in spring
and fall

Affords some
weed control



















































Frost Protection



Frost Protection















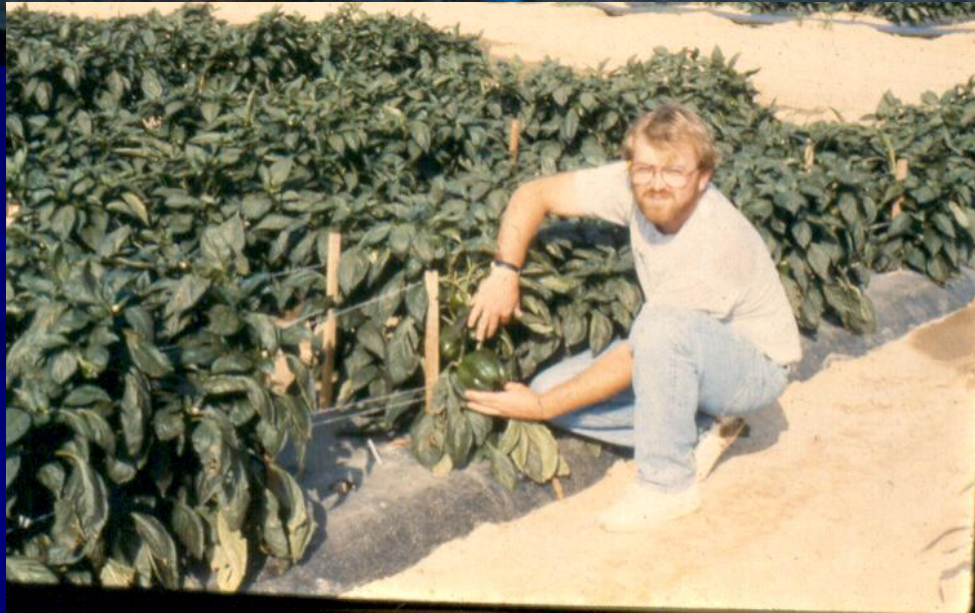




Second Crop











16/12/2010

**MIGHTY
TUFF**
32 GALLON
TRASH CAN
RESISTANT TO 45 GALONES
POURVILLE DE 32 GALLONS

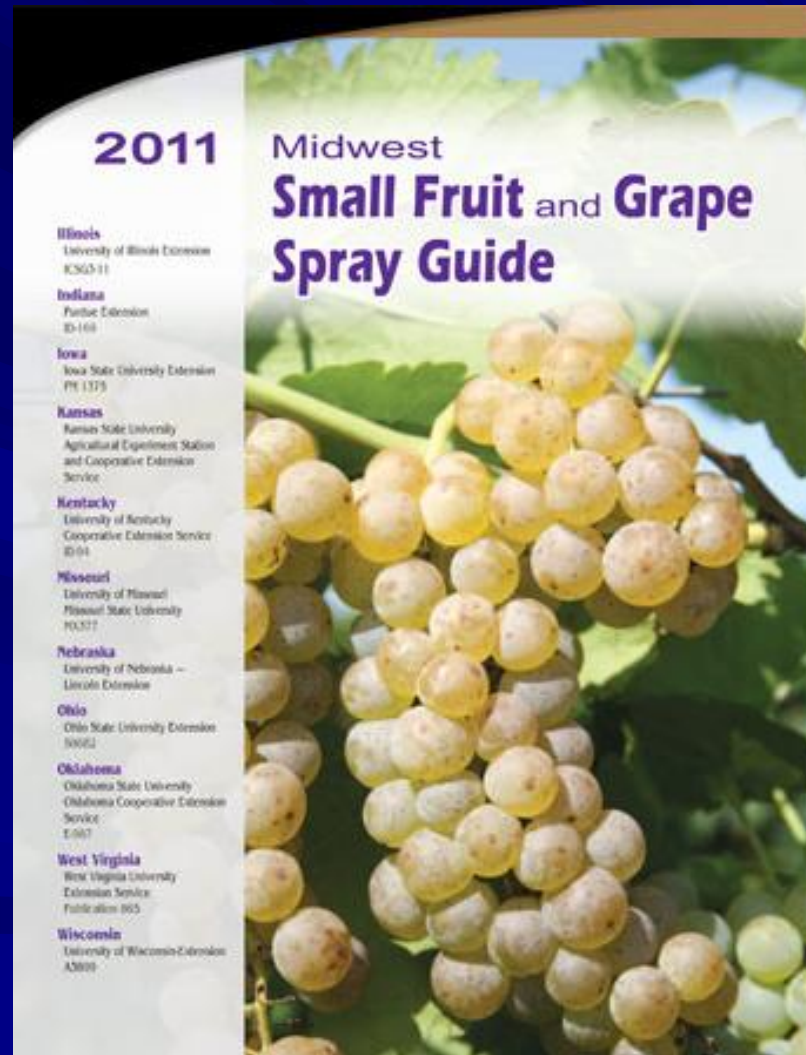


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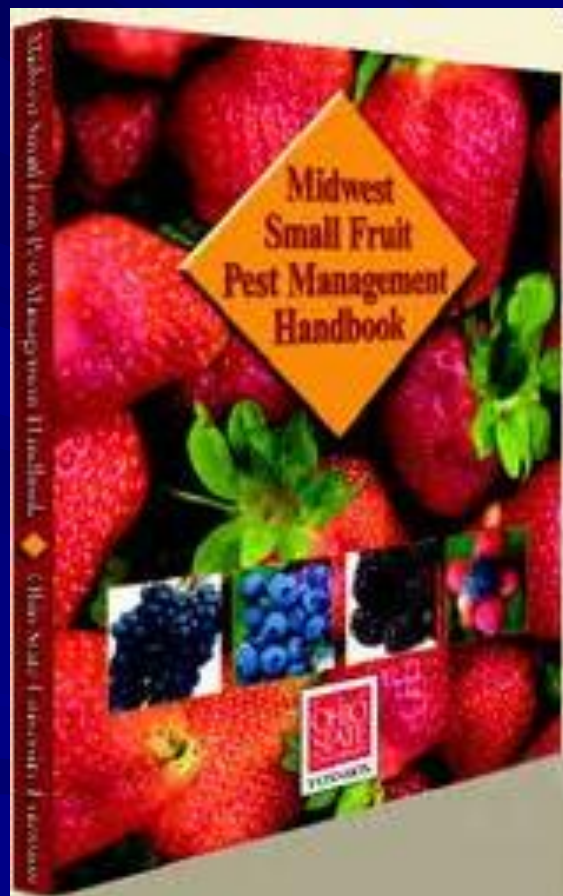


16/12/2010

Small Fruit and Grape Spray Guide



Midwest Small Fruit Pest Management Handbook



the
Southern Region
small fruit consortium




the Southern Region small fruit consortium

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Brambles

[2005 Bramble Agent Training](#)

- [Blackberry Certification Program](#)
- [Blackberry Cultivars In Depth](#)
- [Bramble Disease Control](#)
- [Bramble Life Cycle and Environmental Requirements](#)
- [Estimated Costs of Producing, Harvesting & Marketing Harvesting & Marketing Blackberries in the Southeastern Blackberries in the Southeastern United States](#)
- [Fresh Fruit & Food Safety](#)
- [IR-4 Program: How it Works and What is in the Pipeline for Brambles](#)
- [Pruning & Training Brambles](#)
- [Significant Insect Pests of Significant Insect Pests of Caneberries and Caneberries and Management Options Management Options](#)
- [Update on Blackberry Production in South Georgia](#)
- [Weed Control in Brambles](#)

Note: You will need the [Acrobat Reader](#)  to view these file.



Insect Pests of Blueberry

John R. Meyer
Department of Entomology
NC State University



Small Fruit Pests

Biology, Diagnosis and Management

Arthur L. Antonelli, Carl H. Shanks, Jr., and Glenn C. Fisher





Cornell Fruit

Berry Diagnostic Tool

