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
Fruit consumption drops slightly

By Tom Karst
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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

<table>
<thead>
<tr>
<th>Year</th>
<th>U.S. population, July 1&lt;sup&gt;1&lt;/sup&gt;</th>
<th>Supply</th>
<th>Disappearance</th>
<th>Per capita availability</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Production&lt;sup&gt;2&lt;/sup&gt;</td>
<td>Imports&lt;sup&gt;3&lt;/sup&gt;</td>
<td>Total supply&lt;sup&gt;4&lt;/sup&gt;</td>
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<tr>
<td></td>
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<td>Total</td>
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<td></td>
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<tr>
<td>2005</td>
<td>295.994</td>
<td>123.5</td>
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<tr>
<td>2007</td>
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<td>150.3</td>
<td>77.4</td>
<td>227.7</td>
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<tr>
<td>2008</td>
<td>304.483</td>
<td>194.1</td>
<td>114.9</td>
<td>309.0</td>
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</table>
### Fresh strawberries: Supply and disappearance

<table>
<thead>
<tr>
<th>Year</th>
<th>U.S. population, July 13</th>
<th>Supply</th>
<th>Disappearance</th>
<th>Per capita availability</th>
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<tr>
<td></td>
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<td>Production</td>
<td>Imports</td>
<td>Total supply4</td>
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<td></td>
<td>Exports</td>
<td>Shipment to U.S. territories**</td>
<td>Total</td>
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<tr>
<td></td>
<td></td>
<td>Millions</td>
<td>Million pounds</td>
<td>Pounds</td>
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<td>70.7</td>
<td>1,330.4</td>
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<td>288.028</td>
<td>1,406.3</td>
<td>89.9</td>
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<td>2003</td>
<td>290.704</td>
<td>1,642.4</td>
<td>90.3</td>
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<td>2004</td>
<td>293.310</td>
<td>1,694.4</td>
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<td>295.994</td>
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<td>2006</td>
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<td>2008</td>
<td>304.483</td>
<td>2,091.1</td>
<td>143.0</td>
<td>2,234.1</td>
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Here's the list of the top 20 food sources of antioxidants, based on their total antioxidant capacity per serving size:

<table>
<thead>
<tr>
<th>Rank</th>
<th>Food Item</th>
<th>Serving size</th>
<th>Total antioxidant capacity per serving size</th>
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<tr>
<td>1</td>
<td>Small Red Bean (dried)</td>
<td>Half cup</td>
<td>13727</td>
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<tr>
<td>2</td>
<td>Wild blueberry</td>
<td>1 cup</td>
<td>13427</td>
</tr>
<tr>
<td>3</td>
<td>Red kidney bean (dried)</td>
<td>Half cup</td>
<td>13259</td>
</tr>
<tr>
<td>4</td>
<td>Pinto bean</td>
<td>Half cup</td>
<td>11864</td>
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<tr>
<td>5</td>
<td>Blueberry (cultivated)</td>
<td>1 cup</td>
<td>9019</td>
</tr>
<tr>
<td>6</td>
<td>Cranberry</td>
<td>1 cup (whole)</td>
<td>8883</td>
</tr>
<tr>
<td>7</td>
<td>Artichoke (cooked)</td>
<td>1 cup (hearts)</td>
<td>7904</td>
</tr>
<tr>
<td>8</td>
<td>Blackberry</td>
<td>1 cup</td>
<td>7701</td>
</tr>
<tr>
<td>9</td>
<td>Dried Prune</td>
<td>Half cup</td>
<td>7291</td>
</tr>
<tr>
<td>10</td>
<td>Raspberry</td>
<td>1 cup</td>
<td>6058</td>
</tr>
<tr>
<td>11</td>
<td>Strawberry</td>
<td>1 cup</td>
<td>5938</td>
</tr>
<tr>
<td>12</td>
<td>Red Delicious apple</td>
<td>One</td>
<td>5900</td>
</tr>
<tr>
<td>13</td>
<td>Granny Smith apple</td>
<td>One</td>
<td>5381</td>
</tr>
<tr>
<td>14</td>
<td>Pecan</td>
<td>1 ounce</td>
<td>5095</td>
</tr>
<tr>
<td>15</td>
<td>Sweet cherry</td>
<td>1 cup</td>
<td>4873</td>
</tr>
<tr>
<td>16</td>
<td>Black plum</td>
<td>One</td>
<td>4844</td>
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<tr>
<td>17</td>
<td>Russet potato (cooked)</td>
<td>One</td>
<td>4649</td>
</tr>
<tr>
<td>18</td>
<td>Black bean (dried)</td>
<td>Half cup</td>
<td>4181</td>
</tr>
<tr>
<td>19</td>
<td>Plum</td>
<td>One</td>
<td>4118</td>
</tr>
<tr>
<td>20</td>
<td>Gala apple</td>
<td>One</td>
<td>3903</td>
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</tbody>
</table>

Researchers also found that cooking method also had a significant effect on the antioxidant content of the foods tested.
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
- **Floricane 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

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
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<tbody>
<tr>
<td>pH</td>
<td>5.8 to 6.2</td>
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<tr>
<td>Organic Matter</td>
<td>2 to 4%</td>
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<tr>
<td>Phosphorus</td>
<td>40 to 50</td>
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<tr>
<td>Potassium</td>
<td>280 to 320</td>
</tr>
<tr>
<td>Magnesium</td>
<td>200 to 250</td>
</tr>
<tr>
<td>Boron</td>
<td>1.5 to 2.0</td>
</tr>
<tr>
<td>Zinc</td>
<td>8 to 10</td>
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</tbody>
</table>
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**
- Floricanes bloom, Fruit & die

**Winter**
- Lateral Branching
- Head Laterals. Remove laterals on lower 12 – 18” of canes. Remove excess canes.
Floricane 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
<table>
<thead>
<tr>
<th>Variety</th>
<th>Total Primocane Yields (lbs/Acre)</th>
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<tbody>
<tr>
<td>Prime Jan</td>
<td>6379.3</td>
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<tr>
<td>APF 27</td>
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<td>4274.0</td>
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<td>APF 46</td>
<td>2976.4</td>
</tr>
<tr>
<td>APF 41</td>
<td>2214.2</td>
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<tr>
<td>Prime Jim</td>
<td>2141.6</td>
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<tr>
<td>Variety</td>
<td>2008 Total Harvest Yields (lbs/Acre)</td>
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<tr>
<td>-----------</td>
<td>------------------------------------</td>
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<tr>
<td>Natchez</td>
<td>12160.6</td>
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<tr>
<td>Prime Jan</td>
<td>14683.4</td>
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<td>A 2215</td>
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<td>A 1937</td>
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<td>7804.5</td>
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<td>APF 46</td>
<td>5299.6</td>
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Blueberry Production

J. D. Kindhart
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

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<thead>
<tr>
<th>Crop</th>
<th>Southern</th>
<th>Central</th>
<th>Northern</th>
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<tbody>
<tr>
<td>Blueberries</td>
<td>Collins</td>
<td>Collins</td>
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<tr>
<td></td>
<td>Patriot</td>
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<td>Bluegold</td>
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<tr>
<td></td>
<td>Elliott</td>
<td>Elliott</td>
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</table>
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
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

Total = 51.43 lbs

Total = 21.84 lbs

Year

81 82 83 84 85 86 87 88

Yield (lbs/plant)

0 2 4 6 8 10 12

MULCH

NO MULCH
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)

<table>
<thead>
<tr>
<th>Treatment</th>
<th>8 Year Total Yield</th>
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<td>Sawdust</td>
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<td>Leaves</td>
<td>56.50</td>
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<td>Cornstalks</td>
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<td>Wood Chips</td>
<td>44.64</td>
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<tr>
<td>Wheat Straw</td>
<td>44.16</td>
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<tr>
<td>No Mulch</td>
<td>21.85</td>
</tr>
<tr>
<td>No Trickle</td>
<td>12.86</td>
</tr>
<tr>
<td>No Mulch</td>
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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 in the following season.
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

- 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.
Bird Control
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. Hinson, Ph.D. 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.
Scare Devices
Strawberry Production
Matted Row vs. Plasticulture
INTERNATIONAL RAIL ROAD GUIDE
OF THE
GREAT CENTRAL ROUTE
PUBLISHED BY N. B. TUNIS,
NIAGARA FALLS, N.Y.
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
CAMEROSA
<table>
<thead>
<tr>
<th>Matted Row</th>
<th>Plasticulture</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Plant Spring</strong></td>
<td><strong>Plant Fall</strong></td>
</tr>
<tr>
<td><strong>Straw</strong></td>
<td><strong>Spun bound rowcover</strong></td>
</tr>
<tr>
<td>14 months until return on investment</td>
<td>9 months until return on investment</td>
</tr>
<tr>
<td>$2,200 plus fumigation</td>
<td>$4,500 plus fumigation</td>
</tr>
<tr>
<td>8,000 – 10,000 #/A</td>
<td>10,000 – 20,000 #/A</td>
</tr>
<tr>
<td>3 – 4 year harvest ???</td>
<td>1 year harvest</td>
</tr>
</tbody>
</table>
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

Plasticullture
- Tractor (bigger)
- Disk
- Field cultivator
- Tractor Rotary Tiller
- Bed Shaper/Mulch Layer
- Transplanter
- Plastic Lifter
Increases efficacy of fumigant

Improves soil moisture

Extends growing season in spring and fall

Affords some weed control
Frost Protection
Small Fruit and Grape Spray Guide
Midwest Small Fruit Pest Management Handbook
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
- 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 Caneberrries 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

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