

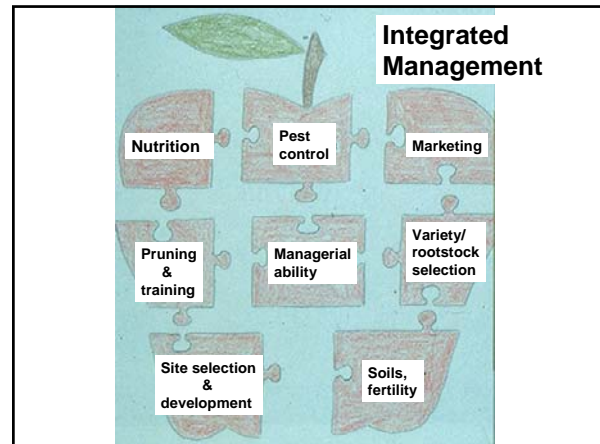



**Organic Fruit Production - -
What to Grow
&
Where to Grow It**

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Plan BEFORE Planting

- The fate of the planting is determined before the crop is set out




What to Grow?

- Market demand
- Site limitations
 - Winter damage
 - Spring frosts
 - Pest pressures
- Species
 - Cold hardiness
 - Chilling requirement
- Varieties
 - Bloom time
 - Pest resistance
- Rootstocks
 - Pest resistance
 - Size control
 - Precocity




What To Grow?

- What is not being grown in your area?
 - Is this an opportunity?
 - No competition
 - High returns
 - Or a **Red Flag?**
 - No market demand
 - Serious production limitations
 - Limited availability of equipment & supplies



Variety Selection

- Pest resistance
 - Does NOT mean immunity
 - 2005 – bacterial spot was a problem on “resistant” varieties of peach
 - May not possess resistance to multiple pests
 - Prima apple is highly resistant to scab, but highly susceptible to cedar apple rust
- Market demand
 - Prima apple is harvested at the same time as Gala, which is in much higher demand



Disease Resistant Apple Varieties*

* 1 = susceptible, 9 = immune, U = unknown

Variety	Apple Scab	Cedar Apple Rust	Fireblight	Powdery Mildew
CrimsonCrisp	9	6	4	4
Enterprise	9	8	8	6
Goldrush	9	3	6	7
Crimson Topaz	9	U	5	6
Crimson Gold	9	U	U	U

Dwarf Apple Rootstock Pest Resistance

- M9 337 – fireblight susceptible
- M9 Nic 29 – fireblight susceptible
- Bud 9 – very winter hardy, resistant to collar rot, less fireblight susceptible than M9
- G 16 – resistant to collar rot, strong resistance to fireblight
- EMLA 26 – does not tolerate wet feet, highly susceptible to fireblight & wooly apple aphids
- G 11 – fireblight resistant

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Blackberry Disease Susceptibility

Variety	Rosette	Orange Rust	Anthraco
Chickasaw	S	?	S
Choctaw	S	R	R(?)
Kiowa	S	R(?)	S
Shawnee	VS	R	R
Arapaho	R	?	R(?)
Apache	R(?)	R(?)	R(?)
Navaho	R	VS	R(?)
Ouachita	R	R(?)	S
Prime Jim	S*	R	S
Prime Jan	S*	R	S

R = resistant R(?) = none observed S = susceptible VS = very susceptible

* = Not an issue with primocane bearers grown for fall crop only

Deal With a Reputable Nursery

- Purchase good quality trees
 - Plant costs are negligible when compared to total establishment costs
- Organic planting stock is required
- If not available, documentation of attempts to find it and lack of availability must be done

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Certified Organic Tree Fruit & Small Fruit Plants

- Trees of Antiquity (CA)
 - <http://www.treesofantiquity.com/>
- Rolling River Nursery (CA)
 - www.rollingrivernursery.com
- Hidden Springs Nursery (TN)
 - www.hiddenspringsnursery.com
- Cottle Strawberry Nursery (NC)
 - www.cottlefarms.com

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If Organic Planting Stock is Unavailable ---

- Document search for organic stock & its lack of commercial availability
- Most certifiers interpret the organic standards as requiring organic management of non-organic planting stock for at least 12 months before harvesting a crop that is to be sold as certified organic

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**“Live where you farm,”
not
“Farm where you live.”**

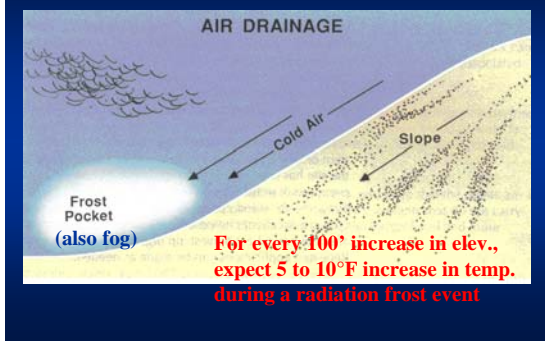
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Site Selection

- Soils – type, depth, drainage, fertility, pH
- Water – availability, quality
- Frost/freeze
- Previous cropping history
- Topography
- Wildlife

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Elevation



North

Less potential for winter injury
Plants stay dormant later - less chance for frost

Intermediate
West between
north & south

Morning sun
reduces disease
East
pressure

Increased potential for winter injury
Plants start growth earlier - increased potential for frost
Soils tend to be drier, warmer and thinner

South

Previous Cropping History

- Persistent herbicides
- Verticillium susceptible crops & weeds
 - tomato, pepper, potato, eggplant, strawberry, raspberry, nightshade, ground cherry, hosenettle, lambsquarter, pigweed, cocklebur
- Cotton root rot
- Nematodes

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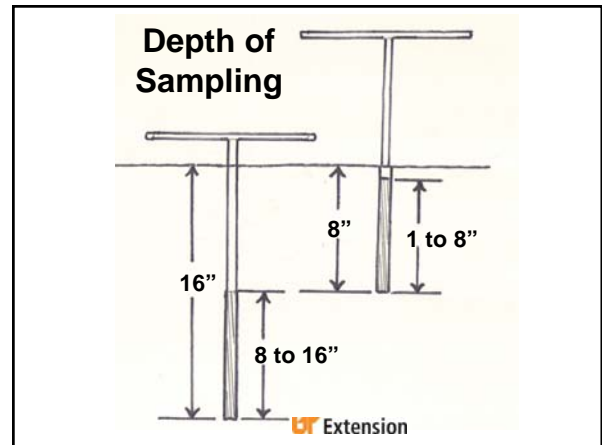
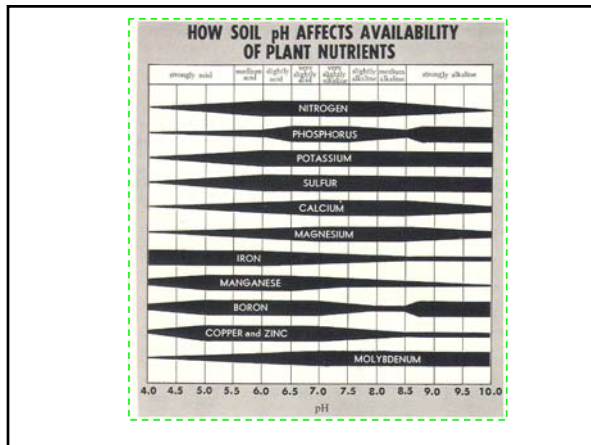
Water Quality?



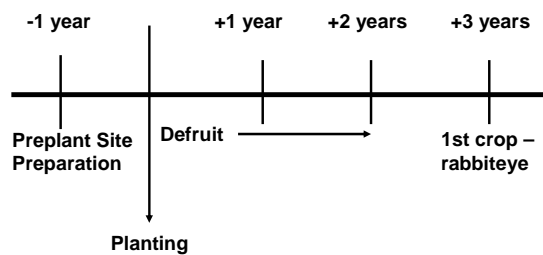
A critical year in fruit production is the one before planting – the success or failure of a fruit crop is often determined before the plants are set

Site Preparation

- Soil testing
- Elimination of noxious weeds
- Facilitation of good air and water drainage
- Floor management
- Elimination of host plants in the vicinity of the planting



Blueberry Production Timeline



Determining Nutritional Needs: Postplant

- Soil testing
- Tissue analysis
- Growth & fruiting
- Past experience

Objectives of a Nutrient Management Program

- **Healthy plants**
- **High yields**
- **Quality fruit**
- **Consistent production**

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Nitrogen Availability

- Manures and compost
 - 50% available during year of application
 - 90% available in application year with fresh poultry manure
 - Balance available during subsequent years (be sure to figure it in annual applications)

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Manure as Fertilizer

- Fertilizer value usually highly variable
- Unbalanced in regards to N, P, K
- Specific application rates will be impossible to recommend
- Typical application rates:
 - Most manures – 1 to 4 tons/acre
 - Poultry manures – 1 to 2 tons/acre

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Timing of Manure Applications

- 120 days pre-harvest in crops where fruit may be in contact with the soil or soil can be splashed onto the fruit from rainfall or irrigation
- 90 days preharvest where fruit is elevated or shielded from soil contact
- Properly composted manures can be applied at higher rates & at times closer to harvest

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Organic Fruit Production – Pest Control

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Why Control Wildlife in Fruit Crops?

- Economic losses
 - Fruit destroyed or consumed by wildlife
 - Increased disease & insect pressure with damaged fruit
 - Damage to plants and cropping system
 - Feeding on succulent shoots
 - Girdling or rubbing on plants
 - Puncturing plastic
- Food Safety

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Wildlife Damage Prevention Categories

- Habitat modification
- Exclusion
 - Fencing
 - Netting
- Scare devices (visual & auditory)
- Repellents (taste & smell)
- Removal
 - trapping
 - shooting

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Maintaining plants in good health is important in insect and disease management

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Pest Management Strategies

- Cultural Controls
- Mechanical Controls
- Biological Controls
- Chemical Controls

Cultural Controls (New Plantings)

- Site Selection
- Crop Rotation
- Soil Preparation
- Cultivar Selection
- “Clean” Planting Stock
- Row Spacing & Plant Density

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Cultural Controls (established plantings)

Mulching (first year)
Weed & Grass Control
Pruning
Fertilization
Irrigation
Sanitation
Habitat Modifications

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Mechanical Controls

- Keeping pests away from crops
 - Traps, row covers, netting
- Removing pests
 - Hand removal, vacuuming
- Removing diseased plants
- Cultivation & hand weeding

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Biological Controls

- Mating disruption pheromones
- Microbial pesticides
 - (beneficial pathogens that kill pests)
- Natural enemies
 - Encourage predators

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Biological Control of Insects:

- Can be enhanced by cover crops & habitat management
- Timed release of beneficial insects
 - Where a known pest appears predictably & can be controlled by specific biological agent
 - Predatory mites
 - Lady beetles
 - Green lacewings
 - Trichogramma wasps

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Chemical Control

<u>Fungicides</u>	<u>Insecticides</u>	<u>Herbicides</u>
Sulfur	Rotenone	Corn gluten meal (Preen)
Copper	<i>Bacillus thuringensis</i>	Vinegar
Serenade (<i>Bacillus subtilis</i>)	Azadirachtin	Lime/lemon juice
		Clove/cinnamon oil

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Disease Control

- Know:
 - susceptibilities of species, varieties and/or rootstocks
 - the symptoms of the disease
 - when infection occurs
 - what weather conditions favor infection
 - control measures

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Apple Scab

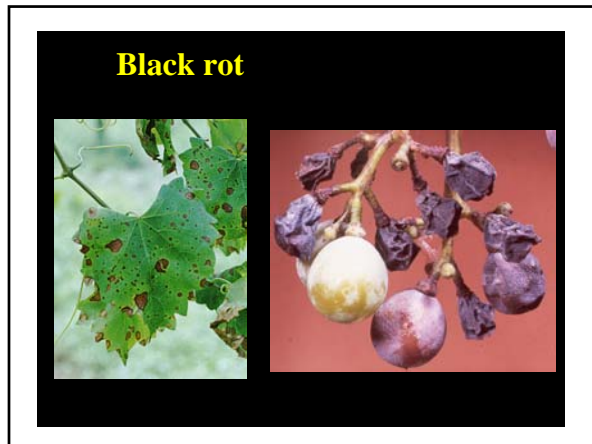
- Primary Infection
- Secondary Infection



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Mill's Chart for Apple Scab Infection

Ave. Temp. °F	Hours Required for Infection			Secondary
	Primary		Heavy	
	Light	Moderate	Heavy	
45	17	26	40	12.6
50	14	19	29	9.3
55	11	16	24	7.3
60	9.5	13	20	6.3
63 – 75	9	12	18	5.9
76	9.5	12	19	6.3
77	11	14	21	7.3
78	13	17	26	8.7



of Wetting Hours Required for Black Rot Infection at Various Temperatures

Ave. Temperature (°F)	Hours of Leaf Wetness
50	24
55	12
60	9
65	8
70	7
75	7
80	6
85	9
90	12

Source: R. A. Spotts, Ohio State Univ.
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Powdery Mildew

- **Conditions favoring infection:**
 - Rel. humidity > 60%
 - Temp. 50 - 77°F
 - 66 - 72°F optimum
- **Critical growth period:**
 - Tight cluster to pink through 1st or 2nd cover.
- **Pressure greater following mild winter**

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Cultural & Mechanical Practices for Pest Control - Preplant

- **Site selection:**
 - Elevated, well-drained, full sun, consider previous cropping history
- **Site preparation:**
 - Adjust soil pH, P, K, Ca & Mg
 - Eliminate noxious weeds
 - Eliminate barriers to air drainage
 - Eliminate alternate hosts for pests
- **Plant selection:**
 - Select types of fruits & varieties suited to your area
 - Purchase plants from reputable nurseries, inspect plants upon receipt
 - Consider pest resistant varieties/rootstocks

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Cultural Practices for Pest Control - Postplant

- Pruning to remove diseased & insect-infested wood, promote good sunlight, air & spray penetration throughout the canopy
- Conservative, timely nitrogen application
- Trickle irrigation instead of overhead
- Crop thinning
- Timely harvest
- Sanitation

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Organic Fruit Production – Floor Management

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Orchard Floor



Management

Floor Management

- Permanent sod between rows
 - Serves as a deceleration & diffusion strip for runoff water
 - Support for equipment
- Mulching or shallow cultivation around trees or down tree row with high density plantings

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Mulching



- Weed control
- Uniformity in:
 - Soil moisture
 - Soil Temperature
- Fertility
- Maintain or enhance soil organic matter levels
- Voles
 - Keep mulches 8 to 10 inches away from trunk
 - Use trunk guards on young trees
- Must re-apply organic mulches to maintain benefits

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Irrigation – Overhead or Trickle



Why Prune?

- Promote growth in desired areas
- Stiffen limbs
- Remove dead, broken, diseased & insect infested limbs
- Remove unfruitful branches or canes
- Promote development of new shoots for future crops
- Adjust crop size, increase fruit size

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Sunlight
is the
key to
fruit production



- Reduces pest problems
- Increases fruit quality (color, soluble solids)
- Maintains fruitfulness of the interior portions of the plant

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Organic Fruit Production – Cropping Systems

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Cropping Systems - Strawberries

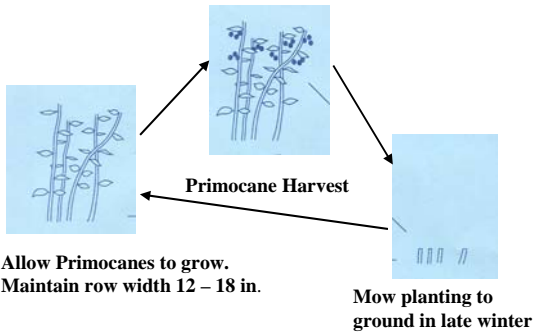
- Matted Row
- Annual Production



- Less disease pressure

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Primocane Crop Only



Allow Primocanes to grow.
Maintain row width 12 – 18 in.

Mow planting to
ground in late winter

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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

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Alternate Year Cropping

Rotation -

- 1st year:
 - Crop ½ of the field, mow off canes in winter
- 2nd year
 - Crop the 2nd half of the field, grow primocanes on the 1st half
- Repeat sequence in following years

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Alternate Year Cropping

- Increased primocane growth
- Heavier yields in floricanes rows
- Easier management
- Reduced pruning costs
- Alternate row cropping increases air movement through planting
- Lessens pest carryover

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Use of Protective Structures



- Season extension
- Increased yields
- Less disease pressure
- Physical exclusion of some insects & wildlife

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Questions?



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Fruit Notes

www.utextension.utk.edu/publications/

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