

# FALL-BEARING RASPBERRIES FOR THE BAYFIELD REGION

Bayfield Fruit Clinic

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# WHY FALL BEARING RASPBERRIES?

- Overwinter well- no exposed canes
- Excellent supplemental crop
  - Same harvest window as apples
  - After blueberries and strawberries
- Low maintenance
- High value crop
- Potential to extend local fruit availability

# RASPBERRY (*RUBUS*)

- 195 species
- 2 main species in production:
  - *R. idaeus*- Red raspberry
    - *ssp. vulgatis*- European
    - *ssp. strigosus*- North American
  - *R. occidentalis*- Black raspberry
  - Purple raspberries- hybrids of red x black raspberry
  - Yellow raspberries- single recessive gene mutation of red raspberry

# *R. IDAEUS*- RED RASPBERRY

- Largest commercial market
  - More cold tolerant than blackberry
  - Higher yield and less disease than black raspberry
  - Yellow varieties are becoming more popular
  - Purple raspberries have inferior fruit quality and not commercially viable

# FLOWERS

- Flowers
  - Flowers are smaller than blackberry
  - Borne terminally on lateral shoots
  - Self fruitful, bees do 80-90% of pollinating
  - Spring frost injury- vascular connections to bud are damaged, may not be noticed until fruit development

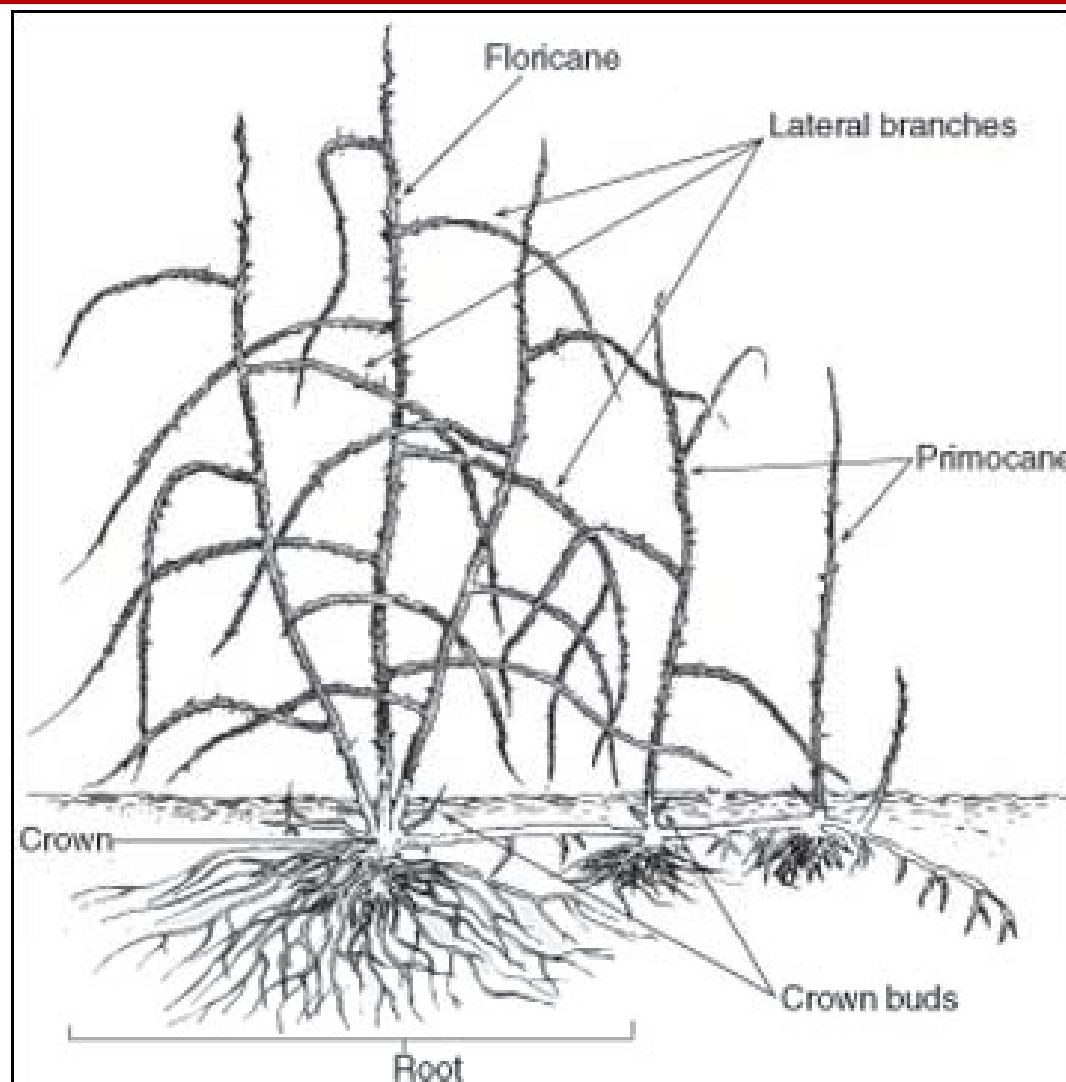


# FRUIT

- Fruit
  - Drupelets detach from receptacle when harvested
  - 30-50 days for fruit development
  - Must be picked every 2-4 days due to range of ripeness
  - Fall bearing types will continue to fruit until frost

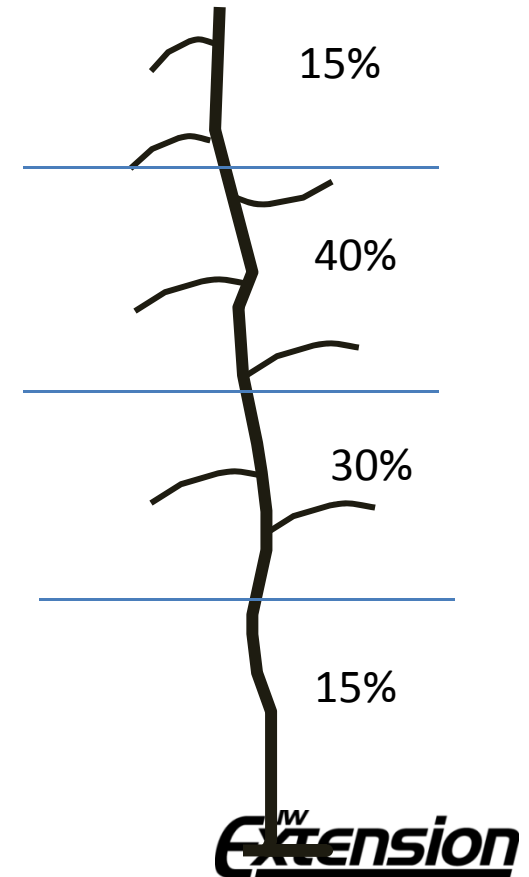


# FLORICANE BEARING



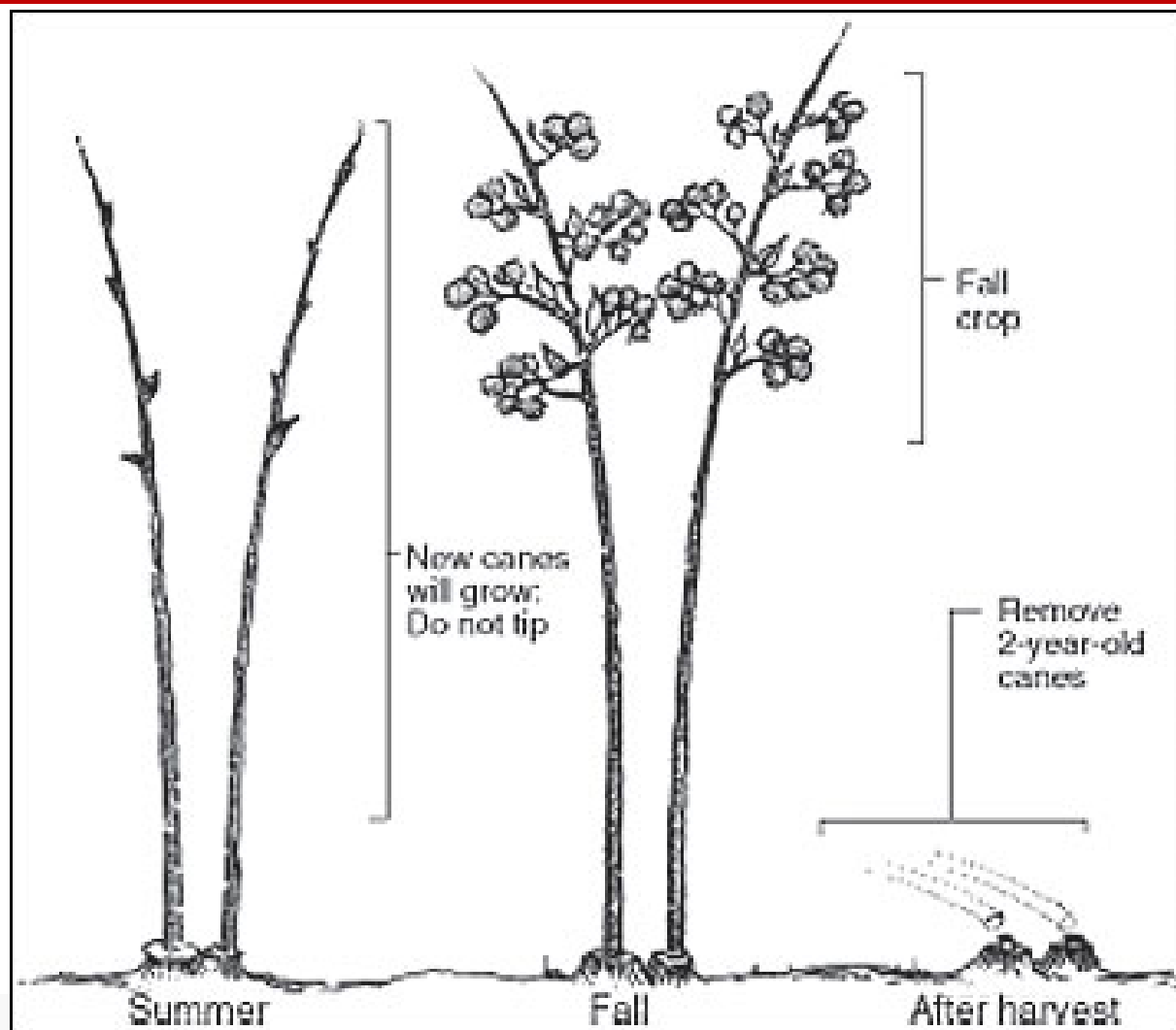
# FLORICANE BEARING

- Fruit are borne on laterals of 2 year old canes
  - Requires canes to be overwintered
- Short days, cool temps: floral initiation
- One crop in summer
- Cane dies after fruiting
- If heading to control height, do not remove more than 25% of cane
- New canes sprout from root buds
  - Planting can spread over time





# PRIMOCANE BEARING



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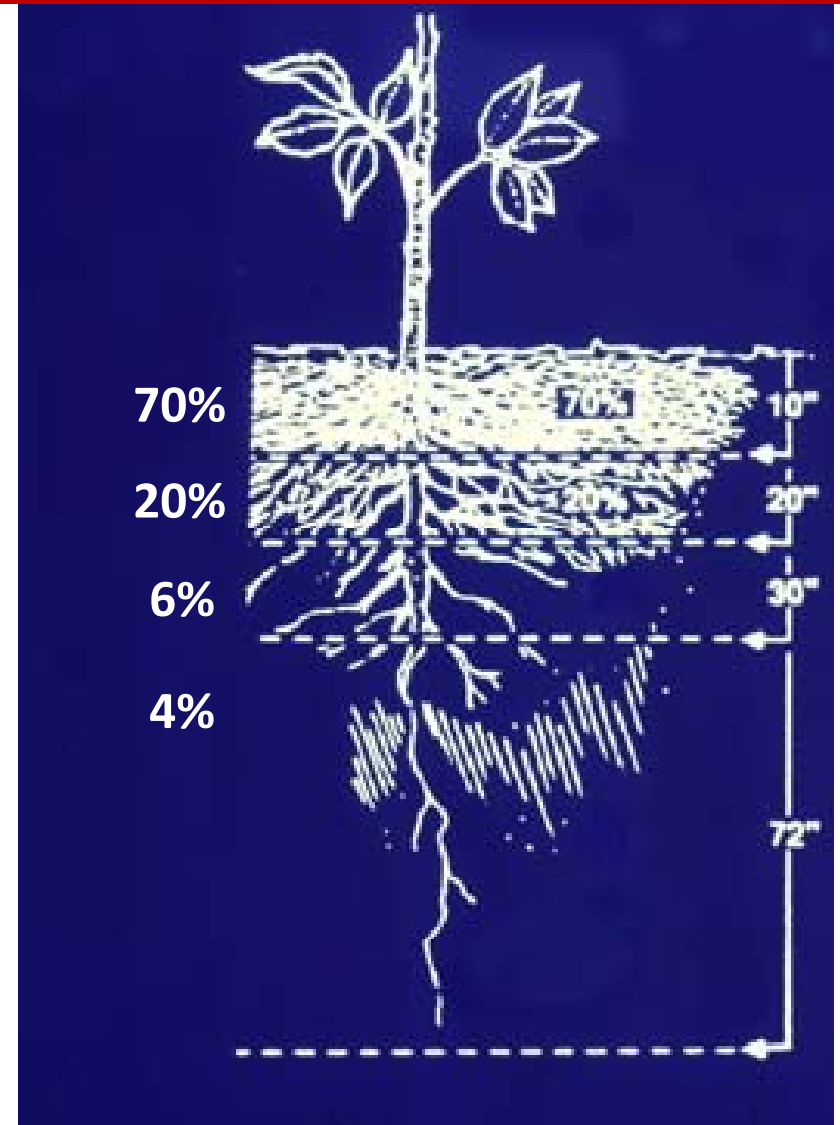
- Fruit are borne on laterals of current seasons growth
  - Day length and temperature neutral
  - Initiate flowers in June-July
  - Flower early July-August
  - Fruit late August/Sept to frost
- Fruiting starts at
  - Tip of inflorescence and moves inward
  - Top of cane and moves down

# SITE SELECTION AND ESTABLISHMENT

- Full Sun
- Good air circulation but protected site from wind
  - Reduce leaf damage
  - Faster drying after rain, dew, irrigation
  - Slope- allows cold air to drain away
    - Summer bearing- north facing slope
    - Fall bearing- south facing slope
- Crop History of Site
  - Wait 3 years before replanting if previous crop was raspberry, strawberry or solanaceous crop

# SOIL CONDITIONS

- Well drained mineral soil
  - Ideal: deep sandy loam with 5-7% organic matter
  - Sandy soils must be irrigated
- pH : ideal 6.0-6.8, can tolerate 5.5-7.5



# PLANTING RASPBERRIES

- Plant in spring after danger of frost



# PLANT SPACING

$$\text{Yield} = \# \text{ of canes} \times \# \text{ of laterals}$$

- Large number of canes does not reduce yield
  - Produce as many canes as possible!
  - Plant narrow rows and more rows/acre
- Row width: 12-18”
  - Ideal for harvest
  - Wider rows will have greater disease issues due to poor circulation
- Between row spacing: equipment often dictates

# CULTIVARS

# FALL BEARING CULTIVARS

- Select variety based on your target market
- Production system
  - Field vs high tunnel
- Variability in ripening time can ease harvest
- Post harvest needs?
  - Shipping
  - PYO
  - Direct market



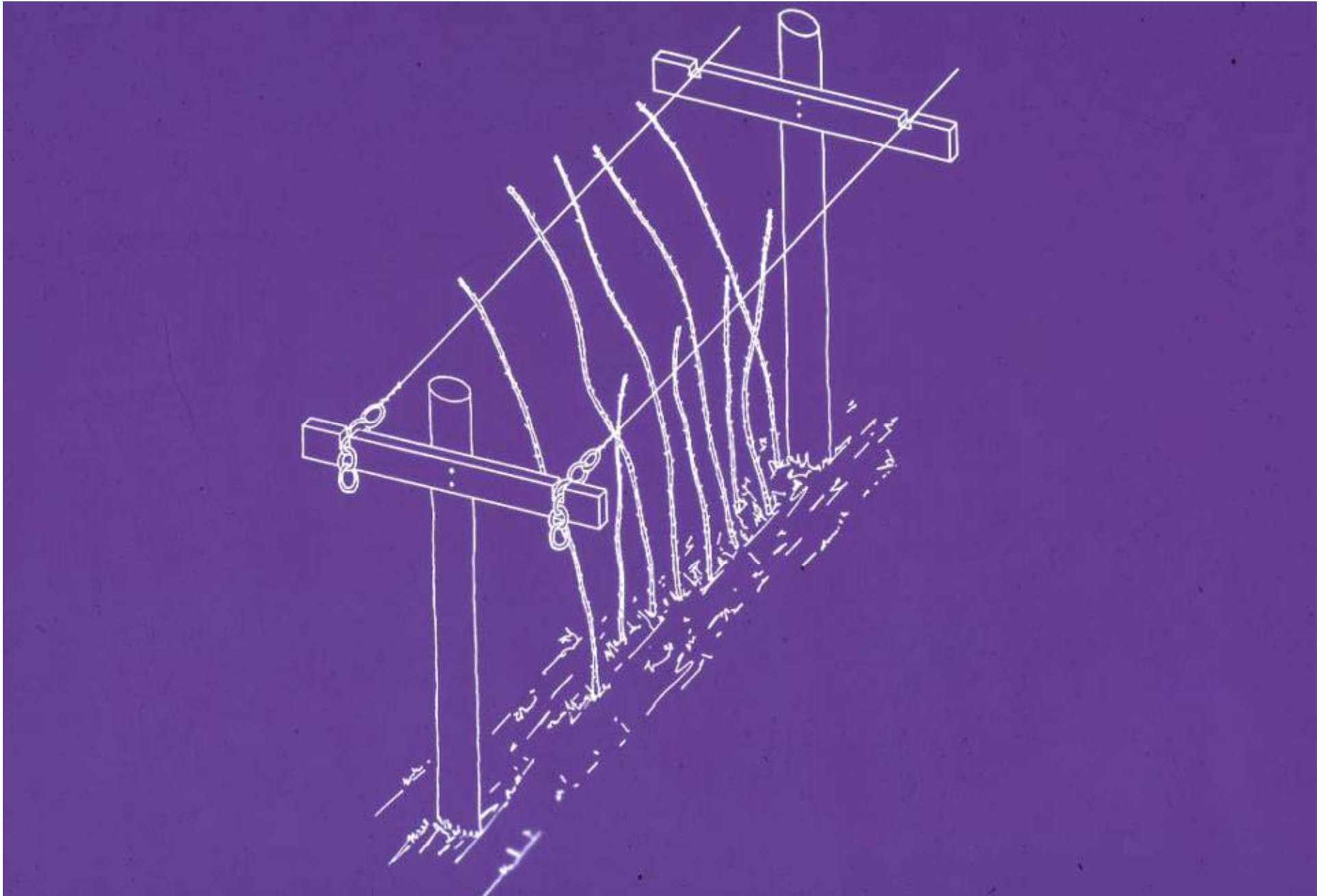
Cultivar	Harvest Date	Berry wt	Yield	Comments 2009
Autumn Britten	8/18-9/29	4.5	3278	Early season producer of large deep red fruit
Joan J	8/18-9/29	5	5405	Large bright red fruit of excellent quality and firmness, vigorous and productive
Himbo Top	8/18-9/29	5	2180	Very good quality fruit with limiting cane production. (Year 2 production level)
Polka	8/18-9/29	4.8	837	Deep red highly flavored semi-firm fruit (Year 1 production level)
Caroline	8/21-9/29	4.4	6310	Highly productive, vigorous grower with good fruit quality and flavor
Jaclyn	9/04-9/29	4.5	1455	Deep red good quality fruit which can be very difficult to remove under cool growing conditions. Poor cane vigor and production
Anne	8/21-9/29	4.3	2100	Yellow fruit of excellent quality, later maturity reduces production in cooler seasons. Good cane vigor and production. Sensitive to leafhopper feeding

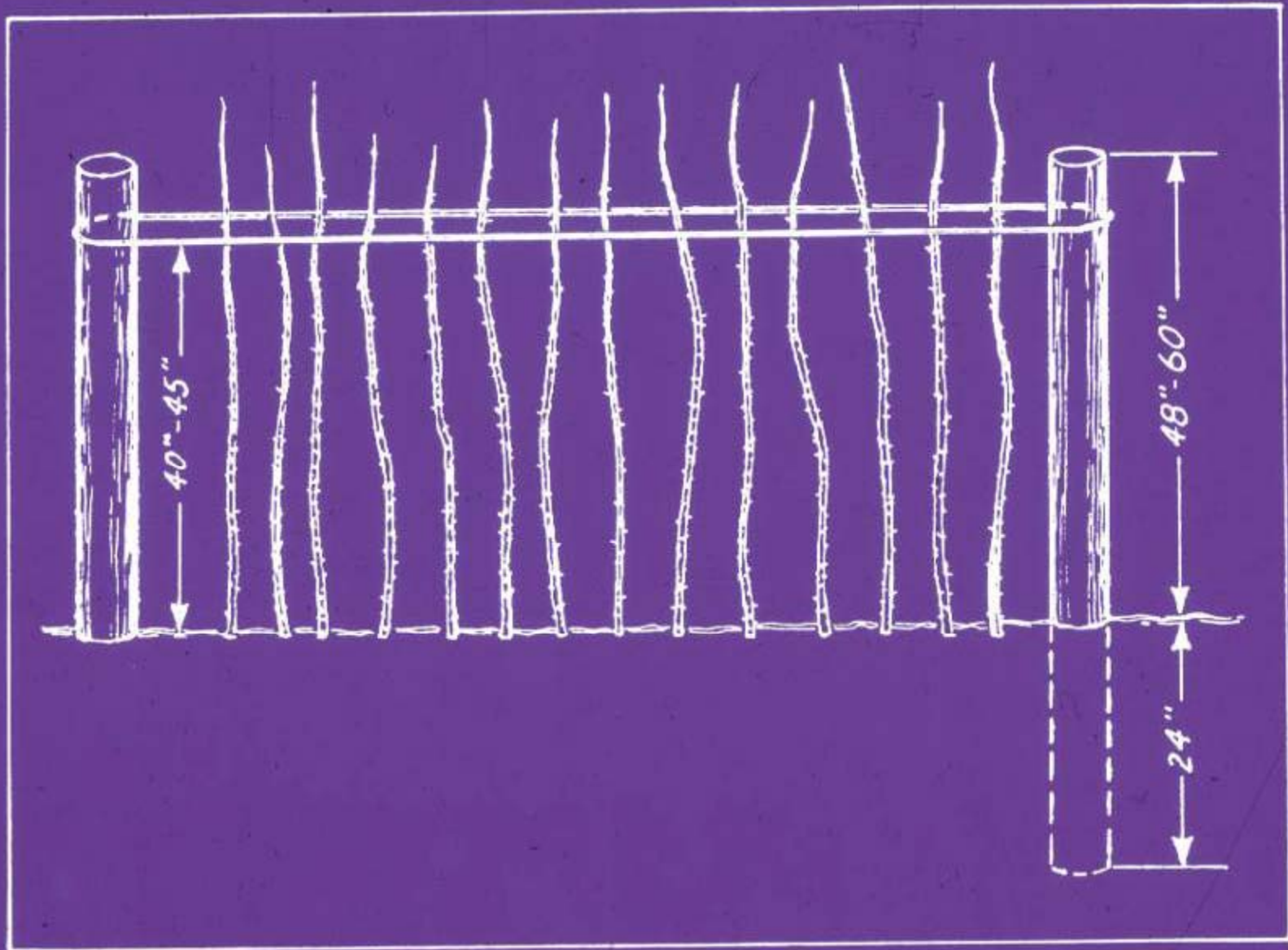
Cultivar	Harvest Date	Berry wt	Yield	Comments 2010
Autumn Britten	7/23-9/17	3.7	1854	Very early maturity in '10, production reduced, lacking vigor
Joan J	8/9-8/22	4.4	4013	Large bright red fruit of good quality and firmness, Production reduced in '10, fruit firmness reduced from excess moisture
Himbo Top	8/9-9/17	4.5	1025	Fruit quality poor due to disease pressure and excessive moisture
Polka	8/6-9/22	3.6	5693	Firm, large fruit on 4-5' canes, quality maintained throughout season Apparent good disease resistance and tolerance of wet weather
Caroline	8/9-9/22	3.9	6064	Highly productive, vigorous grower with good fruit quality and flavor Very susceptible to damage from high winds
Jaclyn	8/9-9/17	4.5	950	Deep red good quality fruit which can be very difficult to remove, Poor cane vigor and production
Anne	8/9-9/22	3.6		Severe disease pressure and high winds destroyed most of crop Sensitive to summer leafhopper feeding

# TRELLISING

# TRELLISING

- Fruit is borne at the top of the canes resulting in top heavy drooping canes
- Trellis reduces damage due to wind
- Some trellis support is needed
- Simple T-trellis is sufficient
  - 7' post with 3' arm
  - Place posts every 25-30' in row
  - Removable posts- PVC pipe permanently in ground
  - Baler twine





# HARVEST

# HARVEST

- Indicators of maturity:
  - Ease of abscission is best indicator of fruit maturity
  - Fully developed color
- Hand harvest every 2-3 days
  - Directly into retail containers
- Machine harvested tend be higher quality compared to hand harvested





# DOUBLE CROPPING

- Can produce 2 crops:
  - Year 1- Fall crop
  - Year 2- summer crop
- Advantages:
  - Larger total crop
- Disadvantages:
  - Pruning is more difficult – lose profits on increased yield in pruning labor
  - Canes become weaker and taller
  - Fruit quality of summer crop is not very good

# POST HARVEST

- Shelf life is short
  - 2-3 days at 32-45<sup>0</sup>F
  - Not sensitive to cold storage injury
- Post harvest handling is critical!
  - Do not leave boxes sitting in the sun!
  - Remove field heat as soon as possible
  - Ensure fruit are properly handled during transportation chain

# PRUNING



**Rototill to  
narrow rows**



**12-18" row**





# PRUNING

- Cut canes as close to the ground as possible
  - Lateral buds can break from cane stubs
  - Weak laterals are potential infection site for disease
- Remove cuttings from the rows

# TIMING OF PRUNING

- Carbohydrates move from canes to roots in the fall
  - Cutting canes before Dec. can reduce carbohydrate reserve and effect spring growth
- Carbohydrates move into buds in the spring
  - Cutting canes too late can lead to loss of carbohydrates if they have started to move
- Best time is Dec.-early March

# SEASON EXTENSION



# EARLIER PRODUCTION

- In northern climates, much of the yield potential of fall-bearing raspberries is lost due to the short season
- Use of row covers in spring can lead to cropping 2 weeks earlier
  - Heritage, Caroline and Josephine responded well in studies



# SPRING ROW COVER

- Place row cover on early in the spring
- Place loosely over canes so canes are not restricted
- Leave the covers on until canes are ~18”
  - Remove earlier if temperatures are high



# FALL EXTENSION

- Primocane raspberries can be extended by:
  - Planting late cultivars
  - Delaying harvest
  - Protecting fruit (high tunnel production)

# DELAYING HARVEST

- Pinching primocanes @ 12" height
  - Promotes branching
  - Delays production of fruit by 3 weeks (NY)
  - Minimal difference in yield



# PROTECTING FRUIT

- Fall bearing raspberry yield is primarily limited by fall frost
- Protecting the crop from frost lengthens harvest period
- Protecting fruit results in higher quality fruit as well as increased yields
- In NY, raspberry harvest was extended by 4 weeks in high tunnels!

# WHAT IS A HIGH TUNNEL??

- Large plastic hoop houses with roll up (or down) sides to allow for ventilation
- Not necessarily heated
- Allow for extension of natural season
- Intermediate environmental protection (between field and greenhouse)



# BENEFITS OF HIGH TUNNEL PRODUCTION



- Long growing season= Increased yield
  - Low investment, high return
- Improved fruit quality
  - No wind or rain damage
- Increased growth
- Wild life barricade
- Some reduced pest pressure
- Harvest is not weather dependant!



# CHALLENGES OF HIGH TUNNEL PRODUCTION

- New pest pressure
  - Powdery mildew and mites
- Soil degradation
- Increased rodent activity
- Wind/snow damage to tunnel
- Potential for extreme high temps if not managed properly

# SITE SELECTION

- Soil Quality
  - Deep, well drained soil
  - Good water holding capacity and organic matter
  - pH 5.5-6.5 (Brambles)
  - High organic matter (3-6%)
- Water quality and availability
- Level (or slight slope) and well drained site
  - Runoff from tunnel roof must move away from the tunnel or be collected
- Avoid cold pockets (bottom of a hill)



# SITE SELECTION

- Accessibility
  - High tunnels are labor intensive and require frequent access
  - It's much easier to forget about something you don't see!

# SITE SELECTION

- What is your potential snow and ice load?
- Wind load
  - Perpendicular to prevailing wind to facilitate ventilation
  - Avoid high wind areas!



# EARLY SEASON

- Can be done with floriculture or primocane brambles
  - Plastic remains up over winter
- Can use floating row covers to gain additional heat and to protect tender leaves during cold nights
  - Remove row cover when plants are 18" high



# LATE SEASON EXTENSION

- Plastic can be removed over the winter
  - Snow cover for crowns
  - Snow leaches the soil
- Tunnel provides protection from low night temperatures
- Additional protection can be provided by covering raspberries with lightweight floating row covers
  - Cover crop when temps are predicted to fall below 25°F
  - Remove in the morning when temperatures begin to rise

# VENTILATION

- Summer
  - Sides can be left rolled up day and night
  - Opening end doors can help to quickly reduce heat
- Spring and Fall
  - Sunset- close up tunnel to conserve heat
  - Morning- roll up sides and open peak vents to create draft
    - Remove moisture to reduce disease pressure

# PRUNING HIGH TUNNEL RASPBERRIES

- Some vigorous cultivars benefit from pinching or thinning in May/June
- Increased growth in the tunnel, plan accordingly
- Space rows 6' apart

# HIGH TUNNEL COST

- Large range in costs, depending on size, design and reinforcements
  - 24'w x 60'l x 13'h with snow package ~ \$5,000
- Rule of thumb: Add 25% of cost for end wall lumber, site preparation and water lines

# HIGH TUNNEL PROFITS

- Fall bearing raspberry economic studies
  - Payback high tunnel investment within 3 years
  - MN study- Up to 16,000lbs/A out of tunnels
- Early freezing temps can reduce profitability
  - Propane heaters can get through a few cold nights
- Blackberry- not as profitable, but can grow an niche crop...market is critical!



# PRODUCTION COMPARISON

**Table 1. Yield and berry quality comparison of fruit after treatments of high tunnel cover, field row cover, or no cover of four primocane-fruited bramble cultivars.<sup>z</sup>**

Cultivar	Treatment	Total yield (g)	Average berry weight (g)	Soluble solids concentrate (%)	Diameter (mm)	Firmness (Newtons)	Number of canes	Biomass weight (oz)
Autumn Britten	High tunnel	1004 a	2.7 bc	9.0 cb	18 cb	2.0 c	28 b	102 b
	Row Cover	452 bc	2.4 cd	9.1 cb	17 c	2.3 bc	12 cd	11 de
	No cover	226 cd	2.4 cd	8.8 cb	16 c	0.8 c	9 cd	4 e
Caroline	High tunnel	224 cd	3.4 b	9.3 b	20 b	1.0 c	44 a	71 c
	Row cover	52 d	2.5 cd	9.5 b	-	-	14 c	8 de
	No cover	29 d	1.8 d	8.2 c	-	-	9 cd	2 e
Jaclyn	High tunnel	173 cd	2.3 cd	9.4 b	17 c	1.0 c	11 cd	30 d
	Row cover	77 cd	2.1 cd	8.7 cb	16 c	0.9 c	6 d	3 e
	No cover	118 cd	1.9 d	9.5 b	17 c	3.8 b	8 cd	5 e
APF-45	High tunnel	789 ab	8.7 a	11.16 a	24 a	15.6 a	31 b	294 a
	Row cover	-	-	-	-	-	5 d	8 d
	No cover	-	-	-	-	-	5 d	10 e
LSD, $P \leq 0.05^y$		397	1.0	1.0	3	1.6	8	22

<sup>z</sup>Means are average four treatment replications.

<sup>y</sup>Least significant difference at  $P \leq 0.05$ ; NS = no statistical difference; means sharing the same letter are not statistically different from each other.

ISU, Horticultural Research Station (ISFRS-09-36)

# WHO IS YOUR MARKET??

- Season extension only works if you have someone who will buy your crop!
  - People are not always thinking about raspberries in October!
- Wholesale vs. Retail?
- Market research is part of the planning stage!



**QUESTIONS?**