

Fundamentals of Viticulture

Economic Considerations

- Market
 - Sold to a winery or other processor
 - Contract
 - What cultivars will they accept
 - Price
- Other possible outlets
 - Farmers market or roadside stand
 - Area stores, markets, restaurants
 - Pick-your-own
 - Near a population center
 - Good public access
 - Near a local attraction
 - Is the vineyard/production site attractive
- How long can you wait to recover your investment cost?
 - 5 years
 - 7 years
 - 10 years
- Can cost be reduced without sacrificing QUALITY ?
- How much time can you commit
- Do Your Homework
 - Read books, trade and scientific journals
 - Visit successful vineyards and wineries
 - Attend workshops, seminars, classes
 - Talk to other growers
 - Internet (pros/cons)
 - Develop a business plan
- Assumptions
 - No land costs are included
 - Have the necessary equipment
 - Planting proven cultivars
 - All labor is paid at skilled laborer rates
 - Trellis will be a standard 2-wire system
 - Additional cost for GDC/VSP or other system
- Assumptions
 - Machinery costs are operating cost only
 - Planting space, 8 feet apart in row, rows 10 feet apart (= 545 vines/acre)
 - Treated wooden post, 12.5 gauge high tensile wire & appropriate hardware
 - Grass alleys, herbicide treatment under vine
 - No interest is included

Adapted from
 “Costs of Establishing a Wine Grape Vineyard”
 by Bruce Bordelon
 Purdue University
 Figures are adjusted for inflation and location

Year One	Cost/Acre
Site Preparation	166
Pants and Planting	2,398
Trellis Materials and Installation	1,670
Weed, Disease and Insect Control (includes mowing row middles)	473
Fertilizer, Canopy Management And Machinery Operating Cost	1,010
Total Year One	5,717

Year Two	Cost/Acre
Pruning, Replanting and Canopy Management	447
Weed, Disease & Insect Control	339
Fertilizer and Machinery Operating Cost	294
Total Year Two	1080

Year Three	Costs/Acre
Pruning and Canopy Mgt	542
Weed, Disease & Insect Control	442
Fertilizer & Machinery Operating Costs	347
Harvest Cost Estimated per Ton \$150	150
Total Year Three	1,828
Three Year Total	8,625

Return

Based on one acre and market value of 50 cents per pound	
Year 1	0.00
Year 2	0.00
Year 3	1000.00
Year 4	3000.00
Year 5	4000.00
Year 6	5000.00
Year 7	5000.00

	Expenses	Income
Year 3	8625.00	1000.00
Year 4	10753.00	4000.00
Year 5	12681.00	8000.00
Year 6	14709.00	13000.00
Year 7	16537.00	18000.00

Conclusions

- Commitment, time and money
- Self gratification or accomplishment
- Do your own business plan

Site Selection

Select a site with good AIR DRAINAGE

- Cold air is heavier than warm air
- Cold air flows downward and settles in low areas
- A 3-5 degree difference may save your crop
- Gradually sloping site higher than the surrounding terrain
- A tree or brush line will form frost pocket

Surface Water Drainage

- Water shouldn't stand for more than a day
- 2-5 percent slope
- Internal Water Drainage
 - Check for Impervious Layers
 - Hole Drainage Test
 - 8 hours very good
 - Over 48 hours poor
- Soil Fertility
 - Reasonably fertile (Do soil sampling)
 - Has not had excessive erosion of top soil
 - Has favorable pH, organic content, texture
 - No impervious layers near surface
 - Soil depth of at least 3 feet
- Fertility
 - More isn't better
 - Organic matter 1 to 3%
 - pH 5.5 - 7
 - Phosphorous (P) 20 - 50 ppm
 - Potassium (K) 125 - 150 ppm

Soil Characteristic	Desired Values ^(a)
pH _w	5.5-6.5 *
Organic Matter	2-3%
Phosphorous (extractable)	40-50 lbs./A
Potassium (exchangeable)	250-300 lbs./A
Magnesium (exchangeable)	200-250 lbs./A
Boron (extractable)	1-2 lbs./A
Zinc (extractable)	8-10 lbs./A

^a Source: Dami, et al., 2005

- Commonly preferred soil pH_w values are 5.5 to 6.0 for *Vitis labrusca* cultivars, 6.0-6.5 for hybrid cultivars, and 6.0-7.0 for *vinifera* cultivars.

- Exposure
 - Orientation
 - Wind direction
 - Tree lines
 - Isolation
 - Access
 - Herbicide drift
 - Water source

Red Flags

- Subsoil pH is below 4.5 or above 7.5
- Low pH contributes to Al and Mn excesses.
- Consider alternative site.
- High pH can limit micronutrient availability, especially Fe.
- Consider alternate site or lime-tolerant rootstocks.
- Organic matter is above 4.0%
- Can be a result of poor internal drainage.
- Can complicate vine management.
- Consider low-vigor cultivars and/or rootstocks.

Trellis Materials

- Line Post
 - Main purpose is to support the wire
 - Should be 4 inches in diameter
- End Post
 - Support the structure
 - The weight of the structure is transferred through the post
 - Should be 8 inches in diameter
- Posts
 - Wooden, treated
 - Steel
 - Other
 - Fiberglass
 - Concrete
 - Well Pipe
 - Irrigation Pipe
- Wire used to direct the growth of the vine
- Also carries the weight of the vine
- Needs to be high tensile strength, 12.5 gauge
 - Comes in 4000 ft rolls
 - Best have a Spinning Jenny
- Catch wires for VSP can be electric wire or wire of a lesser gauge
- Strainer
- Springs
- Dead men
- Earth anchors
- Staples
- Wire splicers
- Cross arms
- Post Hole Digger
 - Post pounder
 - Auger
- Tractor
- Shovel
- Fence pliers
- Tamper
- Spinning Jenny
- Gloves

Trellis Types

- Importance of a good trellis system
 - Maximize sun or light interception
 - Places vines in a more manageable position
 - Makes it easier to reach the fruit
 - Helps with weed control
 - Facilitates spraying for insect and disease control
- Types of trellises
 - Two and Four Arm Kniffin
 - High Wire Renewal System
 - Geneva Double Curtain (GDC)
 - Vertical Shoot Positioning (VSP)
 - Scott Henry
 - Smart Dyson

Cultivar Selection

- Will it grow in Nebraska ?
- Can you sell it ?
- Most importantly “What do the Wineries Want ?”

- French American Hybrids Red
 - Chambourcin
 - deChaunac
 - Marechal Foch
 - Chancellor
 - Leon Millot
- French American Hybrids White
 - Aurore
 - Vignoles
 - Seyval Blanc
 - Vidal Blanc
- American Hybrids Red
 - Concord
 - Frontenac
 - Marquette
 - Noiret
 - Corot Noir
 - St Croix
 - Sabrevois
 - Trollhaugen
 - Valiant
 - Petite Pearl
 - Norton
- American Hybrids White
 - Traminette
 - LaCrescent
 - Frontenac Gris
 - Frontenac Blanc
 - Brianna
 - Prairie Star
 - Edelweiss
 - Cayuga White
 - Bianca
 - Chardonel
 - Esprit
 - Swenson White
 - Catawba
 - Niagara
 - *Riesling

Installation

- Order of Installation
 - Are you installing irrigation?
 - Do you plant the plants first or put in the trellis system first?
- Prune newly set plants to 2-3 buds
- Prune the roots back by a 1/3 and remove any broken ones
- Water them in as soon as possible
- Place growth tubes (if using)

- Eliminate Stress
 - Minimize weed competition
 - Irrigation
 - Nitrogen fertilization
 - Remove clusters

Training Vines Year One

- Train up string or stake to cordon wire, removing laterals up to 6-8" below cordon wire
- Allow trunk to grow 8-12 inches above cordon wire
- Prune shoot 3-4" below cordon wire
- Select two laterals for cordons and train in opposite directions down the wire
- Allow cordons to extend 12" beyond the halfway mark between vines, then prune back
- Position shoots arising from new cordons

Training Vines Year Two

- If trunk growth was poor, prune back to 5/16"-3/8" diameter
- If trunk growth was *very* poor, prune back to 2-3 bud stub and treat as newly-planted vine
- Remove shoots from trunks
- On high-cordon systems, only retain laterals that develop on lower area of cordon
- On VSP and Lyre systems, rub off young shoots developing on lower area of cordon

Concept

"Canopy management is the practice which results in the modification of position or amount of leaves, shoot, and fruit in space to achieve a desired arrangement."

Dr. Richard Smart, co-author of
Sunlight into Wine

Principles Are The Same As For Vinifera Except

- Trellis selection
- Vigor of hybrids
- Soil fertility

Trellis Types

- Selection is dependent on
 - Soil fertility
 - Plant vigor
 - A plant's growth tendencies
- Upright plant growth
 - Low wire system

Shoot Positioning

- Ideal world - shoots are parallel to the trunk
- Real world - they grow parallel to the cordon with tendrils attached to the cordon wire
- Shoot positioning discourages lateral and horizontal growth
- Tucking
 - Generic term for positioning shoots upward
 - Used on
 - Low wire systems such as vertical shoot positioning (VSP)
- Combing
 - Generic term for positioning shoots downward
 - Used on
 - High cordon
 - Geneva double curtain (GDC)
- Combing/tucking
 - Used on
 - Vertically divided canopies
 - Scott Henry
 - Smart Dyson
- When
 - As soon as possible after bloom
 - And when shoots develop enough to avoid snapping or breakage

Cluster Thinning

- Cluster thinning helps promote long term benefit to the well-being and life span of the vineyard
- Some Cultivars may require cluster thinning
 - Seyval
 - Chancellor
 - Vidal
 - Chambourcin
 - Frontenac
- When
 - Two times
 - Pre Bloom
 - Removal of flower clusters
 - Post Fruit Set
 - Berry set will be less per cluster than
- Pre Bloom thinning
 - More time consuming
 - Yield, sugars, vine size and hardiness may be improved
- Post Fruit Set Thinning (75% canopy development)
 - Remove all clusters from shoots less than 12 inches long
 - Leave one cluster per shoot for shoots 12 inches to 24 inches long
 - Leave two clusters per shoot for shoots more than 24 inches long

Leaf Removal

- Two goals to be accomplished
 - Improved air movement and spray penetration
 - Improve sunlight exposure to the fruit and basal buds
- On the sunny side of the canopy
 - Is completely avoided or very minimal
- On the shady side of the canopy
 - Two or three leaves are removed around the base of each shoot or cluster
- Should be performed after fruit set.
- Should be avoided after véraison as this may lead to fruit sunburn.

Shoot Hedging and Skirting

- Removal of shoots that grow beyond their allocated space.
 - Hedging
 - Used on upward trained shoots (VSP, Smart Dyson or Scott Henry)
 - Skirting
 - Used on downward trained shoots (High Cordon or Geneva Double Curtain)
- When
 - Shoots grow beyond their allotted space
 - They impede daily vineyard practices
 - Should not be done after véraison