

# **Help in Addressing the Challenges to Entering the Vineyard and Winery Industry**

## **Part 3**

**Iowa State University  
Value Added Agriculture Program**

**United States Department of Agriculture  
Risk Management Agency**

Dr. Paul Domoto

Department of Horticulture  
Iowa State University  
domoto@iastate.edu

# Planning to Start a Vineyard?



## Potential for a new enterprise:

- Determine if your site is suitable for a vineyard.
- Determine if there is a market for grapes in the area.
  - Winery (private, cooperative, or build your own)
  - Other outlets: Farmer markets, grocery stores, hobbyist.
- Select cultivars to plant.
  - Adaptation to your specific conditions.
  - Use (wine, table, juice, jam & jellies) & demand.
- Plant the vines, establish trellis & begin training.
  - Financing
- Develop a good management program.
  - Time available
  - Cultural practices

# Is your site suitable for grapes?

Climate	Topography	Soils
<ul style="list-style-type: none"><li>• <b>Winter Temperatures *</b></li><li>• Spring Frosts</li><li>• Length of Growing Season</li><li>• Growing Degree Days</li><li>• Precipitation</li></ul>	<ul style="list-style-type: none"><li>• <b>Elevation</b></li><li>• Degree of Slope</li><li>• Direction of Slope</li></ul>	<ul style="list-style-type: none"><li>• <b>Drainage</b></li><li>• Moisture Holding Capacity</li><li>• pH</li><li>• Fertility</li><li>• Organic Matter</li></ul>

# Winter Temperatures

Determine what cultivars can be grown  
& how productive they will be.

**Cane buds** are the most tender portion  
of a grape vine.

- **A compound bud with the potential to produce 3 or more shoots.**
  - **1° bud: The most productive.**
  - **2° bud: Less productive; varies with type & cultivar.**
    - American types 50% or less productive
    - French hybrids 60-80% as productive.
  - **3° bud: Very un-productive**



## Classification of Vine Hardiness

Based on the temperature at which injury begins to occur

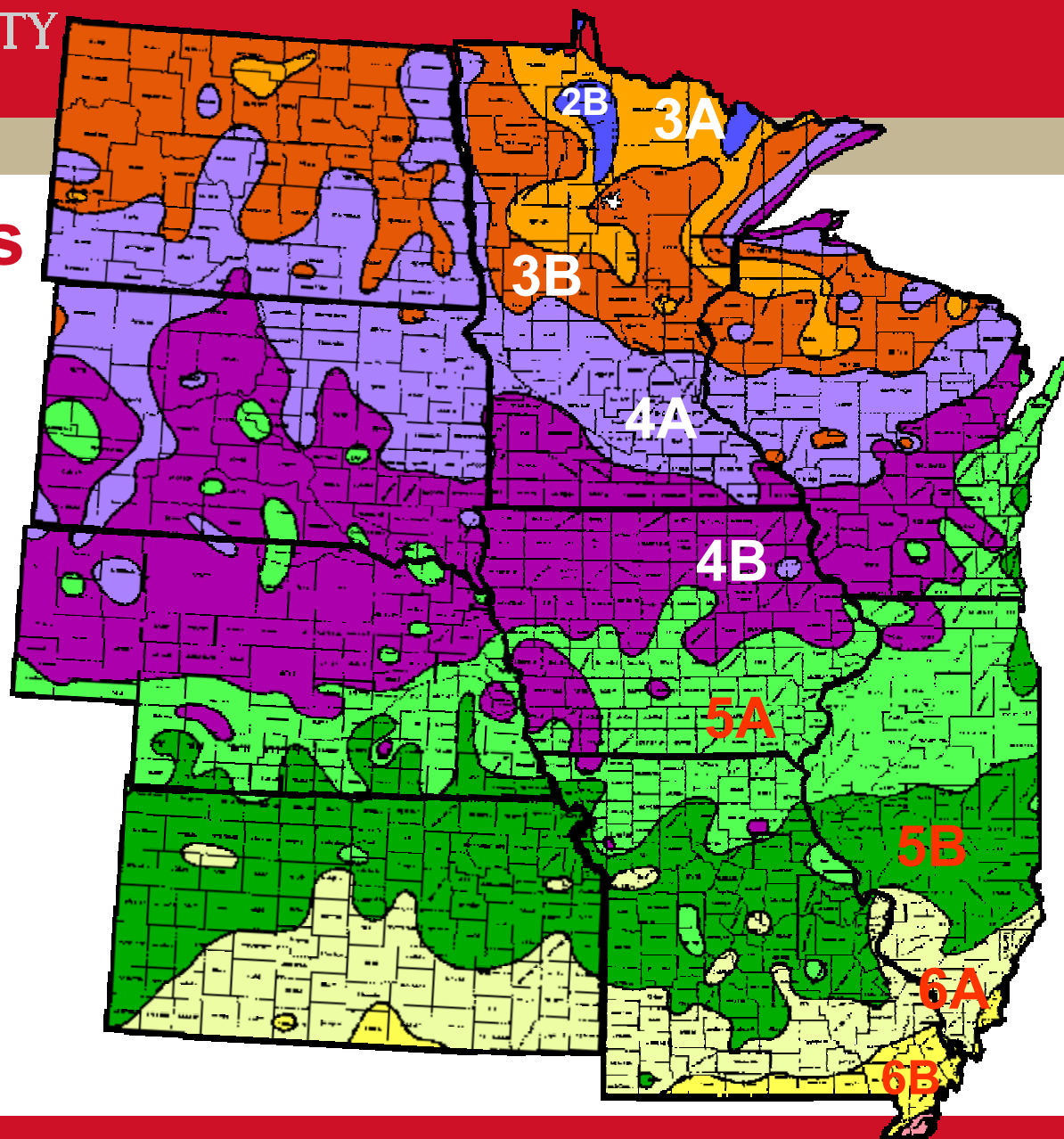
Temp. (F°)	Category	Suitable Type
$\geq 0$	Very cold tender	Almost any.
- 5	Cold tender	Most northern <i>vinifera</i> .
- 10	Moderately Hardy	Hardy <i>vinifera</i> , moderately hardy French hybrids.
- 15	Hardy	Hardy French hybrids, most <i>labrusca</i> .
$\leq - 20$	Very hardy	Hardy <i>labrusca</i> , most <i>riparia</i> hybrids.



# USDA Hardiness Zone Map

Zone	Avg. Min. Temp
------	-------------------

2B	-40 to -45 F
3A	-35 to -40
3B	-30 to -35
4A	-25 to -30
4B	-20 to -25
5A	-15 to -20
5B	-10 to -15
6A	-5 to -10

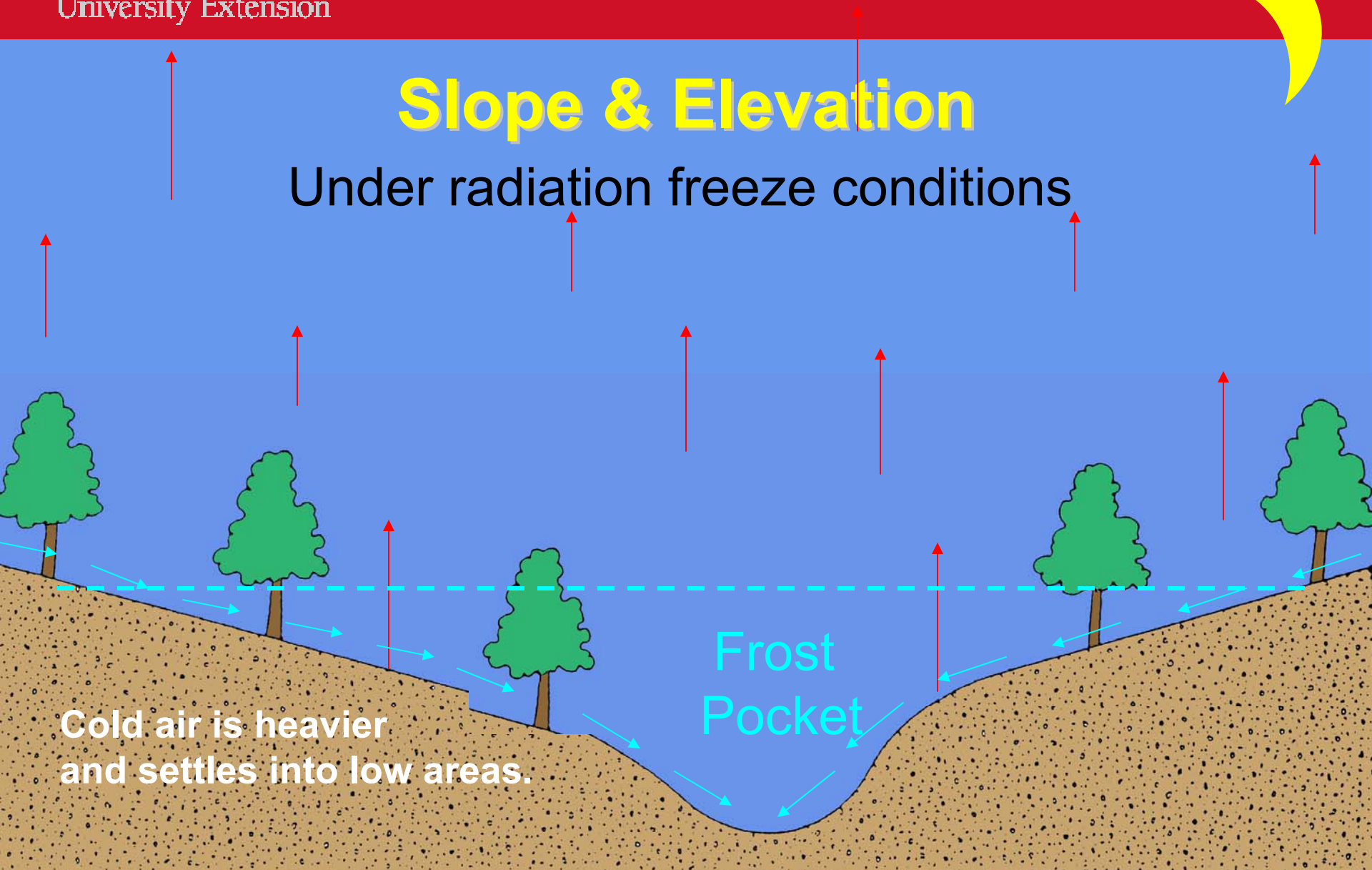






# Slope & Elevation

Under radiation freeze conditions

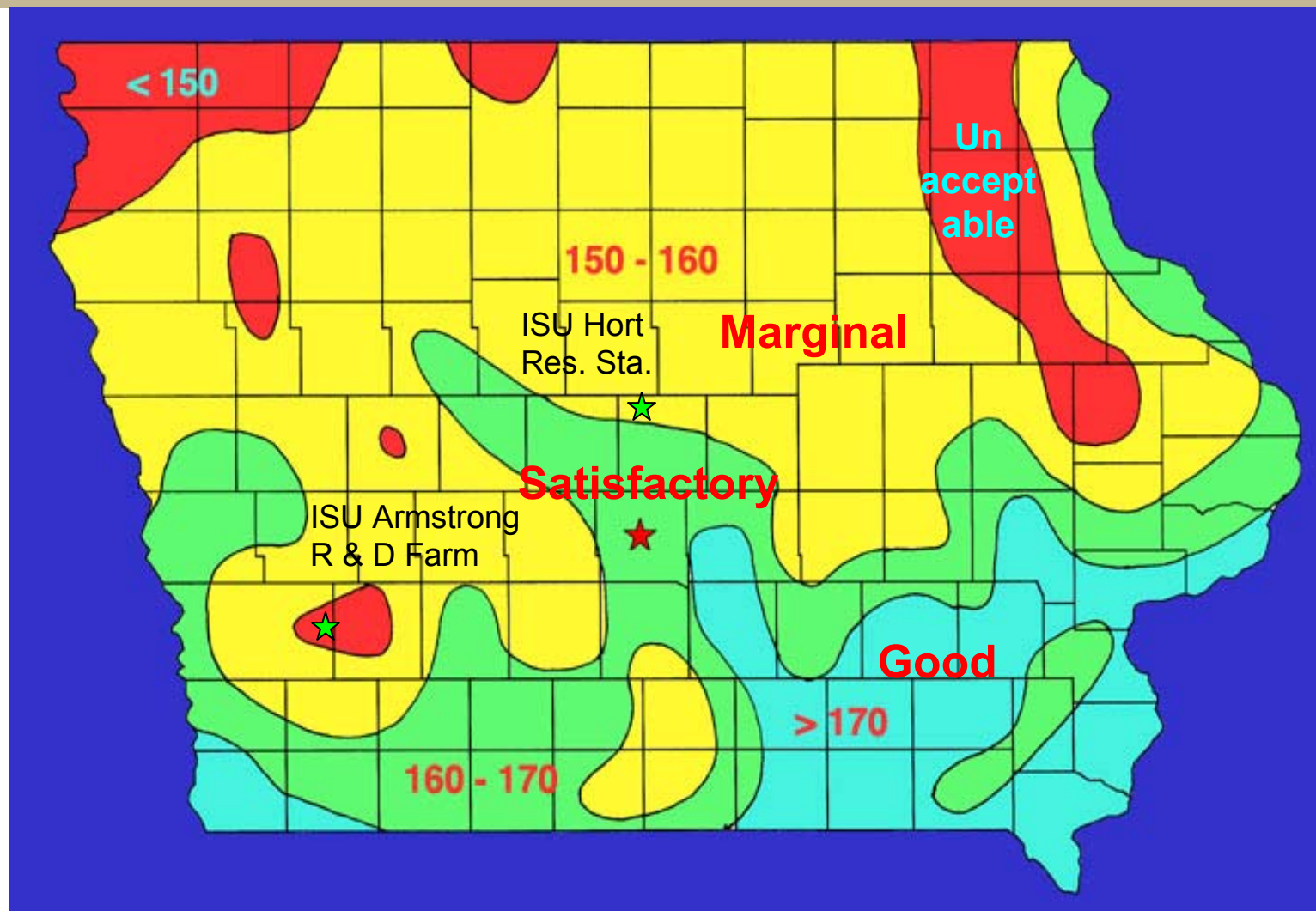


Cold air is heavier  
and settles into low areas.

Frost  
Pocket

## Length of the Growing Season

Frost-Free Days	Suitability for Grapes
< 150	<b>Unacceptable</b>
150 to 160	<b>Marginal:</b> Only early season maturing varieties.
160 to 170	<b>Satisfactory:</b> Early & most mid-season maturing varieties.
170 to 180	<b>Good:</b> Early, mid-season & some late-season varieties.
> 180	<b>Excellent:</b> Most varieties.



**Frost Free Days for Iowa  
& location of 2 research farms.**



## **ISU Armstrong R&D Farm Vineyard**

### **Elevation:**

- **Reduces the risk of spring & fall frosts.**
- **Extends the growing season.**
- **Protection from low winter temperatures.**



## Growing Degree Days

Region	Degree Days*	Suggested Varieties for the Midwest
I	$\leq 2,500$	Very early ripening varieties.
II	2,501 to 3,000	Early, and early mid-season varieties.
III	3,001 to 3,500	Early, mid-season, and some early late-season varieties.
IV	3,501 to 4,000	Most varieties.

\* Base 50° F; Degree day = ((daily high + low) / 2) – 50

# Precipitation



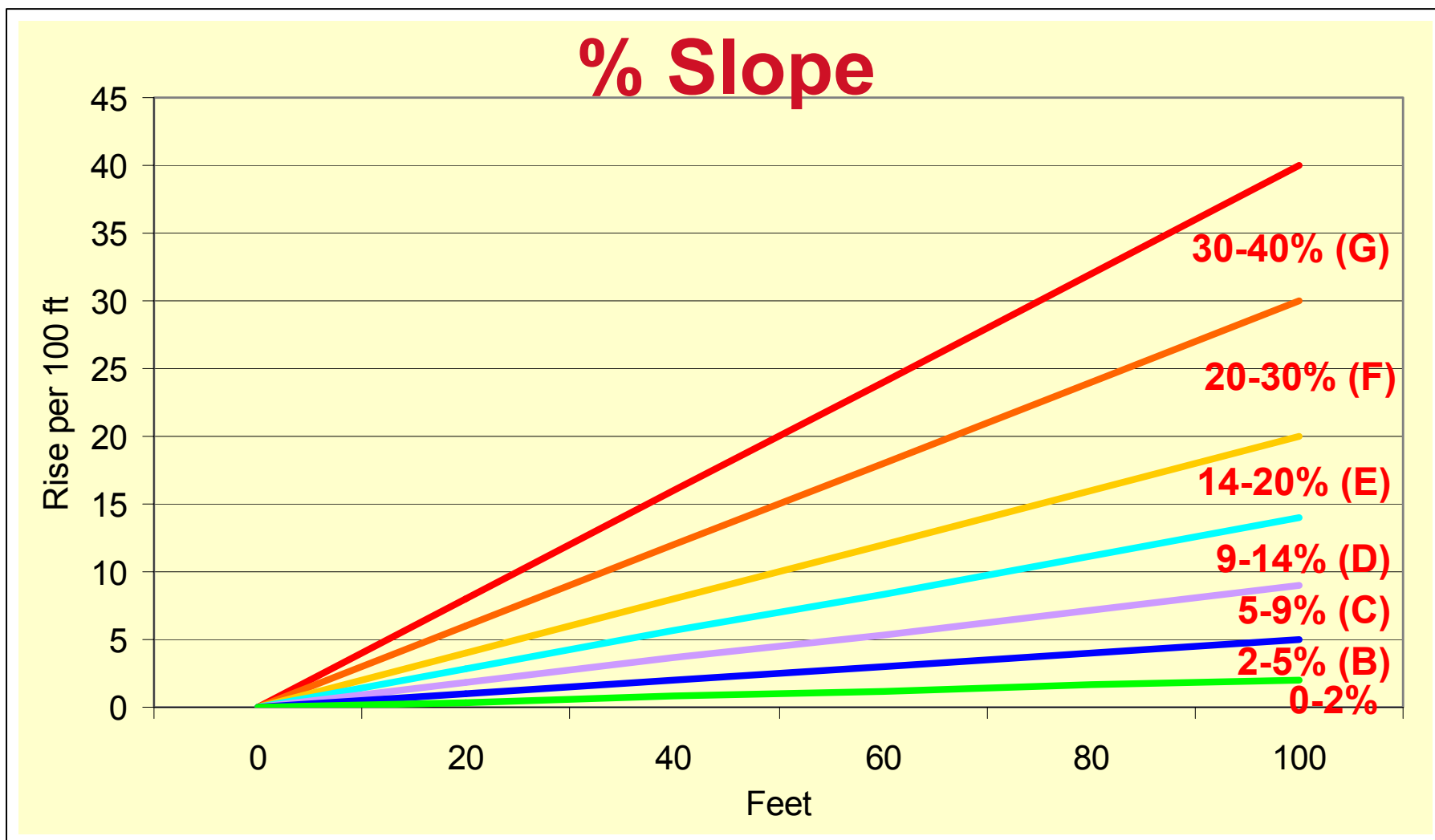
## 1-inch per week

- Varies with:
  - a. Frequency of rain fall
  - b. Rooting depth of the crop
    - Grapes are deep rooted.
  - c. The soil's moisture holding capacity.
    - Soil Texture
    - Soil depth
  - d. Temperature, relative humidity, & wind as they affect transpiration.
  - e. How the soil surface is maintained.

## Degree of Slope

- Soil moisture
  - Infiltration
  - Surface runoff
- Air drainage of frost protection.
- Soil erosion
- Cultural practices





## Direction of the Slope

Growing Condition	N	S	E	W
Available Sunlight	Lowest	Highest	Int. +	Int. -
Accumulation of Heat Units	Lowest	Highest	Int. -	Int. +
Need for Water	Lowest	Highest	Int. -	Int. +
Risk of a Spring Frost	Lowest	Highest	Int. -	Int. +
Risk of Fluctuating Winter Temperatures	Lowest	Highest	Int. -	Int. +

## **Direction of the Slope can be used to an advantage**

- Sequence harvest
  - Within a variety
  - Between varieties
- When the length of the growing season is marginal, plant the latest maturing varieties on a south-facing slope.

# Soil Selection Factors

- Internal Drainage
- Moisture Holding Capacity
  - Texture
  - Depth
- pH
- Fertility

# County Soil Surveys

- Soil Series Description:  
Texture, Drainage, Fertility, Erosion
- Soil Profile Classification:  
Structure
- Table of Engineering Index Properties:  
Soil texture classification by depth
- Table of Physical & Chemical Properties:  
Permeability, Available water holding capacity, Organic matter content

## Chances of Success are Limited Under Conditions of Poor Internal Soil Drainage



*Internal drainage is the most important factor  
for determining if a site is suitable for grapes.*

## Reasons for Poor Soil Drainage

- Poor surface runoff
  - Slope
  - Depressions
- Lateral seepage
  - On slopes
  - Textural change
- Texture
  - High clay content

- Impervious layer in substrata
  - Clay layer
  - Compacted layer
  - Abrupt textural change
- High water table



# Soil Drainage Classification

Very poorly drained	AVOID
Poorly drained	Avoid
Somewhat poorly drained	Marginal
<b>Moderately well-drained</b>	<b>Suitable</b>
<b>Well-drained</b>	<b>Ideal</b>
Excessively drained	Marginal

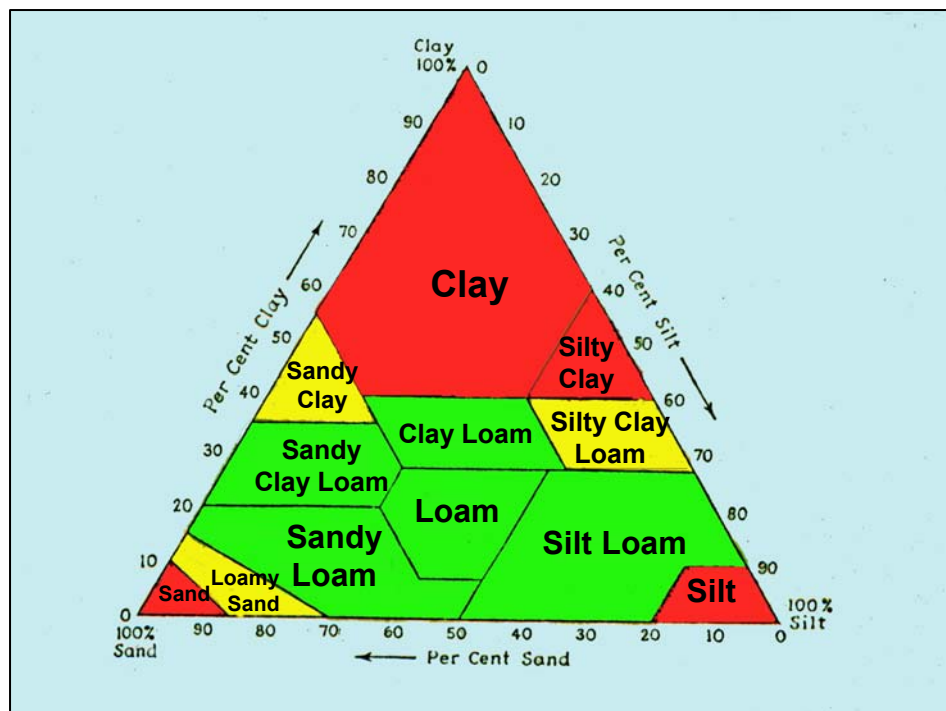
# Moisture Holding Capacity

## Soil Texture + Soil Depth

*Determine the need and frequency of irrigation.*

### Available Moisture

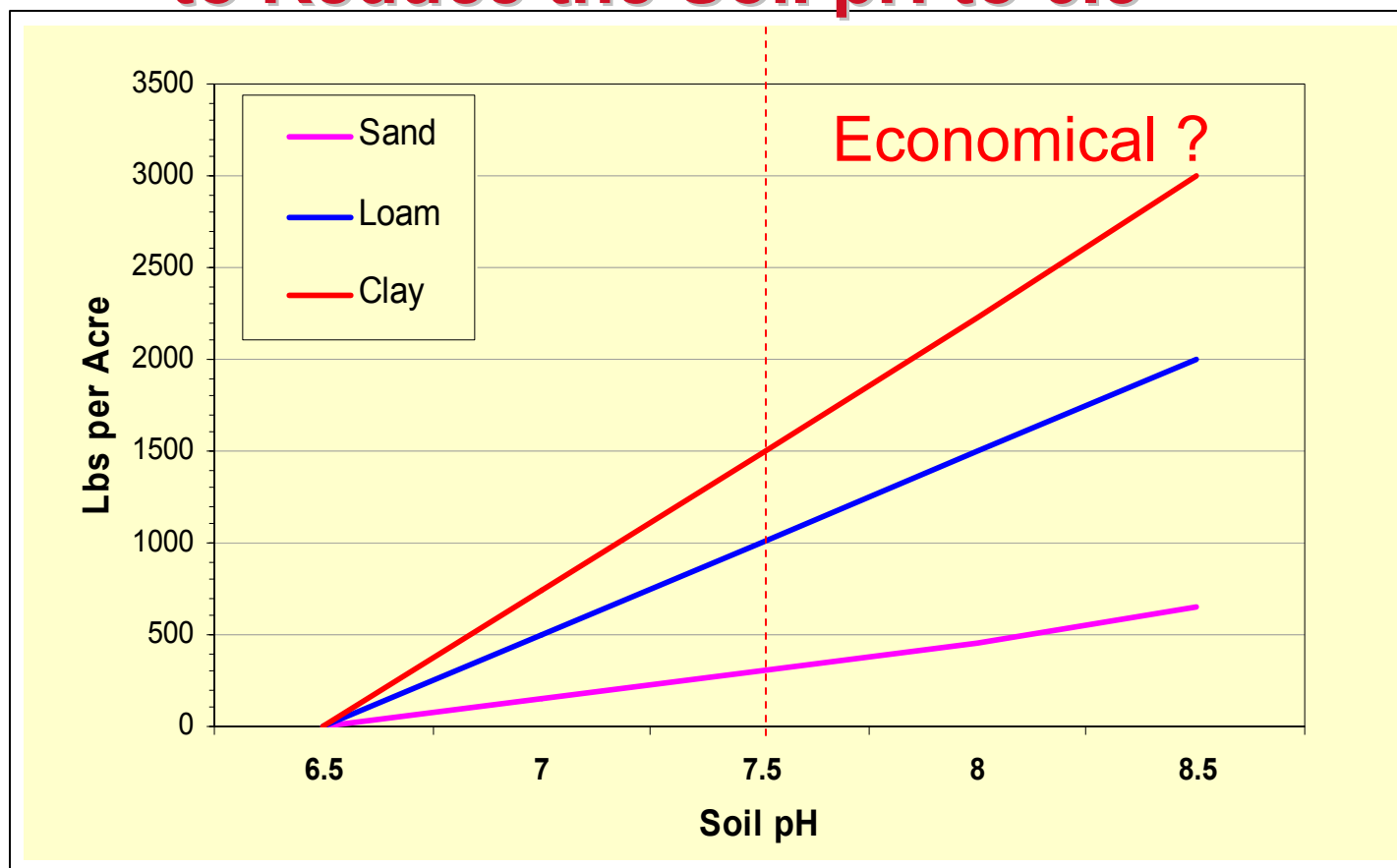
Texture	Inches Per foot
Sand	0.5
Loamy sand	1.0
Sandy loam	1.5
Loam	2.0
Silt loam	2.5
Clay loam	2.5
Clay	2.0



## Soil pH for Grapes

- **Desired range:** 5.5 to 6.5
  - American: 5.0 to 6.5 (~ 6.0 optimum)
  - French Hybrid: 5.5 to 6.5; (6.0 to 6.5 optimum)
    - **Will tolerate a pH up to ~ 7.0**
- **Adjust Soil pH:**
  - Below 6.0: bring up to 6.0 or 6.5 with lime.
  - Above 6.8: consider lowering to 6.5 or 6.0 with sulfur, or using acid forming fertilizers (ammonium sulfate).

## Sulfur Requirement to Reduce the Soil pH to 6.5



# Iron Chlorosis



Photographed by Eli Bergmeier

## Soil Fertility

- **Least concern when selecting a site.**
  - Can amend the soil.
- **Midwest Soils: Concern for**
  - **P** Low in many soils.
  - **K** Grapes have a high requirement for K.
    - K can be tied up under non-cultivation as would occur in a vineyard.
  - **Mg** High Mg in the soil can inhibit the uptake of K.
    - Many Midwest soils are dolomitic in nature.
  - **Zn** Grapes have a relatively high requirement for Zn.
    - Many midwest soils are low in Zn.

## Pre-plant Soil Test

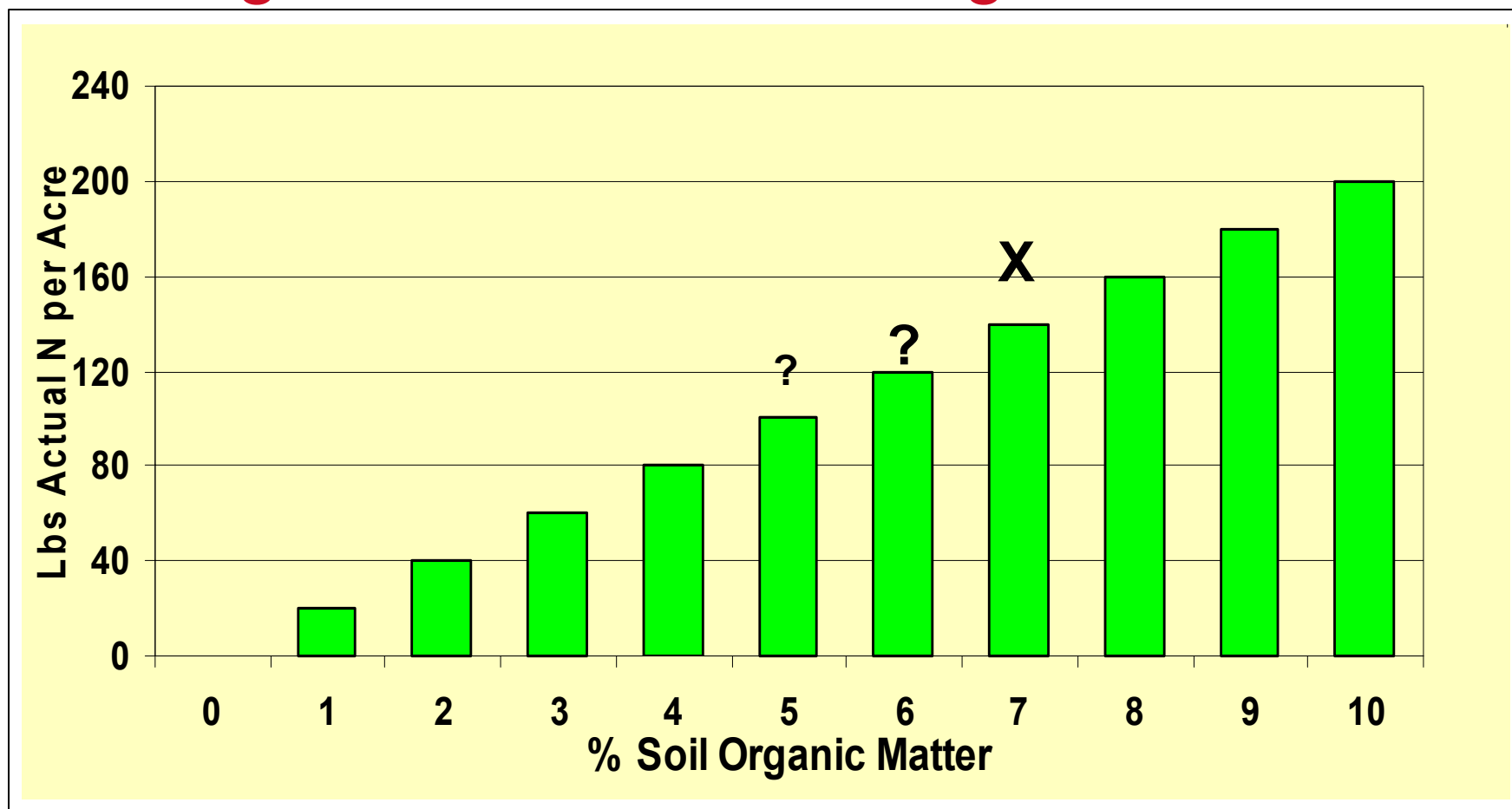
- Test for: **pH, P, K, Zn, Mg, O.M.**
- Submit serial samples collected from 2 depths:
  - 0 to 6 inch depth.
  - 6 to 12 inch depth.

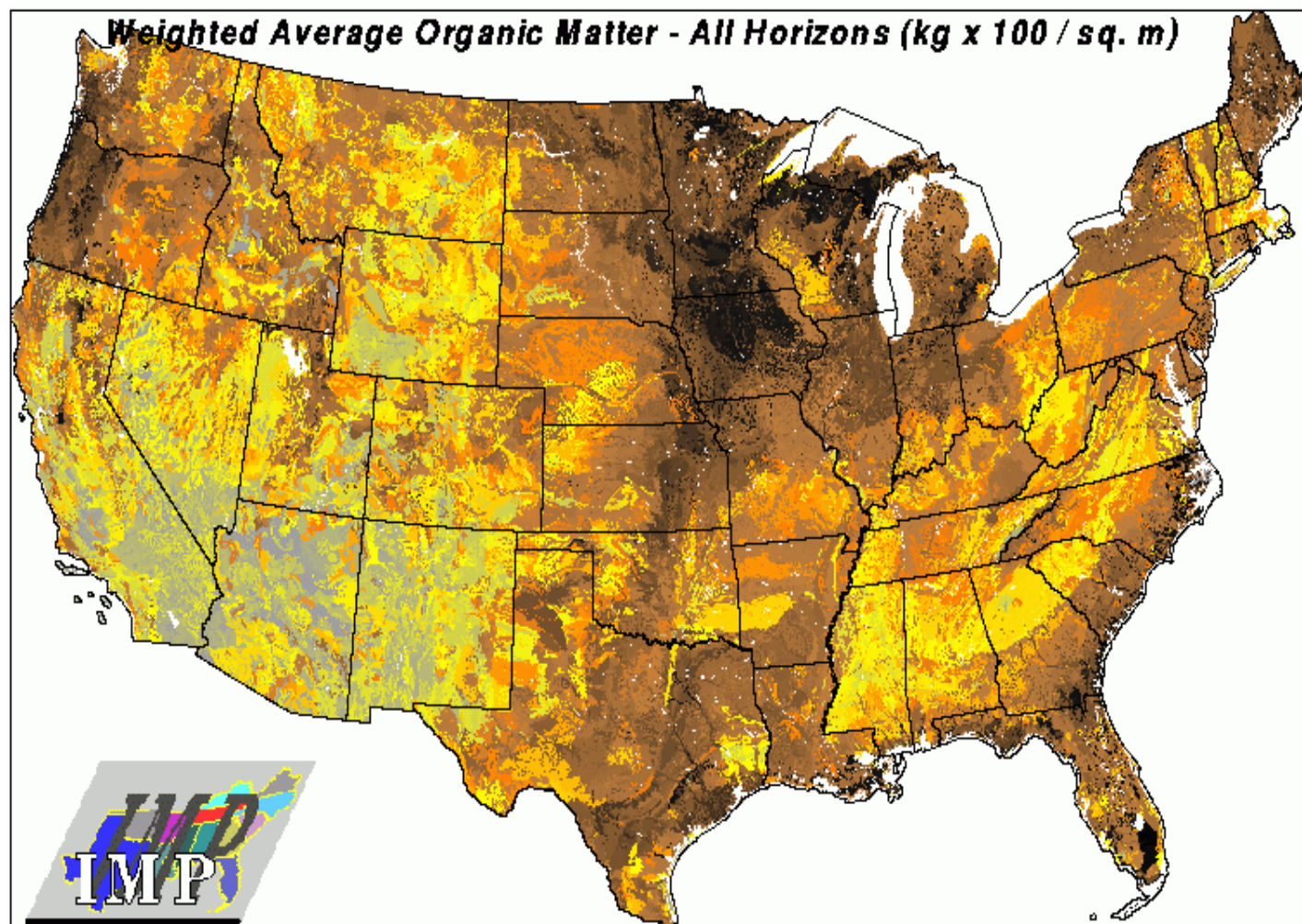


## Soil Organic Matter

- Improves soil structure, moisture retention and fertility.
  - 2 to 3% is considered ideal for grapes.**
- **Midwest Soils:**
  - Range from < 1% up to 20%
  - Well-drained soils in the 3 to 4% range
  - OM is higher in poorer drained soils.
- **Grapes grown on high organic soils tend to be less winter hardy.**
  - Release of N from organic matter.  
**20 lb N / % OM / Ac / Yr**

## Nitrogen Released from Organic Matter





## Cultivar Selection

- **Intended Use (Market):**
  - Fresh
  - Juice / Jam / Jelly
  - Wine
    - Sell to a winery
    - Establish your own winery

## Cultivar Selection for Wine

### Sell to a Winery:

- What adapted cultivars do the wineries want?
  - Proven cultivar
  - New cultivar
- How much do they want?
- Are they willing to develop a long-term contract?

### Establish a Winery:

- What do customers want?
- What adapted cultivars make quality wine?
- What styles of wine do I want to make?
- How much risk am I willing to take?
  - Cultivar adaptation
  - New cultivars

***Develop a sound business / marketing plan before planting!***



## Cost of Establishing a Vineyard





# Winery and Vineyard Feasibility Workbooks

Created September 2005

The Cost to Establish a Vineyard workbook is designed to report all the income and expense of a one-acre vineyard for up to 13 years. There are three different vineyard workbooks, each for a different trellis style.

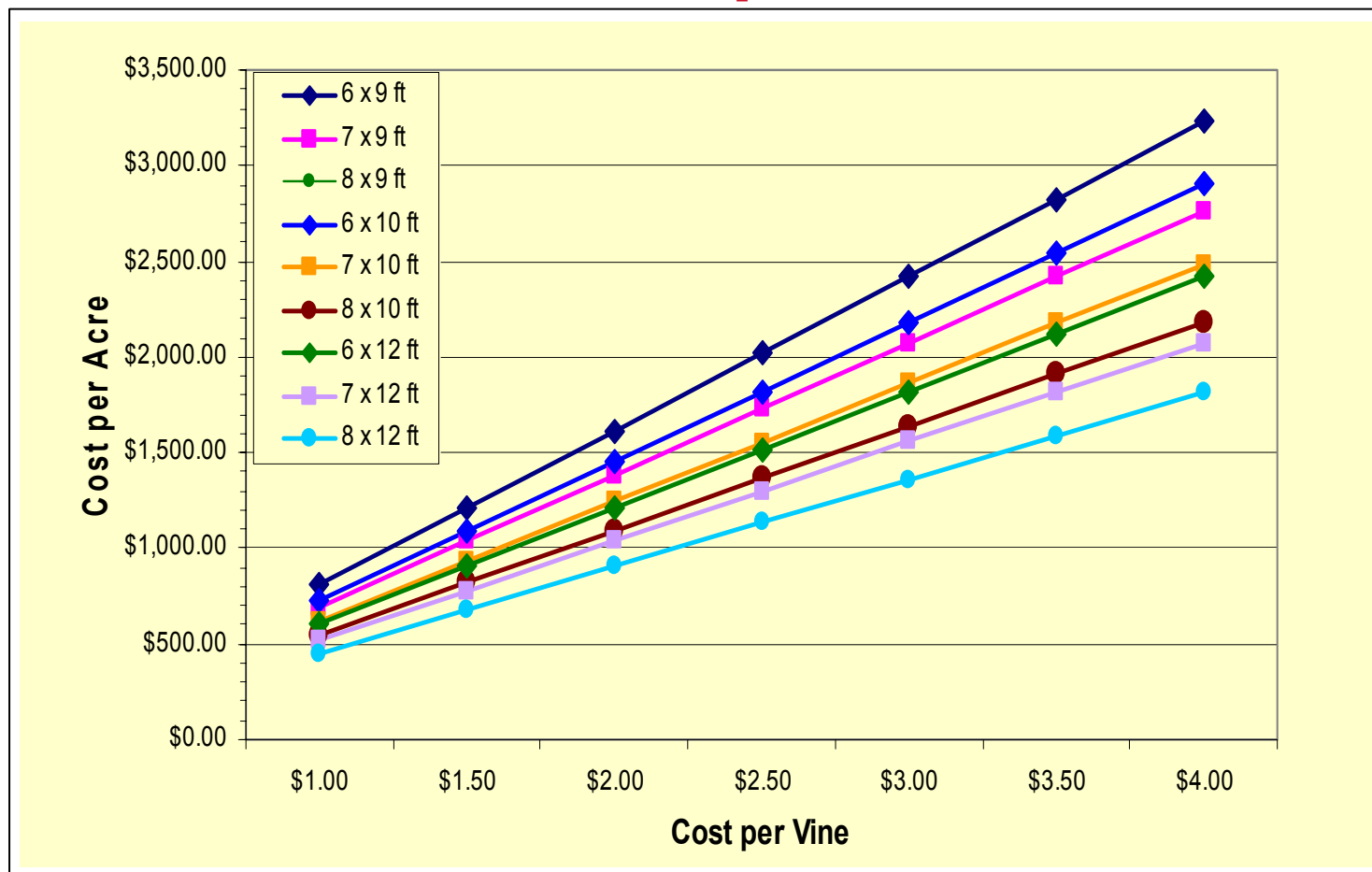
- High Trellis
- Geneva Double Curtain
- Vertical Shoot Position
- [Winery Ten Year Financial Planning Workbook \(version 5\)](#)
  - Errors in the asset worksheet of version 1 were found in Column J that may affect the total investment. If you are using version 1 please check the numbers in cell J35, J49, and J185. Also check to see if the numbers add up correctly on line 181.
- [Estimated Vineyard Establishment with a High Trellis and Production Cost Per Acre](#)
- [Estimated Vineyard Establishment with a Geneva double Curtain and Production Cost Per Acre](#)
- [Estimated Vineyard Establishment with a Vertical Shoot Position and Production Cost Per Acre](#)



# Factors Affecting the Cost of Vineyard Establishment

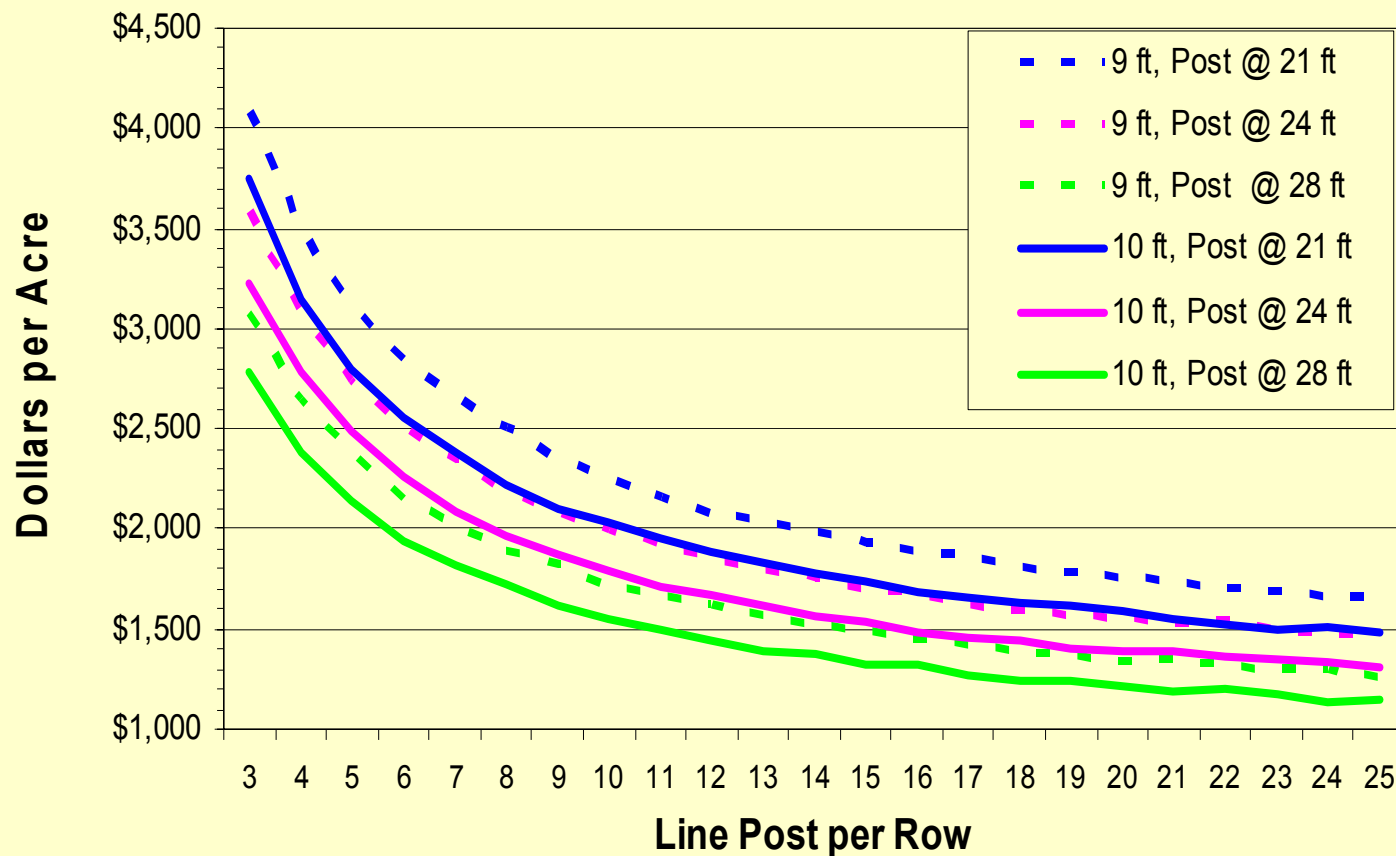
- Vine spacing (number per acre)\*
- Cost of the vines\*
- Method of planting
  - By hand, w/ an auger, or planting machine
- Length of the rows\*
- Line post spacing (post per acre)
- Method used to install the line post
  - Post driver, or post hole auger
- End post design (Anchored vs H-Brace)
- Number of wires per row (training system)

## Vine Cost per Acre



*Based upon vine spacing.*

## Cost of Trellis Materials per Acre



*Based upon row width and line post spacing.*

# Trellis Systems

Single curtain Bi-lateral Cordon



6-cane Kniffen



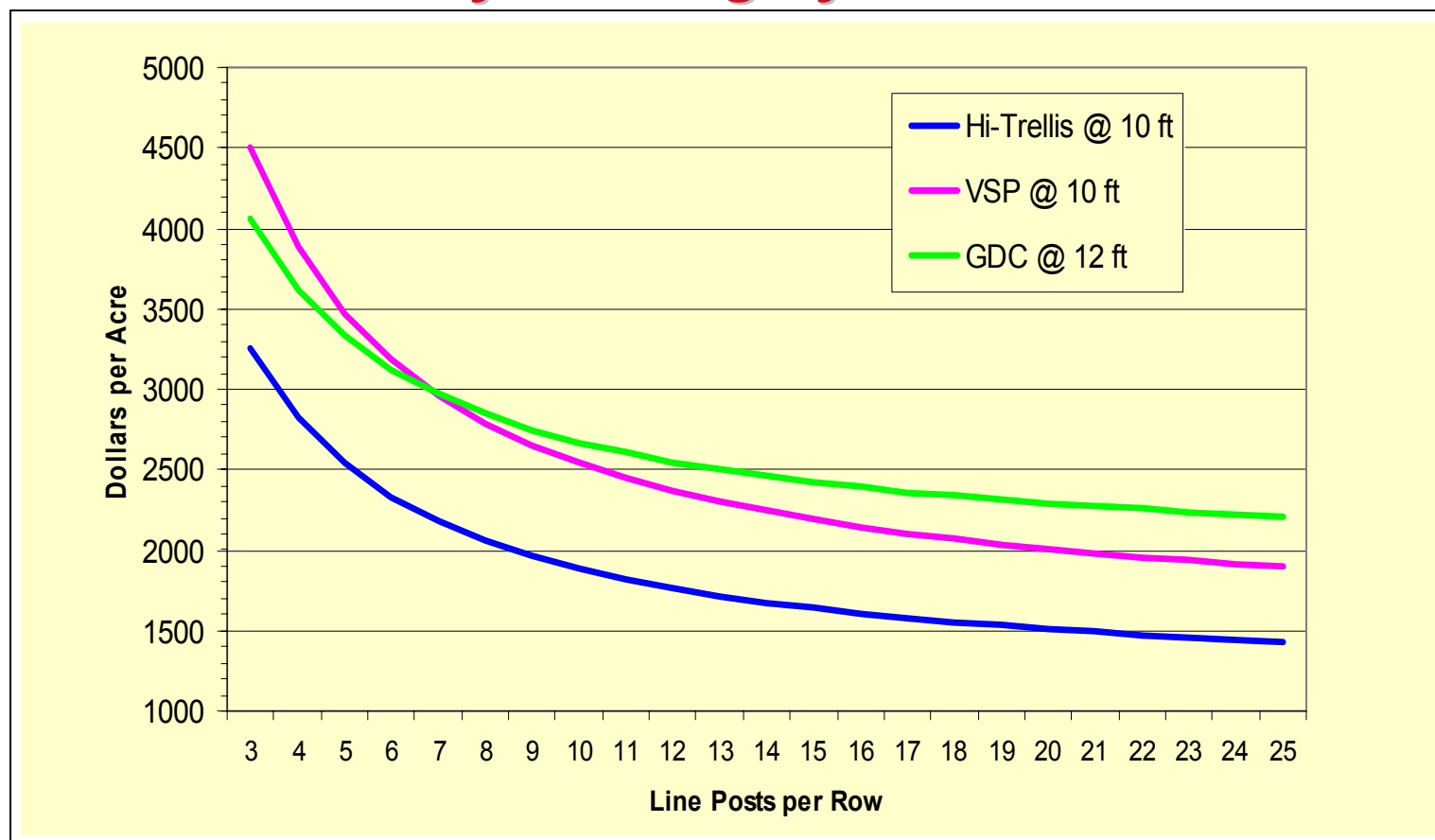
Vertical Shoot Positioning (VSP)



Geneva Double Curtain



## Cost of Trellis Material per Acre by Training System\*



\* With an H-brace end post system.

# Vineyard Establishment Workbooks\*

## Systems:

- Single curtain bi-lateral cordon (Hi-Trellis)
  - 10 rows/A @ 432 ft
  - 10 ft row spacing, 8 ft vine spacing (545 vines/A)
  - 2 wires
- Geneva Double Curtain (GDC)
  - 12 ft row spacing, 8 ft vine spacing (453 vines/A)
  - 8 rows /A @ 432 ft
  - 3 wires + cross arms
- Vertical Shoot Positioning (VSP)
  - 10 ft row spacing, 8 ft vine spacing (545 vines/A)
  - 10 rows/A @ 432 ft
  - 7 wires

## Cultural Practices

### March/April

- Inspect buds for winter injury
- Pruning, tying & brush removal
- Pre-emergence weed control
- Fertilize
- Dormant lime sulfur

### May

- Disease & insect control
- Suckering
- Shoot thinning?
- Tying & training young vines
- Shoot positioning VSP

### June

- Cluster thinning?
- Disease & insect control
- Shoot positioning VSP
- Tying young vines

### July

- Disease & insect control
- Shoot positioning
- Post emergence weed control
- Shearing shoots
- Tying young vines
- Collect petiole sample



## Cultural Practices

### August/September

- Install bird netting
- Disease & insect control
- Begin testing maturity
- Leaf pulling, lateral shoot thinning?
- Shoot positioning & shearing VSP
- Harvest

### September/October

- Remove bird netting
- Check soil pH

### November – March

- Winterize equipment
- Repair trellis
- Plan for the next season

