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Vineyard Design

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Vineyards should be designed to achieve the following goals:

- Develop maximum bearing potential per acre in a minimum amount of time
- Optimize vine performance
- Prevent soil erosion
- Facilitate management of vine canopies
- Facilitate equipment operation

A plan of the prospective vineyard showing the location of rows, roads, and storage or work shed should be drawn up. Large fields should be divided into blocks of suitable size using surveying instruments. Main avenues and head-alleys should be 20 feet or wider to give farm machinery room to turn around. Usually, space equal to the row spacing is allowed on all sides of a vineyard block for normal farm operations. In very large vineyards, large blocks are separated by wide avenues to allow for air movement.

Direction of rows

Factors important in deciding the direction of rows are:

- Need for optimum light exposure
- Slope of the land
- Wind speed

Vineyards with rows running North-South intercept more light than to East-West rows. Light interception is greater for tall and closely spaced North-South rows. At windy sites, the rows should be parallel to the wind. East-West running rows should be used for raisin vineyards so that grapes placed on the ground to dry between the rows will receive the maximum amount of light.

Row spacing

One fallacy common to novice vineyardists is the notion that row spacing must conform to the requirements of the existing farm equipment. On the contrary, new planting should be at ideal spacing, and new equipments should be obtained as needed. If well planned, the new vineyard will outlast several sets of equipment, so equipment should be tailored to the vineyard. Vineyard tractors, sprayers and tillers have been designed for narrow vineyard culture. Full powered tractors are available with 3-4 feet overall widths. With any projected planting, be certain the right equipment is available before planting.

Row spacing depends in part on the proposed training and trellising system to be used in the vineyard. Nine to 10-foot spacings between rows are common and generally sufficient, but 11 or even 12 feet between rows may be needed to accommodate divided training systems (e.g. Geneva Double Curtain), steep slopes. In general, as distance between rows increases, yield per acre decreases.

Vine spacing

The relative spacing of vines in the row has traditionally been determined by the expected vine size and vegetative vigor of a particular cultivar. The close spacing of vines in the row increases the number of buds per unit area of land. This will produce a yield increase up to a point where shoot crowding and shading will begin to reduce the fruitfulness of the vines. The vines can certainly support up to 8 buds per foot of row, however, recent research has shown that if more than 6 shoots per shoot of row are retained, juice quality and winter hardiness are adversely affected. Spacing American and French-American hybrid vines in the row at 8 feet apart has proven satisfactory for average conditions. For vinifera vines, spacing them 7 feet in row has proven satisfactory. Highest yields generally have been obtained from vineyards containing 600 or more vines to the acre. Ideal spacings for American and French-American vineyards with single-canopy training systems are 8' × 9' (605 vines/A), and for vinifera vineyards 7' × 8' (778 vines/A). Increasing the row spacing over 10 ft initially decreases the establishment costs. However, row spacings over 10 ft will require the grower to push an additional 1000 cubic feet of air per second to provide adequate spray coverage for pest control, thus increasing operating costs. To calculate how many vines will be needed per acre see Table 1 below.

Table 1. Number of vines needed per acre based on Vine × Row spacing

Vine spacing (feet)	Spacing between rows (feet)					
	7.5	8.0	8 ½	9.0	9 ½	10.0
5	1162	1089	1025	968	917	871
6	968	908	854	807	764	726
7	830	778	732	691	655	622
8	726	681	641	605	573	545

Laying-out the vineyard

Various rectangular patterns proves to be satisfactory because more plants, hence earlier bearing surface can be put in the row. Another advantage to laying out the vineyard in rectangular spacings is reducing the amount of turns a tractor operator will have to make driving down longer rows thus having to make less turns, versus a vineyard laid out in a square pattern. The size of the field, topography, irrigation system chosen, and soil type determine the row length. On heavy soils, row length can be up to 700 ft. With drip irrigation the length of rows ranges from 300 to 600 ft. With sprinkler irrigation, rows can be up to 1000 ft long provided that head assemblies of the rows are strong enough to carry the load. Drip irrigation is recommended in Kentucky to reduce foliage wetting and disease incidence.

A planting to be laid out in a regular pattern is started by establishing a straight baseline. Usually, this is next to a fence or roadway. Next, establish lines at right angels to the base at both ends and 1 or 2 places in the middle of the plot. Right angles are easily established by using 3 chains (ropes or wires) whose lengths are in 3:4:5 proportions. For

example, using lengths of 30, 40, 50 feet, the 40 feet length is placed on the baseline, with the 30 feet piece at approximate right angles. The 50-foot piece is then laid to close the triangle. The 30-feet piece is adjusted in either direction to just touch the end of the 50-feet piece. In this arrangement, the 30-foott piece is at right angles to the base line. Upright markers are then placed along the base line and the right angle lines to extend these lines (Figure 1). From this point on, any desired row and vine spacing can be established using a steel tape or marked rope to measure them. Small stakes or flags can be used to mark the locations for holes or locations to drive in the posts (Figure 2).

Figure 1. Marking row and vine spacings at right angles

Figure 2. Driving in posts at marked locations