A study of nine commercial vineyard pruning operations covering some 3600 acres in four counties has shown that the manpower requirement for pruning was reduced an average of 30% during the 1965–66 season, when the use of pneumatic pruning machines was compared with conventional hand-pruning methods. A dollar savings averaging about 15% of the cost of hand pruning was also achieved, even after an original investment in pruning equipment of $12.65 per acre.

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Two views of a tractor-mounted six-row pneumatic pruner working

A STUDY OF PNEUMATIC

. . . *and comparisons*

FOLLOWING THE RECENT INTRODUCTION of a variety of models of self-propelled pneumatic pruning rigs, growers with limited acreage wanted to know if they could justify the investment of additional capital to realize labor savings in their pruning operations.

The results of this study are based on grower records from three Thompson Seedless raisin vineyards, five vineyards of mixed spur-pruned wine varieties, and one table grape vineyard of Emperors in Fresno, Tulare, Kern, and San Bernardino counties covering some 3600 acres of vines, which were carefully analyzed for comparisons between hand and power pruning. The wine grape varieties in the study include: Black Malvoisie, Muscat of Alexandria, Aleatico, Nebbiolo, Pedro Ximenes, Sémillon, Trebbiano, Grenache, Palomino, Mission, Zinfandel, Mataro, French Colombard, Alicante Bouschet, Burger, Feher Szagos, Petite Sirah, and Valdepenas.

Of the three tractor-mounted and six self-propelled machines, three were constructed by growers, three were custom designed, and three were purchased as standard production models. Costs (including shears) varied from $3200 to $5700, or $311 to $533 per man (the high of $533 resulted from the purchase of an eight-row machine reduced to six, and the low of $311 where two foremen were employed). The original machine-per-acre cost ranged from $6.26 to $25.60.

Labor

The number of pruners per machine varied from 6 to 12, depending on the number of rows covered, except in one vineyard where two pruners per row were used. In all but two vineyard operations, at least one foreman was used in supervision and in helping the slower pruners. The foremen received a higher rate by about 20¢ per hour and this was included in the average. Observations readily indicate that a pruning machine is limited in forward speed by the pruning rate of the slowest man in the crew. Skilled supervision of a balanced crew is a key factor in the successful use of pneumatic pruners. With the 12-row machines, some growers have used an extra man to help a slow pruner in order to keep the crew moving, because the faster pruner tends to poke along at the slow man's pace. This plus the difficulty of getting a crew of 12 men of equal skill for the larger machines to prune every day are arguments for smaller units. A new man tends to slow down the experienced men. A good, fast pruner would rather work for a piece rate using hand shears because he sets his own pace.

An average of 400 acres were pruned with each machine in the study and they operated about 50 nine-hour days. The acreage pruned per machine during the season is a reflection of the machine size, the soil type, and the weather conditions. Unfavorable weather can be anticipated during the pruning season and interruptions are to be expected. On coarse-textured soils, rains will not cause much loss of time, but on the heavier or fine-textured soils, inability to move the machine may be a serious factor. This study indicates that in a 50-day season, one man could prune 38½ acres of spur-pruned wine grapes or 27½ acres of Thompson Seedless for raisins or wine. Thus a four-man pruner has a potential of handling 110 acres of Thompson Seedless. A grower with 200 to 250 acres of Thompsons might consider using one eight-man, or two four-man pruning machines.

Prepruning trimming of canes with tractor-mounted sickle bars or rotary cutters was used by three of the wine grape growers. Sufficient data are not available

Fresno County raisin vineyard. The machine, provided with a creeper transmission and using the middle furrow as a guide, moves down the row unattended.

PRUNING IN VINEYARDS

with hand pruning costs

to fully evaluate the effect of this practice on pruning efficiency, but the degree of savings, as reflected in fewer man hours per acre, strongly suggests advantages, especially in light of the low cost involved. Additional studies are needed in this area.

Machine rates

In the Thompson vineyards, machine pruning rates averaged close to 14 man-hours per acre as compared with 20 hours for hand pruning in the same vineyards, a saving of nearly 30%—with the spur-pruned wine varieties a 32% reduction was noted (12 man hours per acre versus 17, see table). The number of vines pruned per hour is not a good basis for comparing pruning performance among different vineyards since varying vine spacings give different vine populations per acre, and dissimilar levels of vine growth present varying degrees of pruning ease. Valid comparisons can be made between methods of pruning within the same vineyard where the amount of brush, the type of vine training, and the vine spacing are all similar.

Incentive payments were given by three growers and these varied from 50¢ to $1.00 per row (⅛ mile). No estimate of the impact of this type of bonus on worker productivity was possible. The whole area of the effectiveness of incentive payments to workers is open to further investigation. One grower in the study had discontinued the payment of a bonus based on output prior to the 1965–1966 season; those still using this method were not entirely sure of its value.

The cost of operating the machines, including the fuel, oil and lubrication, daily shear sharpening, annual shear overhaul, and general repairs, is a small part of the total cost of the machine, averaging about $1.41 per acre. Machine depreciation and interest on the capital invested, on the other hand, show a cost averaging $2.91 per acre. Operating costs, therefore, account for slightly more than 5% of the total cost of pruning with power shears, with 84% going to labor and 11% to depreciation and interest.

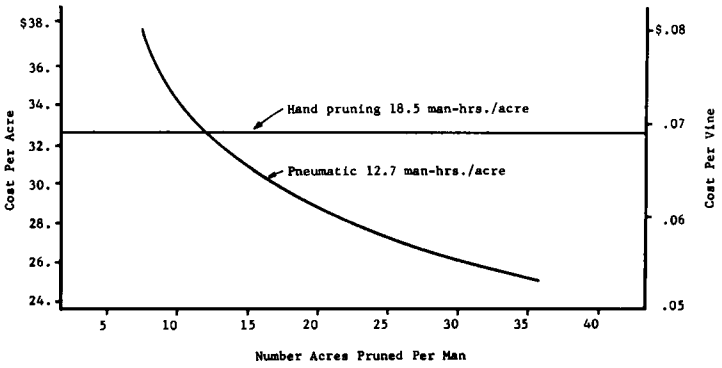
The depreciation schedule is based on five years, though this might be changed with more experience. One would expect, however, that the cost of repairs would also be increased if a more extended program were used. By using five years for depreciation, and an interest rate of 6% (applied to one-half of the initial investment), one can estimate the justification

SUMMARY OF PNEUMATIC PRUNING STUDY IN VINEYARDS, AVERAGES OF RECORDS

Serial numbers	Thompson Seedless 1, 2 & 3	Wine varieties* 4, 5, 7 & 8	All varieties* 1–5, 7–9
Machine haurs for season	426	456	444
Man hours per acre	13.9	11.6	12.7
Wage rate	$ 1.62	$ 1.74	$ 1.71
Vines per acre	500	466 Hand 444	472 Hand 461
Vines per man hour	36.0	40.2	37.7
Original cost of machine per acre	$ 18.67	$ 8.05	$ 12.65
COST PER ACRE			
Pre-prune trimming	..	$ 1.60	$ .80
Labor	$ 22.46	$ 20.24	$ 21.66
Machine operating including repairs	1.66	1.28	1.41
Total cash cost	$ 24.12	$ 23.12	$ 23.07
Machine depreciation	3.73	1.61	2.53
Machine interest	.56	.24	.38
Total cost	$ 28.41	$ 24.97	$ 26.78
COST PER VINE			
Labor	4.49¢	4.34¢	4.59¢
Total machine & trimming	1.19¢	1.02¢	1.08¢
Total cost	5.68¢	5.36¢	5.67¢
HAND PRUNING			
Man hours per acre	19.8	17.1	18.5
Cost per acre	$ 32.51	$ 30.56	$ 31.37
Cast per vine	6.50¢	6.88¢	6.80¢

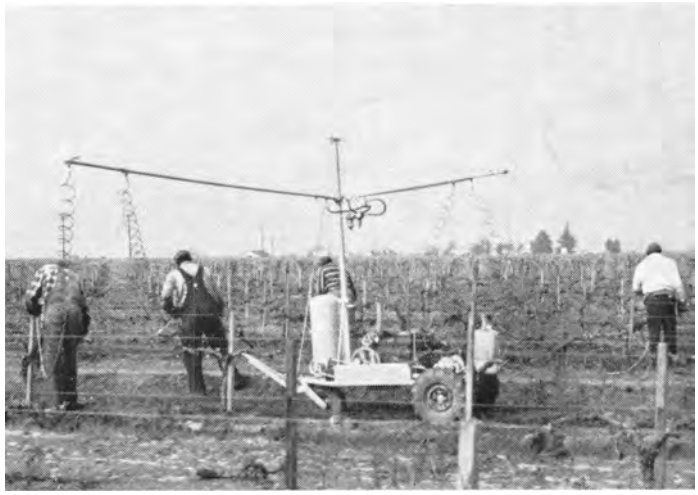
*Serial number 6 omitted from averages because twa men were used per row. Others were ane man per row.

PRUNING COSTS AS RELATED TO ACREAGE COVERED IN SEASON—HAND VS. PNEUMATIC



A comparison of pruning costs, based on the averages in the study, with the number of men per machine varying from 6 to 12.

A commercial four-man pruner in a Fresno County Muscat vineyard.



for the expenditure for a machine by calculating the investment per acre using a value of 23% of the initial expense divided by the number of acres. For example, an eight-row machine with an initial cost of $3200 would have interest and depreciation charges of $736 or $9.20 per acre, for 80 acres ($3200 × 23% ÷ 80).

With the addition of machine operating costs to this figure, a comparison with the cost of hand pruning might be made. While it is true that some of the operating costs, such as taxes and repairs, may not vary entirely according to the acreage, this is not an important factor in the analysis. Therefore, if we assume that the machine is going to last five years and that cash costs per acre, for all practical purposes, remain more or less constant regardless of the acreage pruned, then the total cost will vary according to the investment per acre. The minimum acreage is close to 15 per man—the break-even point. This would indicate a minimum of 60 acres for a four-man pruner or 150 acres for a 10-man machine.

The study clearly shows that, after all costs are considered, the use of pneumatic pruning resulted in higher costs in only one of the nine vineyards when compared with hand pruning. This occurred in vineyard No. 8; all the other vineyards showed a distinct dollar savings. The quality of the pruning work was not evaluated for any of the vineyard enterprises. It was acceptable to the growers involved though the standards of quality may have varied considerably among them.

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A comparison of 1x3x3-inch wafers and baled alfalfa hay for milk production

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IT HAS BEEN ESTIMATED that 100,000 tons of alfalfa were wafered in California in 1965. Each year for the past six years increased amounts of wafered alfalfa hay have been fed to dairy cattle. A new experimental wafering machine was tested in the summer of 1965. Windrowed alfalfa was picked up by the experimental wafering machine, sprayed with water, chopped, and channeled between two wheels. A smaller wheel with scalloped cutting portions operated inside a larger wheel to compress the hay into wafers about 1 × 3 × 3 inches in size.

Wafers from this experimental machine were compared with baled alfalfa hay in a feeding trial conducted in San Joaquin County. On June 1 and July 2, second- and third-crop alfalfa, respectively, was cut with a self-propelled swather. Six days later two windrows were baled and two windrows were wafered, alternating across a 40-acre field. Windrows on the sides and ends of the field were baled and not used in the trial. Samples taken at harvest time indicated that the moisture content of the baled hay varied from 11.5 to 14.1% and, for the wafered hay, from 9.8 to 15.3%. The wafers were delivered in a dump truck and stored in a bunker silo and baled hay was stored in a hay barn. On the basis of limited samples of stored wafers, fines amounted to 14% of the total weight.

Sixty high-producing Holstein cows in their second, or later, lactation and averaging 94.3 days post-calving (range from 26 to 149 days) were randomly assigned to one of two groups, after being paired according to lactation number, days in lactation, and previous and current production. One group was fed baled alfalfa