

White wine quality is sensitive to the temperature of the juice at the time of crushing (in general, cooler grapes make better wine). Refrigeration immediately after crushing is now standard. Observation in vineyards indicated that berry temperature follows air temperature very closely with no more than a 20-minute lag. The midday high to predawn low temperature variation is commonly 30°F. No temperature change from time of picking until late morning was measured in gondola loads of night-picked grapes if they were held in the shade.

The several vintners who tested night picking reported a reduction in the refrigeration load. Heat extraction from the juice by mechanical refrigeration and shell-and-tube heat exchangers is calculated to use about 6 cents worth of electricity per degree Fahrenheit per ton of crush. This would be a direct energy cost saving of \$1 per ton for a 16° temperature benefit.

Conclusions

Fluorescent illumination can provide the intensity, uniformity, and color balance needed for night picking at daytime levels of performance. Cool-White fluorescent lamps gave the greatest overall brightness on all crops evaluated, but color enhancement lamps (N-74 or N-75) gave superior color separation to detect ripeness and defects on cantaloupe and table grapes.

Up to 36 percent refrigeration energy conservation was estimated as a result of a lower temperature drop through the precooler. Also, since more of the cooling would take place before noon under night picking, it might be possible to reduce compressor operation during peak energy-use hours (noon to 8:00 p.m.). Off-peak energy (10:00 p.m. to 8:00 a.m.) costs are now one-third to one-half as high as peak energy costs and are expected to go still lower.

The electricity consumed by lamps for night picking is in the range of 100 to 300 Watts fluorescent per picker. This gives a calculated energy effectiveness ratio (refrigeration energy saved divided by light wattage used) of more than 10.

Although some workers find it difficult to adjust to a nighttime schedule, an unpublished survey by UC Cooperative Extension indicates that many workers prefer predawn field work to daytime harvesting in the hot summer. Night picking also offers growers the flexibility of adding picking and packing shifts when time is critical in harvesting a crop.

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Characteristics of women in farming

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Although the substantial contributions of women in agriculture are recognized (see "Women on Commercial Farms," *California Agriculture*, May-June 1985), no definitive studies have been reported on the division of labor between spouses on California family farms. Nor is much known about the external conditions and internal perceptions that influence women's involvement in farming. A telephone survey of 228 married farm women in Yolo County revealed that economic and structural changes have created a greater demand for women to work on the farm.

The survey population was drawn from lists obtained from the Yolo County Assessor's Office, the Agricultural Stabilization Board, and the Davis Farmers' Market. A total of 363 farms were found to be owned and operated, at least in part, by the individual farm family, which was a requirement for inclusion in this study. The 228 farms from which completed interviews were obtained closely paralleled the Agricultural Census data on family farmers in Yolo County and were not significantly different from the farms not in the sample. The study was designed to find out how the involvement of these women is influenced by farm type and size, by their education and age, where they lived, the use of hired labor, and the presence of extended family in the area.

We selected Yolo County for the study because of the importance and diversity of farming in the area. Agriculture is the county's largest industry: more than 85 percent of the land area is in farms. Major crops include tomatoes, wheat, rice, corn, sugarbeets, almonds, alfalfa, walnuts, barley, and melons.

Who does what

To learn how tasks were allocated and decisions made on the family farm, we asked 19 questions about decision-making and division of labor. We grouped these in the four general areas of production decision-making, production tasks, management support services, and homemaking (table 1).

In 50.2 percent of these cases, husbands made all the decisions regarding which crops to plant, while in 18.7 percent of the cases, these decisions were shared by the spouses. Males also played the dominant role in hiring and supervising labor. When decisions on size of farm, purchasing equipment, borrowing money,

or determining scale of animal production were made, there was a strong tendency toward sharing the tasks.

Men dominated in all tasks related to production, such as cultivating, irrigating, harvesting, and hand work. On the farms in this study, few women performed production tasks either alone or with their spouses.

In those tasks related to management, males continued to dominate in all areas except in bookkeeping, where twice as many wives (44 percent) as husbands had exclusive responsibility. This task was shared less than 9 percent of the time. In running errands and reading publications, the wife's involvement was moderate and quite often shared with her spouse.

Finally, as anticipated, wives took primary responsibility for homemaking. In only one case did we find the husband taking exclusive responsibility for meal preparation or child care. In about a fourth of the cases, yard and child care were shared. Women had virtually exclusive responsibility for meal preparation and child care. Planning social events and recreation were shared by most, with more wives taking exclusive responsibility than husbands.

There appeared to be two general types of farm women. Our data showed that one type, while active in homemaking, participated very little in production decision-making, production tasks, or management support services for the family farm. In contrast, the other type was involved directly in one or more of these farm operation activities in addition to carrying on homemaking. Furthermore, the farm wife who was directly involved in an activity such as production decision-making was also relatively more likely to be actively involved in production tasks and/or management support services and vice versa.

Differences in involvement

We tested statistically the involvement of farm women in the farming operation against variables that, based on previous studies, may affect this involvement. This allows us to better understand why some farm women are highly involved in the farming operation, while others are not.

The variables that best predicted this (by regression analysis) were, in order of importance: residence on the farm, presence of extended family involvement in

TABLE 1. Percentage (and number) of persons involved in farming and homemaking

| Item | Husband exclusively | Wife exclusively | Shared | Item | Husband exclusively | Wife exclusively | Shared |
|-----------------------------------|---------------------|------------------|--------------|---|---------------------|------------------|---------------|
| Decision-making | | | | Management | | | |
| Deciding crops to plant | 50.2 (86) | 2.0 (3) | 18.7 (32) | Running farm errands | 27.5 (60) | 14.5 (32) | 26.4 (58) |
| Labor supervision and hiring | 48.5 (87) | 1.9 (3) | 9.3 (17) | Obtaining information from agencies | 51.2 (105) | 11.5 (23) | 14.4 (28) |
| Deciding size of farm operation | 31.1 (70) | 5.3 (12) | 44.4 (99) | Reading publications and checking prices | 37.9 (80) | 12.3 (26) | 24.4 (51) |
| Deciding size of animal operation | 31.9 (31) | 15.2 (15) | 36.7 (35) | Attending agricultural meetings | 51.6 (95) | 5.2 (10) | 19.6 (36) |
| Purchasing major farm equipment | 40.0 (81) | 2.2 (4) | 29.8 (60) | Bookkeeping and scheduling | 23.6 (52) | 44.0 (96) | 8.6 (19) |
| Obtaining agricultural credit | 41.9 (73) | 4.1 (7) | 32.4 (57) | Homemaking | | | |
| Production | | | | Yard care | 9.5 (21) | 47.6 (106) | 22.3 (50) |
| Cultivating | 56.0 (111) | 1.6 (4) | 2.9 (6) | Meal preparation | 0.4 (1) | 91.7 (209) | 3.7 (9) |
| Irrigating | 37.4 (71) | 2.3 (4) | 6.2 (12) | Planning recreation and social activities | 3.1 (7) | 23.1 (51) | 68.1 (151) |
| Hand fieldwork | 32.3 (63) | 3.7 (7) | 4.1 (8) | Child care | 1.0 (1) | 71.0 (52) | 22.0 (16) |
| Harvesting | 24.5 (49) | 1.5 (3) | 7.1 (14) | | | | |

NOTE: Only three categories are shown here, since "hired personnel" and "others" are excluded to save space.

the farming operation, age and education of the wife, percentage of total farm income earned from animal production, percentage of labor supplied by hired help, and the husband's off-farm job hours per week. Together these variables explain approximately one-third of the variance in involvement of women on farms.

Women residing on the farm were 62 percent more involved than those who lived elsewhere. Extended family participation also had a pronounced effect on involvement: women were 43 percent less involved if members of the extended family participated in the farm operation.

The remaining variables had less importance with regard to the wife's involvement in farming but were still contributing factors. Both the woman's age and the percentage of total labor supplied by hired help influenced involvement. Older women were less involved, as were those on farms where greater use was made of hired labor. Women with more education and wives whose husbands held off-farm jobs were more likely to participate in the farming enterprise. Curiously, if the wife held an outside job, it did not seem to influence whether or not she still worked on the farm. This finding seems to indicate that, while the husband's involvement with outside work may cause the wife to assume more of the farming responsibilities, the reverse does not.

Finally, those farms that were relatively more dependent on animal production tended to show greater involvement of women in their operation. The negative

influence of extended family participation and hired help on the woman's involvement and the positive influence of the husband's off-farm job hours suggests that women form a labor reserve, taking on farm tasks when other options are unavailable. The increased participation by women on smaller farms was found to result from the need for the entire family to use its total resources for survival rather than to a greater opportunity for women to participate on small farms.

Over half (53 percent) of the women interviewed seemed to be content or at least to accept their current role. They did not wish to change the division of labor, a finding that lends additional support to the concept of the farm household as a cooperative, interrelated unit. When asked to identify types of work preferred, 31 percent indicated housework, 40 percent preferred farm work, 13 percent said they liked both, and 16 percent stated that they did not like either.

Conclusions

More than a third of the women surveyed had outside jobs and were thereby supplementing farming income. In addition, over 40 percent were actively involved in over half the items measuring farm involvement excluding homemaking activities.

A composite description of the woman most likely to be actively involved in the farming operation is as follows: She is about 40 years old, is well educated, and lives on a farm with at least some animal

production. Her husband holds an off-farm job that helps to maintain the farm operation without the participation of members of the extended family. In addition, she maintains responsibility for household duties and may even hold an outside job.

Outside employment is particularly common on smaller farms. A typical response reflecting this situation was "more farm women will have to be employed off the farm to help pay the bills to keep from going under." Farm size is associated with female participation, since smaller farms generally have less access to hired labor than do bigger operations. The real cause for higher levels of involvement in farming is the need for the wife to participate when alternative options for labor do not exist. This is true regardless of farm size. This distinction has been missed in previous research on the topic.

Yolo County, like the rest of the United States, is currently witnessing rapid changes in the structure of farming. Many traditional farms are facing serious economic problems, which has led to an increase in outside employment to help maintain the farm operation. There has thus been an increase in small part-time farming operations. These changes have created a greater demand for women to work on the farm.

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