

insects on the ground under one tree. These included the following lepidopterous larvae: tortricids (22 percent), geometrids (17 percent), gelechiids (16 percent), noctuids (8 percent), and diop-tids (2 percent). The rest were sawfly larvae (15 percent) and dipterous, neuropteran, and hymenopterous insects (7 percent).

Examination of treated trees 10 and 14 weeks after spraying showed some differences in arthropods in untreated, Bt-treated, and carbaryl-plus-Bt-treated trees. For example, more spider mites were found on untreated trees than on Bt- or Bt-carbaryl-treated trees. However, if Sevin sprays caused any depression of beneficial arthropod populations, it was not apparent 10 to 14 weeks after spraying: spiders and lacewings were as numerous on carbaryl-Bt-sprayed trees as they were on trees sprayed with Bt alone and on unsprayed trees.

Mass-trapping with disparlure had no effect on the eradication effort, since no male moths were trapped.

Conclusions

In the laboratory tests to monitor effectiveness of the sprays, it was disappointing to find such low average Bt drop density as well as the low mortality of third-stage gypsy moth larvae fed foliage from areas treated with Bt only. These tests showed higher mortality on foliage that had been sprayed with both carbaryl and Bt.

If the gypsy moth breeding populations in Santa Barbara were, indeed, focused on the restricted locations where carbaryl plus Bt were sprayed, it is reasonable to expect that these sprays were even more effective on very young larvae. Our results do not permit adequate assessment of the relative merits of Bt and carbaryl in eradicating gypsy moth, since no area was treated with carbaryl alone. Treatments did not cause any permanent upsets in the populations of insects normally found in oaks.

Final results of the eradication effort will not be known until the treated area has been sampled over three consecutive years for presence of gypsy moth life stages. During 1983, four male moths were trapped in Santa Barbara, none of which were in the zone sprayed in 1982.

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Innovative approaches improve farm labor

John W. Mamer □ Robert W. Glover

A major educational effort to improve personnel management practices would benefit both workers and employers

The United States agricultural employment system is largely casual. Most employers and employees have few continuing ties that provide an assured quality work force on the one hand and adequate farmworker livelihood on the other. Labor practices are commonly those of a simpler, less commercial agriculture of an earlier time and are not suited to the needs of today's far more technically and organizationally sophisticated agriculture.

The changes in agriculture have led to some reassessment of traditional farm labor management and market mechanisms. A more mechanized highly technical, and commercial agriculture requires skilled workers. Workers are increasing pressure, and more employers are recognizing the need to reduce instability and improve employment efficiency, and hence the wage, of career farmworkers. Additional impetus for change has been the application to agriculture of employment, safety, health, and other labor standards already in force in other industries.

Nevertheless, low income and only intermittent employment for many farmworkers are still the rule rather than the exception. Each year, too many growers face an uncertain supply of

labor while trying to cope with a casual labor market. Even where job-matching mechanisms exist, frequently they do not operate satisfactorily, or growers and workers lack the labor market skills to use them effectively.

Before labor use can be improved, the full dimensions of the problem, as well as recent trends and innovations, must be understood.

New approaches

In various places across the United States, labor problems are being approached in ways new to agriculture, ranging from collective bargaining to thorough application of modern labor management principles and practices. Unionization of farmworkers is being pursued with a new vigor in some areas. Although collective bargaining in agriculture goes back many years both in California and in the rest of the country, it is impossible to predict how widespread the unionization movement will become.

Some innovative farm employers have made progress in improving conditions of employment by applying ideas and methods long used by progressive nonagricultural employers. These farm employers include a citrus harvesting cooperative of 270 grower members in the coastal valleys of California, a large diversified agricultural producer in southern Florida, members of the shade tobacco growers' association in Massachusetts and Connecticut, a large association of canners and freezers in Wisconsin, and one of the nation's largest apple growers in Pennsylvania.

Through their personnel policies and practices, these firms have sought to establish a continuing relationship with their employees. They have evolved methods of meeting their skill needs while taking into account their workers' desires and concerns.

The harvesting cooperative, for exam-

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ple, protects job rights by a recall system based on seniority, has a compensation system that encourages and rewards superior performance, and offers several nonwage benefits, such as a pension plan, paid vacations, and medical insurance.

In filling supervisory and management positions, the cooperative recruits internally. With one exception, all of the more than 30 crew leader positions and all of the other supervisory and management positions are currently staffed by individuals who first came to work as citrus pickers.

The crews, essentially the same workers who have returned year after year, have become increasingly proficient. From 1965 to 1981, the boxes picked per hour increased from 3.38 to 8.36. Hourly earnings rose from an average of \$1.77 to \$6.40 in that same period.

The cooperative employs no undocumented workers, and has not since 1965. The employees' decision in 1978 to be represented by the United Farm Workers (AFL-CIO) has not hindered positive employer-employee relations. Total harvest cost per box increased from 62 cents to \$1.29 in the 1965-81 period.

The diversified agricultural producer in southern Florida identified housing for its seasonal workers as the most serious factor in its crew turnover problem. The firm privately financed and built a farmworker housing project, including 192 units, a church, day-care center, post office, and laundry, enabling it to offer its workers above-average housing. Its seasonal workers are employed seven months of the year, and any family wishing to work elsewhere off season can retain occupancy of its unit and resume residence on returning. The firm reports that turnover rate of employees living in the project has been reduced to less than 2 percent annually.

Members of the shade tobacco growers' association in Connecticut and Massachusetts, faced with the need to recruit thousands of seasonal workers each year, developed a program that provides summer employment for about 5,000 high school students (14 to 17 years of age) who perform cultural and harvest tasks.

Most of the students are local residents, but some come from as far away as Florida and Mississippi. Most are recruited through their schools, and they are often accompanied and supervised by teachers. Association members provide excellent dormitory-type housing and off-hours recreational programs for nonlocal youth. Wage premiums and other incentives are structured to encourage the workers to remain through the season and minimize absenteeism.

Although it is widely believed that young people are difficult to employ successfully in agriculture, for more than a quarter of a century these association members have been employing thousands of youth in tasks that are not among the more attractive types of farm work.

The association of canners and freezers in Wisconsin had difficulty in getting skilled labor to operate and maintain the increasingly sophisticated equipment used in their operations. The association solved the problem by establishing a well-organized apprenticeship program in which cannery and seasonal field workers (who are also employees of these firms) could be upgraded to the more skilled and longer term jobs.

The apprenticeship program has graduated 279 maintenance mechanics from a four-year course and currently has 128 apprentices in training. A number of former apprentices have gone on to become supervisors and managers in their respective firms. The quality of the training and the completion rate are excellent, so much so that the Wisconsin state official overseeing such programs considers this to be perhaps the best apprenticeship program in the state.

The Pennsylvania apple grower, a large operation in an area of limited local population and faced with a short harvest season, has an aggressive employee relations program. The company maintains contact with its workers during the off-season, assuring them they are wanted for the next harvest and using them to recruit other workers as needed.

During the harvest, close attention is devoted to employee relations, especially to setting fair piece rates for blocks of trees having special characteristics, so as to equalize earning opportunities. The rate per bin is also adjusted for size of crop and difficulty of picking.

The firm employs only domestic workers (about half of them Puerto Rican), of which more than 85 percent each year are returnees. The firm meets its quality goals, and its workers consistently earn more than do other apple harvesters on other farms in the region.

These approaches have not been more widely adopted primarily because of limited information and guidance. Farm employers do not know about these success stories or how to apply modern resource management ideas to agriculture. Traditional university training in farm management gives scant attention to human resources. In addition, the continued availability of large numbers of undocumented foreign workers tends to reduce the incentive to pursue alternative farm labor management strate-

gies, particularly to stabilize the labor force.

Conclusion

There is little disagreement that outmoded practices are causing serious trouble for employers and employees alike. The optimistic view is that agriculture has managed to generate innovations and resources for attacking these problems, and in a few instances public programs have experimented with ways to expand these improvements.

This survey indicates that public agencies, the U.S. Department of Agriculture in particular, are in a good position to help solve the problems in a coordinated, nationwide effort. Specifically, a major educational effort to improve personnel management practices would benefit both workers and employers. More information on the agricultural labor market is also needed — numbers of workers, income, kinds of work, and the like. Laws and regulations must be enforced equitably and uniformly.

The findings of the Agricultural Work Group survey suggest that priority should be given to farmworkers who have a substantial commitment to agriculture for their livelihood, but who now are only seasonally employed, and to the 15 percent who are year-round workers. The main challenge is to improve employment for those who are not finding the quantity or quality of work they desire.

Priority also should be given to sectors of agriculture requiring particularly large amounts of labor, where survival may depend on the ability to obtain labor at competitive costs.

Additional suggestions include coordination among federal agencies in matters related to farm labor; utilization of federal rural development programs in efforts to stabilize agricultural employment in areas of major seasonal farmworker populations; review of the federal farmworker housing program to make it more effective; modifications of job-training programs to make it easier for farmworkers to move up the skill ladder; and continued dialogue among representatives of employers, researchers, and farmworker organizations.

A community of farmers and workers exists who would like to see the problems solved and who, if properly informed and involved, can be expected to make the reasonable adjustments needed.

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