

recognized for many years. Many "decasualization" schemes have been proposed, but few have been put into practice, even though results have been impressive in the few systematic efforts to decasualize seasonal farm employment.

By applying relatively modern methods of personnel management to the recruitment and employment of lemon harvesting crews, one association of citrus producers effectively decasualized its lemon harvest work. In the process, the number of lemon pickers employed annually decreased from 8,517 to 3,335 in the 1965-77 period. The number of boxes picked increased from 4.4 million to 6.9 million and average hourly earnings increased by 54 percent. Average annual earnings per worker increased by 377 percent. Recruiting and selecting more proficient workers and employing them for longer periods yields a higher output with fewer employees on the payroll. Some workers realize higher annual earnings; others, who might have been previously employed for a short time, are no longer employed at all by the association.

The coverage of farm workers under Unemployment Insurance will in part reduce the burden of unemployment on farm workers, but it appears that in the short run and the longer run, unemployment is likely to remain a serious problem—particularly for seasonal workers.

The emerging situation

The present pattern of high seasonal peaks in employment and the limited employment opportunities in the off-season are

likely to continue for the foreseeable future. High seasonal farm labor requirements originate in the pattern of crops grown and production technology used. Production technology and crop patterns change, gradually or sometimes precipitously, and, in turn, the profile of employment changes. About a quarter of a century ago, the President's Commission on Migratory Labor saw in new technology the means for improving the situation by reducing the high seasonal peaks of employment. This view continues to have substantial (but not unanimous) support.

Perhaps the issues have become more complex in the past 25 years. Consciousness of job scarcity is now more prominent. In the absence of alternative employment opportunities, a reduction in seasonal jobs diminishes the main employment opportunities of the seasonal farm worker. Farm workers, individually and through their organizations, have sought to protect their welfare as new technology comes into use.

The larger society in this state and the nation has an interest in a stable and productive agriculture. However, that society also has an interest in a farm labor force employed under conditions that are, at the very least, not substandard.

There can be little doubt that in the years ahead new technology will be developed and used on California farms. Capital will be substituted for labor as it becomes economic to do so. However, in the near future as well as in the long run, it is clear that greater stability of employer-employee relations (stimulated by modern labor management,

collective bargaining, Unemployment Insurance, and non-wage benefits) is likely to be fully as important a cause of "displacement" as new technology. The labor force and the patterns of employer-employee relationships emerging can scarcely co-exist with the open-access labor market existing heretofore. This means many peripheral workers will be excluded no less surely than if by mechanization displacement. As employment conditions in California agriculture become more like those in the nonagricultural sectors of the economy, employment in agriculture is likely to decline.

The pervasive and persistent unemployment problem faced by those who seek to make an occupation of farm work, particularly seasonal farm work, is likely to be serious for the foreseeable future, as in the past. Unemployment, whether it has its origin in inefficient matching of workers with jobs, in the introduction of labor-saving technology, or in the modernization of employer-employee relationships on California farms, is not being mitigated by expanding non-farm employment opportunities in the rural community. For many, farm employment opportunities may become much more restricted. For others, farm employment will become more attractive and more permanent. Machines may have a relatively small role in the process.

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New systemic fungicide controls downy mildew of broccoli

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Downy mildew of crucifers (*Peronospora parasitica*) is difficult to control during periods of wet, cool weather with currently registered standard fungicides. A new systemic fungicide, Ciba Geigy 48988 (N-2, 6-Dimethylphenyl-N-methoxyacetylalanine methyl ester), became available in 1976 for testing for control of Phycomycete fungi (downy mildew, *Pythium*, *Phytophthora*). CG 48988 was effective in control-

ling the disease when applied as a seed treatment, foliar spray, or as granules on the soil.

Seed treatment

Broccoli seed of the cv. Green Duke was treated with CG 48988 50W at the rate of 1 or 2 ounces per 100 pounds of seed in two trials. In the first trial seed was planted on September 15, 1976, in plots of two 50-foot

rows per bed, replicated four times. Downy mildew became prevalent on the cotyledons of the untreated broccoli shortly after emergence while both seed treatments controlled the disease until 18 days after planting. Larger plants were noted in the seed treatment plots two weeks after planting; and on October 18 the weight of eight plants was 56.8 grams in the treated plots and 10.2 grams in the nontreated plots.

In the second trial plots were 190 feet long, planted on January 31, 1977, and replicated four times. There was no downy mildew on the cotyledons or true leaves 28 days after planting with the 2-ounce treatment; the 1-ounce treatment showed only three infected plants out of 1356 total plants in four replicates and the untreated plots had 14.6 percent diseased plants.

The 2-ounce rate controlled downy mildew in this plot for 38 days after planting. It appeared that length of control by seed treatment would depend on the inoculum potential in an area at any given time. Use of seed treatment would assure downy-mildew-free cotyledons and true leaves at a critical juncture in the life of the plant. Marketable yields were taken on May 17 but no significant difference existed between any treatments

Foliar sprays

Foliar fungicide sprays were applied to Green Duke plants at the six-leaf stage in two separated fields near Santa Maria. There were few colonies of downy mildew fungus in the field before application of fungicides. Plots were beds 50 feet long and treatments were replicated four times. Sprays were applied on October 4 and 18, 1976, except for one treatment in which the material was applied once, on October 4. All materials were applied to runoff with a Hudson 2-gallon CO₂ pressurized sprayer at 30 psi. Rohm and Haas B-1956 spreader sticker was used in each treatment at the rate of 7 ounces per 100 gallons of water. Plots were rated on a scale of 0 to 4, with a 4 rating denoting severe mildew.

Two sprays of Ciba Geigy 48988 controlled downy mildew of broccoli significantly better than all other treatments tested (table 1).

Granular trials

In 1977, control of downy mildew of broccoli was attempted by applying 5 percent granular CG 48988 directly on the soil over the seed row immediately after planting. Two plots were treated with fungicide applied on April 5 at 0.5 pound active ingredient per acre over seed of cvs. Green Duke and Moran 143A; one plot received 1 pound active ingredient per acre on April 28 over cv. Gem; and one plot 0.25 pound active per acre on May 18 over cv. Moran 143A. Each fungicide treatment was compared with a nontreated bed. All treatments were sprinkle-irrigated within 24 hours after treatment. Plots consisted of double rows of broccoli 50 feet long and replicated four times. Green Duke was harvested on June 28, July 1, and July 5; Moran 143A and Gem on July 11, 15, and 19.

Control was achieved for 57 days after planting with 0.25 pound active CG 48988 per acre; 63 and 70 days with 0.5 pound active ingredient; and for 76 days with 1 pound active ingredient. The highest rate completely controlled downy mildew until harvest, but control with 0.5 pound active ingredient broke down 14 days before harvest with Green Duke and 27 days before harvest with Moran 143A.

Total marketable yields were not significantly different among treatments with either cvs. Green Duke, Moran 143A, or Gem (see table 2). The first Green Duke harvest, however, produced significantly higher yields from treated plots and the two early harvests of Moran 143A and Gem were significantly better than those from nontreated plots. Total yield of Gem was lowered by hollow stem.

The 1978 trial compared Ciba Geigy 48988 applied as a 5 percent granular treatment with foliar sprays for the control of downy mildew of cv. Green Duke in a field near Santa Ana. All treatments were applied at the eight-leaf stage. Plots were replicated eight times and consisted of double rows of broccoli 50 feet long. The granular material was applied in a single application on January 5 at 0.5 pound active ingredient per acre and was placed near the growing plant on top of the bed. Foliar sprays were

applied at the rate of 8 ounces per 100 gallons of water on January 5, 12, and 26. Rohm and Haas B-1956 spreader sticker was used at the rate of 6 ounces per 100 gallons of water. Foliar sprays were applied to runoff at the rate of 160 gallons of the fungicidal mixture per acre with a Hudson 2-gallon CO₂ pressurized sprayer at 30 psi. Sprinkler irrigation was not necessary for moving the granular material into the soil because 1.25 inches of rainfall occurred the evening of January 5. By February 8 rainfall had totaled 9.1 inches and was 12.3 inches at the end of the harvest. Downy mildew was not present on plants at the time of the first fungicidal application, but severe disease developed within 10 days. Plots were rated on a scale of 0 to 4, with a 4 rating denoting severe mildew completely covering both leaf surfaces.

The granular and the foliar spray treatments were rated 0 on February 8 while no treatment was rated 2.7 with medium to severe disease on the foliage. Broccoli harvested on February 15 and 20 demonstrated no significant yield difference between treated and untreated plots.

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TABLE 1. Comparison of Fungicides Applied as Foliar Sprays for Control of Downy Mildew of Broccoli, Santa Maria, 1976

Material and rate 100 gal water	Disease rating† November 1	
	Plot 1	Plot 2
Ciba Geigy 48988 50W, 8 oz (2 sprays)	0.6 a*	0.3 a
Copper Count N 8% ½ gal + maneb 80W, 2 lb	1.7 b	1.7 b
Ciba Geigy 48988 50W, 8 oz (1 spray)	1.9 b	1.8 b
No treatment	2.2 b	2.0 b

* Significant 5% level
† Scale of 0 to 4; 4 = severe mildew

TABLE 2. Yields of Broccoli after CG 48988 5% Granular Soil Treatment Was Applied to Control Downy Mildew

Variety	lb. active/acre	Yield-ton/acre (1st harvests) (June 28)	Total Yield tons/acre
Green Duke	0.5	2.81 a*	3.57 a
	Untreated	1.63 b	3.31 a
Moran 143A	0.5	1.03 a (July 11-15)	1.73 a
	Untreated	0.73 b	1.37 a
Gem	1.0	1.49 a (July 11-15)	2.40 a
	Untreated	1.17 b	2.28 a

* Significant 5% level