



Almond orchard above has been strip sprayed for weed control down the tree row and mowed with rotary chopper in nontillage program.

Savings of more than \$20 per acre are possible by using a nontillage system of almond culture in place of the conventional tillage method, according to this recent study in Butte County.

Sprayer below is adjustable for strip spraying orchard for nontillage weed control.



NONTILLAGE AND STRIP WEED Cut Almond Production In Butte County Tests

H. C. MEITH • P. S. PARSONS

TWO EXPERIMENTS aimed at improving orchard management for almond production were started in 1958 by the Agricultural Extension Service in Butte County. One test was designed to increase water penetration by a program of nontillage in which an annual cover crop was chopped instead of disked in the spring. The other was to eliminate the need to hand-hoe weeds from around the base of the tree before harvest by using chemical weed killers to maintain a weed-free strip down the tree row. Both trials were completely successful. Growers who adopted the practices found not only that water penetration was improved, but, in addition, such orchard operations as spraying, irrigating, orchard heating and harvesting could be done faster and easier. Hulling was cleaner and faster, too.

A study of the impact of nontillage on cultural costs was completed in January, 1965. Three growers, Fred Montgomery, Harry Mead and Sam Lewis of the Durham area, who are using the nontillage method, furnished information on costs for both the tillage and nontillage methods.

Production costs in this study are based on an 80-acre operation with a yield of one ton per acre used as a basis for figuring costs. A yield of one ton per acre is far better than the county average but is well within the range of the better orchards in the county. Labor rates per hour, as used in this study, were \$1.65 for unskilled help, \$2.20 for skilled help and \$2.75 for the knocker and huller operator. These figures include not only the

CONTROL Costs



Rotary chopper seen above is typical of type used in orchard mowing for nontillage system.

cash wage per hour but also all other costs for labor such as Social Security, Workmen's Compensation and other fringe costs.

Cultural equipment needed for an 80-acre almond orchard under nontillage included:

1—Diesel wheel tractor, 40-45 HP	\$5,000
1—4 WD Jeep or equal	2,500
1—Orchard sprayer, used	3,500
1—Weed sprayer and boom, trailer mounted	600
2—Heater oil service tanks	1,500
1—12-ft rotary chopper	1,550
1—7-ft flail mower	675
1—Front end loader with brush rake attachment	1,500
1—Sprinkler pipe trailer	300
1—Chain saw and miscellaneous pruning equipment	250
1—Heater oil storage tank and pump	1,000
1—Fuel storage tank and pump	500
Thermometers and frost alarm	100
Soil moisture meter and blocks	150
Shop tools	800
Orchard heater lighting equipment	100
	\$20,025

Harvest Equipment

1—Pickup machine	\$8,500
1—Knocker	5,000
1—Sweeper	1,500
3—Carts	1,200

Hulling Plant

1—Receiving pit	1,000
1—Pre-cleaner	1,500
1—Stoner	1,800
1—Huller	8,000
1—Air separator	1,400
Miscellaneous elevators, conveyors, bins, motors	3,500
Dust collectors and blowers	650
Electric service and wiring	1,000
	\$18,450

1—Metal building 40 × 60 × 15 side wall on 4" slab, including shop space	\$8,400
--	---------

The list of cultural equipment needed under the tillage method replaced the rotary chopper and flail mower with one each of the following pieces of machinery: 12-ft disk, valued at \$1,550; 12-ft land plane with rollers, \$2,500; 12-ft smooth roller, \$1,000; and 12-ft weed knife, valued at \$500. The total cost of

SAMPLE COSTS TO PRODUCE ALMONDS IN BUTTE COUNTY UNDER NONTILLAGE, FEB. 1965

Operation	Hours per acre	Labor	Fuel and repairs	Materials (kind and quantity)	Cost	Total
Prune 3 @ \$2.20 and 7 @ \$1.65	10.0	\$18.15				\$18.15
Pile brush	3.0	4.95				4.95
Buck brush	0.3	.66	\$.41			1.07
Spray 3X	1.0	2.20	4.35	Misc.	\$40.00	46.55
Fertilize (contract)				3 lbs. N/tr—\$1/a.	19.25	19.25
Place and remove heaters	3.0	5.50	1.00	240 gal. oil	31.20	37.70
Lighting				3 callouts	5.66	5.66
Check thermometers	0.7	1.54	1.14			2.70
Fill heaters	1.5	3.85	3.00			6.85
*Strip spray	0.3	.66	.48	1 lb. weed killer	3.00	4.14
*Chop 4X	0.6	1.32	1.29			2.61
*Flail 2X	0.5	1.10	.93			2.03
*Drag-roll	0.1	.22	.10			.32
*Walk and clean	0.2	.41	.10			.51
Irrigate (sprinklers) 3X	3.0	4.95		Power to pump—21 ac. in.	11.25	16.20
Summer weed spray	0.3	.66	.48	Weed oil	3.00	4.14
Bees				2 hives @ \$2	4.00	4.00
Total hours and cultural costs	24.5	\$46.17	\$13.30		\$117.36	\$176.83
Knock	2.0	\$5.50	\$3.50			\$9.00
Rake	1.0	1.65				1.65
Sweep	1.0	2.20	1.50			3.70
Pick up	1.0	2.20	1.35			3.55
Haul to huller	1.0	1.65	1.50			3.15
Hull	2.0	5.50	2.00			7.50
Total hours and harvest costs	8.0	\$18.70	\$9.85			\$28.55
Cash overhead						
Miscellaneous, office expenses, etc.					\$10.27	\$10.27
Taxes and insurance					26.95	26.95
Total cash overhead					\$37.22	\$37.22
Total cash cost					\$242.60	\$242.60
Management 5% of 2000 lbs. @ 30¢						\$30.00

Investment	Per Acre	Annual Cost		
		Depreciation	Interest	
Land	\$1,000.00	...	\$60.00	
Trees	1,000.00	\$28.60	30.00	
Irrigation system	200.00	13.33	6.00	
Buildings	100.00	2.50	3.00	
Equipment (cultural)	250.00	25.00	7.50	
Harvest & hulling equip.	231.00	23.10	6.93	
Orchard heaters (20)	160.00	13.33	4.80	
Total	\$2,941.00	\$105.86	\$118.23	\$224.09

Cost per pound @ 2000 lb. yield—24.8¢

TOTAL COST PER ACRE\$496.69

* Operations changed from tillage method as explained in text.

cultural equipment for nontillage was \$20,025, as compared with \$23,350 for the tillage system.

A detailed cost analysis for the nontillage system is shown in the table. The total cost per acre under nontillage was \$496.69, as compared with \$517.28 per acre for the conventional tillage method. This meant a saving of \$20.46 per acre, or per ton, in this case. The savings were possible mainly through the substitution of mowing and weed spraying for the usual methods of soil management. Additional savings resulted from the elimination of a soil-sealing irrigation prior to harvest and through lower overhead costs for equipment.

Tillage costs

Specific deviations for the tillage system, as compared with the nontillage method shown in the table include elimination of the five starred items in the first part and substitution of two items: (1) Cultivate 16X, figured at 5 hours per acre with labor costs of \$11 and fuel and repair costs at \$6 for a total cost of \$17 per acre; and (2) hoe around trees, figured at 1.7 hours per acre with labor costs of \$3 per acre.

Three irrigations were used under the nontillage system for a total of \$16.20 per acre, as compared with four irrigations (including the soil-sealing irrigation) under a tillage program for a total of \$20.10 per acre.

Total hours and cultural cost figures for tillage were \$191.12, compared with \$176.83 per acre for the nontillage system. Miscellaneous overhead expenses were figured at \$10.98 for tillage as compared with \$10.27 shown in the table for nontillage. These changes brought the total cash costs for tillage to \$257.60 instead of \$242.60 as shown in the table for nontillage. Per acre costs for cultural equipment (under investment) were \$292 per acre for tillage with depreciation figured at \$29.20 and interest at \$8.76 for a total investment cost of \$229.55, as compared with \$224.09 for nontillage. Total costs per acre (including investment) were \$517.28 for tillage, as compared with \$496.69 for nontillage. Costs per pound of almonds produced (figuring a 2000 lb per acre yield) came to 25.9 cents for tillage, as compared with 24.8 cents for nontillage.

Clem Meith is Farm Advisor, Butte County; and Phil Parsons is Extension Economist, University of California, Davis.

PROPAGATION of Apple Rootstocks by Hardwood Cuttings

H. T. HARTMANN • C. J. HANSEN • F. LORETI

Excellent nursery trees of several clonal apple rootstocks were produced in these tests 11 months after hardwood cuttings were planted. Preplanting treatments with indolebutyric acid followed by bottom heat at the base of the cuttings, while the tops were exposed to normal winter chilling, were necessary. This method could replace the more expensive and slower "stooling" method of propagating clonal apple rootstocks.

IN MANY APPLE-growing regions of the world, clonal, self-rooted rootstocks are used to propagate new trees rather than apple seedlings. Such clonal stocks are largely the East Malling and Malling-Merton size-controlling stocks selected and developed at the East Malling Research Station and the John Innes Horticultural Institution, both in England. In the past, these rootstocks have usually been propagated by the "stooling" or mound-layering method in which soil is mounded up around the young shoots arising from the base of the mother plant.

These shoots form roots during the growing season and after they become dormant are cut off to be lined out in the nursery for another season's growth. This method is slow, cumbersome, and expensive. On the other hand, propagation by hardwood cuttings is fast and inexpensive.

In the trials reported here, studies were made of the propagation of several apple rootstocks by the use of hardwood cuttings. Cutting material obtained from Oregon was made into hardwood cuttings on January 2, 1964. The cuttings were

Photo 1. Root system of Malling-Merton 111 apple rootstock 12 months after starting from hardwood cuttings. Length of rule is 18 inches.

