

Mechanical Cotton Harvesting

harvesting costs, value of field waste and grade-loss contribute to economics of machine-picking of cotton

Trimble R. Hedges

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Mechanical cotton harvesters picked about one bale in seven during the 1949 California cotton harvest.

Indications are that the percentage of the 1950 crop machine-picked will be even greater than in 1949—which was an important fraction of that crop.

Sixty-three San Joaquin Valley growers furnished information for a study regarding their 1949 experience concerning amount of cotton picked, pertinent costs, cotton grades, and their degree of success with mechanical harvesting. In addition, the class grades of hand-picked and machine-picked bales were obtained from 35 gins located in the valley.

The net economic advantage of these mechanical pickers definitely favors their use when they are compared with hand-picking in terms of a combination of direct costs, field waste and grade loss. The comparative figures for the 1949 season on a per bale basis were hand-picking, \$45.00, machine-picking, \$26.17, or a net advantage of \$18.83 per bale in favor of the machine.

There was wide variation in the extent to which machines were used as compared with their potential capacity for the season. Half of the machines—32—averaged but 297 hours—33 days—of operation, and picked only 168 bales in 214 acres of picking. Twenty-one machines—with approximately full season use—averaged 520 hours—62 days—and picked 292 bales in 356 acres of picking.

In a typical season a machine can be expected to harvest all the seed cotton from 200 acres and pick 300 bales in two pickings.

Machine harvesters picked at the rate of 0.60 acre and 1,021 pounds of seed cotton per hour in first picking, 0.85 acre and 429 pounds of seed cotton per hour in the second picking. Pick per work day averaged 7.0 bales in first picking and 2.3 bales in second picking.

Harvesting Costs

Cost of machine picking averaged \$8.25 per hour of operation. Of this, \$4.26 was overhead—depreciation, calculated on the basis of five years life for the harvester and seven years for the tractor;

taxes; insurance; and interest, at 4%, on investment—\$2.50 was machine and tractor expense, and \$1.49 was labor. The purchase price of about \$9,500 for harvester and tractor combined largely explains high overhead cost.

Total harvesting costs per bale and per hundredweight of seed cotton are summarized:

	Cost per bale	Cost per hundred-weight of seed cotton
First picking . . .	\$11.04	\$.81
Second picking . .	28.38	1.93
Av. all picking . .	14.65	1.05

These costs are somewhat higher than they would be in most seasons because some reported machines were not used a full season. A grower picking 200 acres of cotton—150 acres picked a second time—would have average costs of \$7.36 per machine hour, \$12.49 per bale and \$0.91 per hundredweight of seed cotton. Hand picking rates in 1949 averaged about \$2.75 to \$3.25 per hundredweight in first picking and ranged up to \$4.00 in second picking.

Field Waste

Comparative field waste also affects the economic advantage of machine versus hand-picking.

The best indication here is the harvester efficiency studies at the United States Cotton Field Station at Shafter. Over-all harvester efficiency was 96.5% at the Station in 1949. Hand-picking efficiency under similar conditions averaged 97.6%. This means that in 1.5-bale cotton, mechanical harvesters leave about 79 pounds of seed cotton in the field, whereas hand-pickers leave 54 pounds, or 25 pounds less than the machine. The field value of 25 pounds of seed cotton in 1949 was about \$1.82. This amounts to about \$1.20 per harvested bale.

Grade-Loss

Machine-picking can affect cotton grades by introducing excessive leaf stain, foreign matter and moisture—in

spindle moistening. Machines can also twist or tangle the lint. These factors together largely account for the lower grades on machine-picked as compared with hand-picked cotton. It is significant, however, that some growers got grades comparable to those obtained in hand-picking. Twenty growers—of 50 for whom grades were available—obtained season average machine grades of Strict Low Middling or better.

Growers in all areas of the valley obtained satisfactory machine grades, although, on the average, machine grades were highest in Kern County and western Fresno County. They averaged lowest in Madera, Merced and on the Eastside—eastern Fresno and Tulare counties.

Satisfactory grades that compare favorably with grades for hand-picked cotton can result from mechanical harvesters if certain conditions are met. The cotton should be planted and grown with machine harvesting in mind. The rows should be uniform in height, width, and shape, smooth and free of clods, with the crest at the base of the stalk. The field should be free of weeds and grass. Furrows should be wide enough to permit steering the picker.

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GOPHERS

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To locate runways, the probe is thrust repeatedly into the ground near fresh gopher mounds until it hits a tunnel. The operator can easily tell when this happens because then the probe drops suddenly due to changed resistance as its point passes from the soil into the open tunnel.

After locating an open runway, the small probe hole is enlarged for placing the bait by inserting the handle end of the probe. The bait is then dropped into the runway, and the probe hole closed with a clod or pressed shut with the heel.

It is more effective to place baits at two or three sites in each burrow system rather than to drop them all down a single hole.

In heavily infested fields it is often difficult to tell where one burrow system ends and another begins. In that event, baits may be placed arbitrarily every 20 feet or so.

An intensive, persistent campaign against gophers is strongly recommended. Treatment should be repeated until survivors have been eradicated or reduced to a negligible minimum.

A rough check on the effectiveness of the treatment may be had by kicking off the tops of mounds during the operation and revisiting the area several days later to look for new work. Another method is to return to the field after irrigation to check on new mounds.

For the final elimination of survivors, traps or a different poison bait formula should be used since the last survivors may be wise to the original treatment.

Once cleared of gophers, fields should be surveyed periodically for reinvaders. These are apt to migrate overland from nearby untreated lands and to dig in around the edges of the field.

Cost of Poisoning

Cost of poisoning will vary greatly with density of the gopher population, degree of control desired, price of material, labor cost, and operating conditions.

A rough idea of the expense may be had by considering how much it would cost to eradicate or reduce to a negligible minimum 100 gophers in a five-acre alfalfa field—heavy infestation of 20 per acre.

Labor is the principal item. Given abundant fresh mounds and low vegetation so that gopher systems can readily be seen, and moist soil for easy and efficient probing, an experienced operator can thoroughly treat at least 25 systems an hour. To this must be added an hour for preparing baits and the time required for a second treatment to reduce survivors. Assuming an 80% kill, it would take

about another hour to re-treat the 20 surviving gophers—killing presumably another 80%, or 16 of them. Thus, to obtain a 96% kill would take two treatments, requiring approximately six man-hours. With labor at \$1.00 an hour, this would amount to a little more than six cents a gopher, or about \$1.20 per acre.

Cost of materials would be nominal. With strychnine alkaloid at \$28.96 per pound it would take only 40¢ worth of this poison to kill nearly 100 gophers, about four tenths of a cent per gopher. With strychnine sulfate at \$22.24 per pound, 35¢ worth would be needed.

For bait, about four pounds of cut root vegetables would be required for 100 gophers using strychnine alkaloid—slightly more with strychnine sulfate.

The cheapest available bait material can be used—culled or unmarketable vegetables are satisfactory. At 5¢ a pound, the bait for 100 gophers would only cost about 20¢, or two tenths of a cent per gopher. The cost of poisons and baits together at most would add about six tenths of a cent per gopher to the total cost.

Poisoning is cheaper and obtains better kills than either gassing or trapping.

Trapping may be desired for final eradication or may be preferable in small areas or for small numbers of gophers, but poisoning with the proper poisons, baits and dosages is the most effective and economical method for eradicating pocket gophers.

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COTTON

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Careful operation of the harvester itself is extremely important. Growers cite the necessity for keeping picker drums clean of dirt, grease and soiled cotton, using a minimum of moisture on the spindles and not picking when weather conditions are very unfavorable—high humidity.

Growers also reported successful machine-picking in very rank, high-yielding cotton.

Grades of machine-picked cotton varied widely among the gins. Some gins in each area had grades comparable with hand-picked cotton.

Economic Advantage

The economic advantage of machine-picking must be evaluated on more than just the costs of machine versus hand-picking.

In this study, machine-picked grades were lower than those for hand-picked cotton. Money returns from the crop,

therefore, were lower for machine-picked than for hand-picked cotton. The difference averaged, for the season, slightly less than one full grade.

An indication of the effect of grades on money returns is the government loan value. The loan value of hand-picked cotton at 35 gins averaged \$142.84 per bale, and of machine bales \$132.52, a difference of \$10.32 per bale. The \$10.32 difference in loan value is a market cost to be charged to mechanical harvest.

The net economic advantage of machine-picking is found by adding together harvesting costs, value of field waste, and value of grade-loss, and comparing the total with the cost of hand-picking.

These figures are summarized in terms of the average grower in 1949:

	Hand picking	Machine picking
Picking cost	\$45.00	\$14.65
Field waste		1.20
Grade-loss		10.32
Total harvesting cost	\$45.00	\$26.17
Difference in favor of machine-picking		\$18.83

A practical economic question facing the grower is at what yield of seed cotton per acre he can afford machine-picking. In 1949 a grower's total cost would have been \$6.47 per hundredweight of seed cotton worth \$7.70 above ginning costs—assuming second picking cotton with lint at 20¢ a pound and cottonseed at \$45.00 a ton.

A grower who considered only the direct costs of operating a mechanical harvester—exclusive of overhead—could operate when the yield was only 75 pounds. His direct costs would be \$6.25 per hundredweight.

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TOMATO

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cut off. Although insects were suspected, in many cases, careful examinations revealed that the damage was out of proportion to the insect population present. Observations were made that indicated that birds were responsible for the loss. Of these, horned larks were the most important offenders.

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