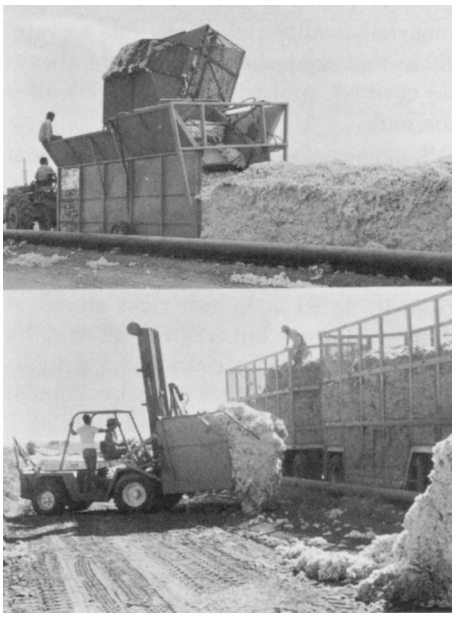
SEED COTTON STORAGE

an aid to both growers and ginners

R. G. CURLEY · R. A. KEPNER · M. HOOVER

O. D. MC CUTCHEON · L. K. STROMBERG · E. A. YEARY



A cotton picker, top photo (and cover), is shown dumping into a Rosebud ricker. This ricker has a hydraulic ram operated compactor. Forklift and loader attachment in bottom photo is loading ricked cotton into special highway trailers for long-distance transport to a gin.

The conventional trailer system of handling seed cotton directly from the picker to the gin doesn't always provide an uninterrupted flow of cotton from the field through the gin. Growers sometimes have to stop picking because all their trailers are full, waiting to be ginned. Gins may have to work short shifts or shut down temporarily for lack of cotton, during the first or last part of the season or if adverse weather makes picking impossible. Storing part of the crop between picking and ginning alleviates both problems. Growers can complete their harvesting at an earlier date and ginning costs are reduced.

THE CONCEPT of seed cotton storage is not new but new methods are causing it to expand. Three California gins provide seed cotton storage in covered baskets at the gin yard. In recent years a few California growers have developed substantial field ricking operations. In this system the cotton is dumped from the pickers into a slip form or ricker that is moved along the turnrow. The ricker makes continuous stacks as long as desired (usually 80 to 120 ft). The cotton is moderately compacted, either mechanically or manually, while still within the ricker. The ricks are usually covered with plastic. They remain in the field until needed for ginning and are then loaded into conventional cotton trailers, using one of several types of special loaders. It is estimated that at least 70,000 bales were ricked in the San Joaquin Valley in 1972. Three growers accounted for at least two-thirds of this total. Several hundred mechanical rick compactors were reported to have been used in other states in 1972, primarily in low-rainfall areas.

In another type of storage system, seed cotton is dumped from the pickers into a four-sided form having an openable rear gate. This unit, known as a module builder, was developed at Texas A & M University in 1971, under the sponsorship of Cotton Incorporated. It has a mechanical tamper and compresses the cotton into high-density stacks on wood pallets that are a little less than 8 ft wide and 24 or 32 ft long. Each module is free-standing after the module builder is removed. The modules are winched onto a specially built tilt-bed trailer and hauled to the gin. They may be ginned immediately or they may be covered and stored, preferably in the gin yard, until needed by the gin. The only use of the module system in California has been for a total of about 300 bales on two farms near Firebaugh in 1972.

The primary purpose of this report is to give the results of performance studies made during 1972 comparing two ricking systems with the direct trailer system. One grower used a Rosebud ricker, which was developed at Texas Tech University for Cotton Incorporated and has a single-stroke mechanical compactor. The other grower used a ricker with a roller-type compactor which he developed.

Information on several other ricking operations was obtained from growers and ginners. Rosebud rickers were used in some of these, and others had manual-compacting rickers.

Each of the ricks formed with the roller-type unit was completely covered with plastic. A continuous band of soil was placed on the edges of the plastic to hold it down. In most other ricking operations the plastic covering extended only part way down the sides of the rick and was held in place with twines or ropes over the top and around the perimeter.

Rick widths are 7 to 7½ ft with the Rosebud ricker and about 9 ft with the roller-type ricker. A common width for manual-compacting rickers is about 12 ft. Ricks that are to be covered are usually made 85 to 90 ft long, to take a 100-ft roll of plastic.

Growers reported that lint grades for seed cotton stored in covered ricks were at least as good as from trailers picked at the same time, and much higher than for cotton that did not get picked before the heavy rains started early in November. Most of the ricked cotton was stored at not over 10 to 11% moisture. Some

growers failed to cover their ricks and incurred quality reductions due to rain. Ricks that are to be stored should always be covered, preferably on the day they are built.

Samples were taken from four ricks at the time of picking and one month later, just before ginning. The ricks were completely covered during the entire storage period. Seed germination was reduced from 97 to 91% in two ricks stored at 11.5% moisture but was not affected by storage in two other ricks at 9.4% moisture. Storage at either moisure content had no effect on free fatty acid content.

Picker field efficiencies (per cent of total field time during which a picker is actually picking cotton) with the direct trailer system averaged 68 to 72% on three farms and 80% on a fourth. Each of these operators used either four or five two-row pickers. Average operating speeds ranged from 2 to 2.7 mph. The time stopped to dump into trailers averaged about 1.1 minutes per dump for two growers, 1.6 minutes for a third grower (all making 1-bale dumps), and 2.5 minute for a fourth grower making 2-bale dumps. The time required to make the last dump into a trailer was usually three to four times as great as the time for the first dump.

Dumping times into the rickers averaged a little less than for dumping into trailers. But, with each ricker serving five pickers, the average time waiting to dump was slightly greater than for trailers. Times waiting to dump into trailers were generally quite small because a picker operator would usually dump into a second trailer rather than waiting.

The "waiting plus dumping" time with the Rosebud ricker studied averaged 0.38 minute per load less than with this grower's trailer system. This difference represented only a 1% increase in picker field efficiency. With the roller-type ricker the average waiting time during the observations was 2.1 minutes and the picker productivity was 5% less than with the trailer system. The grower later indicated that waiting times were reduced as the operators gained experience with the roller-type ricker.

These results suggest that, under California conditions, ricking cannot be expected to have any great effect on picker field efficiencies The major advantage of ricking, in regard to increasing picker output and getting the crop harvested sooner, is in not having to wait for trailers.

A cotton picker is shown dumping into a grower-built ricker which uses a hydraulic powered roller-compactor.

A common type of unit for loading from ricks into trailers has a tined, scoop-type loader on a forklift, large tractor, or other propulsion unit. These loaders can pick up 1,500 lbs of seed cotton at one time. Reported average loading rates ranged from 15 to 40 bales per hour. The organization of the support functions and the amount of support equipment and labor, particularly in regard to keeping trailers available and optimally located, has considerable influence on the loading rate.

Principal problem

The principal problem observed with the ricking system was difficulty in getting the cotton out of the fields after the heavy rains started early in November. In one of the operations studied, the grower used a grapple fork on a dragline after the fields became too muddy for the forklift loader. Dragline loading rates were low (18 to 20 bales per hour), and considerably more cleanup of cotton left on the ground was required than with scoop-type loaders.

A number of growers used a clamshell type of loader on a backhoe. These were said to require less maneuvering than scoop-type loaders and they worked reasonably well under muddy conditions. Reported loading rates were 15 to 25 bales per hour.

Calculated costs per bale for forming ricks are presented in table 1. Included are overhead and operating costs for the ricker, $3.50 per hour for a tractor, and wages for two or four men to operate the ricker. Costs are shown for two depreciation rates. The results indicate that manual ricking is more economical than the Rosebud mechanical ricker when the annual use is not more than 50 hours per year and mechanical compacting is more economical for over 100 hours per year.

Trailer availability

A grower usually would rick only when trailers are not available, stacking not more than one-third of his crop—sometimes much less or none at all. Pickers dump directly into trailers during any portions of the day (i.e. early and late) when the moisture content is too high for safe storage. A grower having 1,500 acres of two-bale cotton might stack a maximum of 500 to 1,000 bales, representing 50 to 100 hours of ricker use.

The total cost of covering ricks, including $0.80 to $1.10 per bale for 6-mil plastic (if new each year), is about $1.25 per bale for top and partial side covering (tied in place) and about $1.50 per bale for complete coverage with the edges held down by a band of soil. Removal of the tied-down plastic at the time of loading costs 15 to 20¢ per bale less than removing the soil-anchored plastic (included with loading costs in table 2). Saving the tied-down plastic and reusing it at least once would reduce the total covering cost.

The soil-anchored plastic is more difficult to salvage for reuse.

Overall loading costs with two types of loaders, each at two loading rates, are presented in table 2. A total field crew of six to eight men, for operating the loader, uncovering, cleanup, and shuttling trailers, is needed to achieve the maximum rate indicated for each loader. Equipment and labor costs for all these operations are included. Costs per bale are considerably lower with the forklift loader than with the backhoe when the forklift loader is used at the higher loading rate. There is little difference between costs with the two loaders if the forklift loader is used at 20 bales per hour and neither type has any use other than for loading cotton. The loader should be owned by the gin or a contractor and moved from farm to farm to maximize its use and minimize costs per bale.

Cost differences

To determine the difference in costs between the ricking system and the direct trailer system, the cost of the "trompers" that would be needed if dumping from pickers into trailers must be subtracted from the total ricking cost. Allowing 50¢ per bale for two trailer trompers at 10 bales per hour, ricking, covering the ricks, and loading trailers from ricks may be expected to increase the pre-ginning cost by $3.50 to $5.00 per bale in comparison with the direct trailer system. The cost of owning and maintaining trailers and moving them to the gin is assumed to be the same for either system. In 1972, insurance costs for ricked cotton were the same as for trailer cotton.

Seed storage can reduce ginning costs per bale by permitting the gin to operate on a regularly scheduled basis at a more uniform daily output rate and by permitting increased total seasonal output. With the highly variable daily incoming rate that is characteristic of the direct trailer system, some gins pay their crews for considerable time when they are not working or are doing unnecessary work. This is done to ensure availability of the crews when needed. With no change in total seasonal output, gins that customarily pay their crews for considerable nonproductive time could realize savings as great as $3.00 to $4.00 per bale (wages + compensation insurance + payroll taxes) if sufficient stored cotton were available to permit operating at a relatively constant daily output rate.

Cost summaries for 26 gins in the San Joaquin Valley show a wide variability in labor costs. Six of these gins had plant labor costs from $5.60 to $8.93 per bale and probably could realize substantial labor savings from seed cotton storage. Six other gins in this group, at the low end of the cost range, had plant labor costs from $3.44 to $2.86 per bale. Labor savings due to seed cotton storage probably would be small for these gins.

Increasing the total seasonal output would reduce the ginning costs per bale by reducing plant overhead and administrative costs per bale. The increased output (assuming additional cotton available), would be obtained by operating more days per year, more hours per day, or both. An analysis based on the 1971–72 cost summaries for 26 San Joaquin Valley gins indicates that in most of these cases a 50% increase in seasonal output from a given gin might be expected to reduce the cost per bale by $2.00 to $4.50. Doubling the seasonal output would reduce the cost per bale by $3.00 to $7.00.

For the grower whose trailers are still in good condition, the ricking system requires considerably less additional investment in equipment than does the module system. But modules can be taken from the field immediately and are then available for ginning at any time, regardless of the weather and field conditions. The module system also has good potential for mechanized handling and automatic feeding at the gin. Although a module system was observed in these studies, experience was too limited to permit any meaningful cost comparisons.

Reduced ginning costs will usually compensate for a major portion of the grower's increased cost of handling seed cotton by the ricking system. In 1972 one gin allowed growers a bonus of $3.50 per bale for seed cotton stored in ricks.

From the grower's standpoint, improved timeliness of picking with reduced probability of grade reduction due to rain is the principal advantage of storage. Harvesting may be completed at an earlier date if he does not have to wait for empty trailers. The amount of time lost for this reason is highly variable, and in many cases is quite small. It is difficult to assign a dollar value to the timeliness factor, since the effects depend largely upon weather conditions. California growers who stacked appreciable amounts during the abnormally wet 1972 season realized substantial advantages in gross income because of grade reductions and yield losses suffered by cotton that remained on the stalk during the rains. Getting the cotton harvested sooner also facilitates preparation of the land for subsequent crops.

TABLE 1. CALCULATED COSTS FOR FORMING RICKS

Annual use, hours	30	50	100	150	200
	Total cost $ per bale @ 10 bales per hr.				
Rosebud ricker (2 men), new cost = $2,100					
Assuming 5-year life	$2.77	$2.06	$1.52	$1.34	$1.25
Assuming 10-year life	2.07	1.64	1.31	1.20	1.15
Manual-compacting ricker (4 men), new cost = $1,000					
Assuming 5-year life	2.23	1.89	1.64	1.55	1.51
Assuming 10-year life	1.90	1.69	1.54	1.48	1.46

TABLE 2. CALCULATED COST FOR LOADING FROM RICKS INTO TRAILERS

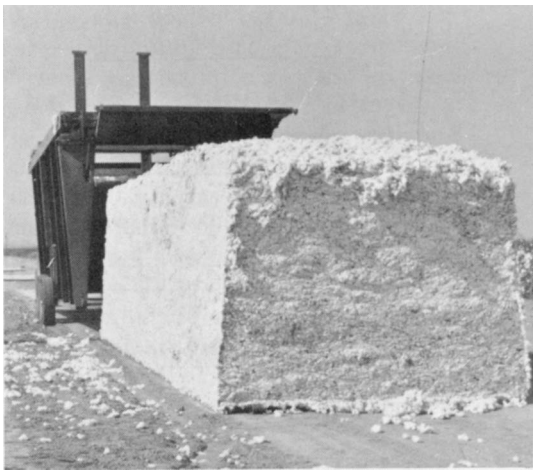
Hours loading per year	100	150	200
	Dollars per bale		
Total cost per bale*			
Forklift and loader attachment owned; no other use.†			
20 bales per hr loading rate	$2.14	$1.78	$1.60
40 bales per hr loading rate	1.45	1.27	1.18
Forklift owned, 100 hr extra use per year; loader owned.			
20 bales per hr loading rate	1.73	1.56	1.46
40 bales per hr loading rate	1.25	1.16	1.11
Backhoe and loader attachment owned; no other use.‡			
15 bales per hr loading rate	2.24	1.95	1.80
25 bales per hr loading rate	1.91	1.74	1.65

* The above cost includes removal of plastic that has edge covered with soil. If plastic is tied down rather than having edge covered with soil, the easier removal reduces the cost per bale b 15 to 20¢.

† Forklift new cost = $11,000, 10-year life, 10% resale value loader attachment new cost = $2,100, 20% annual depreciatior

‡ Backhoe used cost (3 years old) = $7,000, 10 years remainin life, 10% resale value; loader attachment new cost = $1,00(20% annual depreciation.

R. G. Curley is Extension Agricultural Engineer, Davis; R. A. Kepner is Professor of Agricultural Engineering, Davis; M. Hoover is Extension Cotton Specialist, Shafter; O. D. McCutcheon is Kings County Farm Advisor; L. K. Stromberg is Fresno County Farm Advisor; and E. A. Yeary is Farm Advisor, Statewide (Farm Management), Kearney Field Station. *The study reported was partially supported by a grant from Cotton Incorporated. A more detailed report on these studies is available from the first author.*



Rear view of a 24-ft module builder pulling off of a newly completed cotton module.