

Asparagus Harvester Improved

increased efficiency of mechanical harvester
results of improvements tested in 1954 season

Robert A. Kepner

Results obtained during the 1954 season with an experimental asparagus harvester—first used in 1952—indicate that recovery of short spears can be improved and blade life greatly increased by minor modifications.

The harvester used in the 1954 tests was basically the same machine tested in 1952. A series of sheet-metal dividers, about 2" above the top of the asparagus bed and spaced at 2½" intervals across the bed, channel the standing spears between pairs of rotating gripper wheels. Immediately after the spears are gripped, a bandsaw type of blade cuts them just below the surface of the ground. The grippers then elevate the spears and drop them, butt end first, onto a cross-conveyor belt. The latter, in turn, elevates the asparagus and deposits it in a small

hopper or trough, as indicated in the accompanying photograph. The experimental machine was built to cover only a 15" width of row, but the design can readily be expanded to cover the 30" to 36" bed widths of conventional plantings.

Each time the harvester is used—normally at intervals of five to seven days—all spears are cut, regardless of length. While this so-called set-level system undoubtedly results in some loss of yield due to the variation of spear lengths, it permits one machine to be used for five or six times as much acreage as would be possible with a selective harvester cutting spears of the desired length every day or two. It is estimated that with the set-level system, one harvester could take care of at least 80 acres

on a 5-day cutting schedule, replacing 10 to 12 hand cutters.

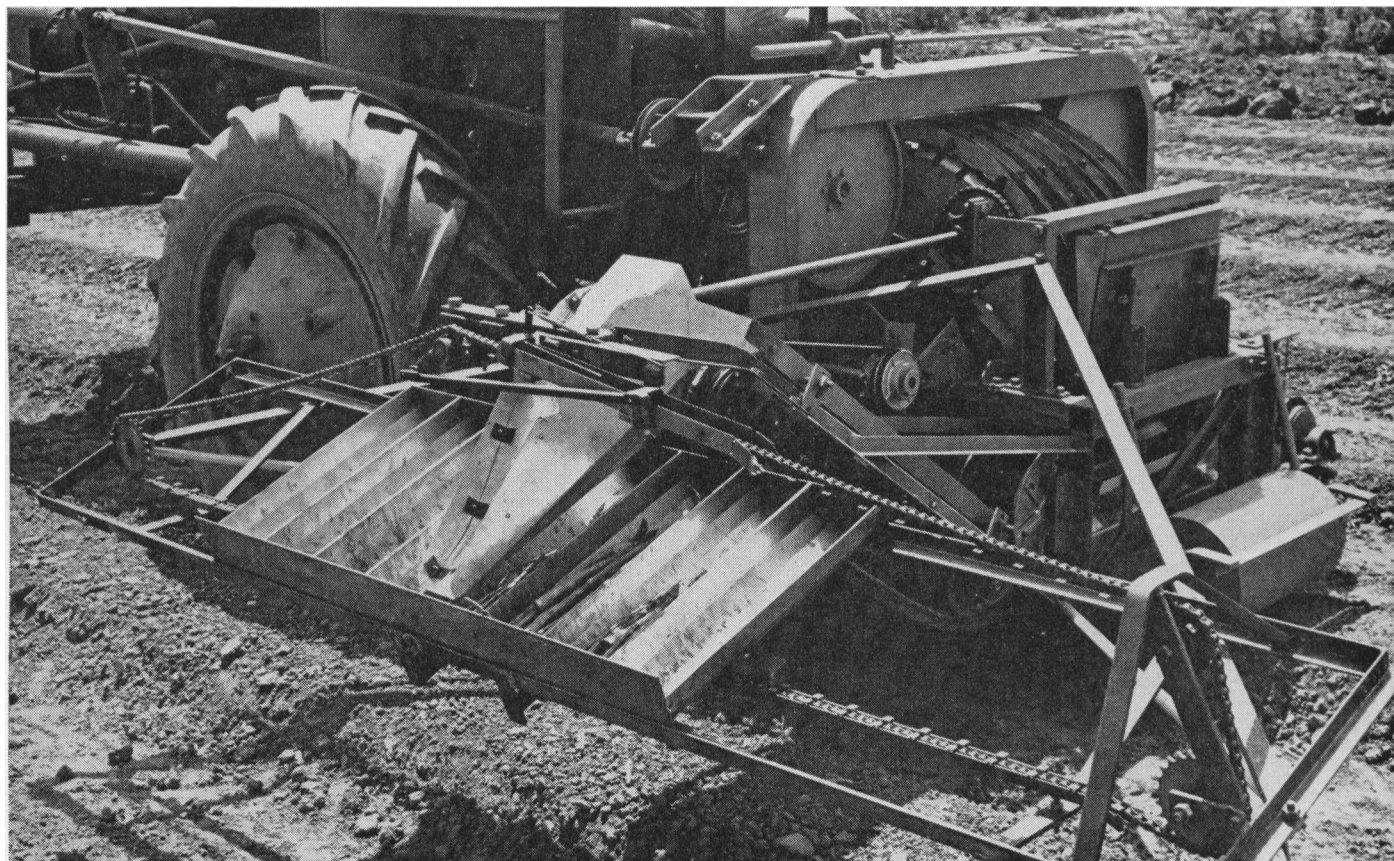
Although comparative yields for hand cutting and machine harvesting cannot be determined until a full-width machine is built and used in commercial plantings during an entire season, the set-level system appears to be economically feasible for harvesting canning and freezing asparagus. This system is probably not practical for fresh-market asparagus under current grading standards, because of the greater spear lengths required.

During the current season a total of 40 test runs, each covering about ¼ mile of row, were made with various combinations of adjustments and modifications. All of the tests were in a one-half acre, direct-seeded field at Davis

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Asparagus harvester, showing trough and spout assembly, tried out during 1954 tests. The spears discharge from the upper end of the conveyor belt into the spout or guide, which is open along the bottom. Troughs are moved intermittently to the rear, each trough collecting the spears from 25' of row. The two upper band-saw wheels and the top portions of the gripper wheels are visible behind the driver's seat. The roller on top of the asparagus bed at the rear of the machine gages the depth of cut.

Photo by Ruth Teiser.



ASPARAGUS

Continued from preceding page

which had been planted by the Vegetable Crops Department in 1949. Eight cuttings were made at intervals of four to ten days. Spear diameters generally ranged from $\frac{1}{4}$ " to $\frac{7}{8}$ ", with a few up to 1". The cutting depth was ordinarily between $\frac{1}{4}$ " and $\frac{1}{2}$ ". All runs were at a forward speed of $2\frac{1}{2}$ miles per hour.

The principal objective in these performance tests was to determine the effect of raising the band-saw blade above the position used in the 1952 tests—up closer to the gripper wheels—and to compare different divider-point heights with each of the two blade positions. The results are indicated in the accompanying bar graph. The down position of the blade is the same as in 1952, while the up position is $\frac{1}{2}$ " closer to the grippers. The point heights indicated are the heights of the lower front corners of the sheet-metal dividers, above the blade level.

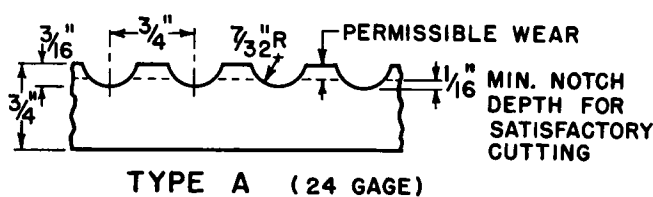
The left-hand bar of each pair includes only spears longer than 4", while the right-hand bar is for all spears over $3\frac{1}{2}$ ". The percentages in both cases are based on the total number of spears over 4", so that the two bars of each pair are directly comparable on a quantitative basis. Thus, it is evident from the total height of the bars that including spears $3\frac{1}{2}$ " to 4" long added slightly over 10% to the total number of spears available from this field. While spears much under 4" would not make the No. 1 canning or freezing grades—which require a minimum trimmed length of $3\frac{1}{2}$ "—they do have value as lower grades.

The results indicate that the up posi-

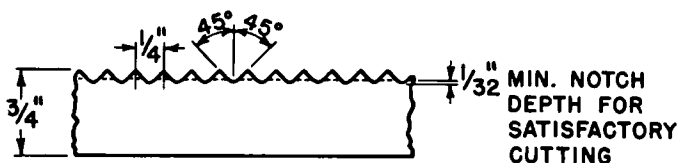
tion of the blade was definitely superior to the down position and that with the up position there was very little difference for the two point heights. Considering only the spears longer than 4", about 6% were missed with the blade up, and 9% with the blade down and a $2\frac{1}{2}$ " point height. Spear side damage—caused primarily by contact with the lower part of the dividers—was slightly greater with the blade up. Nearly half of the $3\frac{1}{2}$ " to 4" spears were recovered with the blade up, as compared with only 10% to 15% recovery in this group with the blade down.

Thus, considering all spears longer than $3\frac{1}{2}$ ", raising the blade $\frac{1}{2}$ " increased the total recovery of undamaged spears by about 6%. Very few spears shorter than $3\frac{1}{2}$ " were recovered, since the gripping level was $3\frac{1}{4}$ " above the upper blade position and $3\frac{3}{4}$ " above the lower position. Raising the blade much above the upper position used in the 1954 tests would undoubtedly increase spear damage caused by the dividers, and would introduce certain other problems.

The use of a series of small troughs—each $4\frac{1}{2}$ " wide and $2\frac{1}{2}$ " deep—to receive the spears discharged from the conveyor belt, in conjunction with an open-bottom spout or deflector to guide the



TYPE A (24 GAGE)



TYPE B (24 GAGE)

Two types of blades used in 1954 tests. Type A was operated at 5,000 feet per minute and type B at 1,700 feet per minute.

spears as they leave the belt, showed considerable promise in maintaining uniform orientation of spears. In a series of counts involving over 1200 spears, approximately 90% were oriented with their butt ends toward the outer ends of the troughs.

The experimental arrangement is shown in the accompanying photograph. The trough assembly was moved intermittently toward the rear so that each trough received the spears from 25' of row. In the final design, individual troughs would be independently attached to conveyor chains which would move the filled troughs forward and elevate them to an appropriate location for hand removal and boxing of the asparagus.

Blade Tests

One of the principal mechanical problems encountered in the 1952 tests was excessive blade wear in abrasive soils. In these earlier tests, blades like those illustrated by type A in the accompanying drawing were used at a speed of 5,000 feet per minute. During the current season, it was found that blade wear could be greatly reduced without impairing cutting ability or harvester performance by using a blade with teeth only $\frac{1}{4}$ " apart, as illustrated by type B, at a speed of 1,700 feet per minute.

While even the slow-speed blades would last for only four or five hours in extremely abrasive soils, the total annual cost for blades should still be less than \$5 per acre. In peat soils, a slow-speed blade should last for several weeks, and the annual blade charge would be insignificant.

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Results of the 1952 tests with the harvester were described in California Agriculture for October 1952.

Performance efficiencies in 1954 asparagus harvesting tests.

