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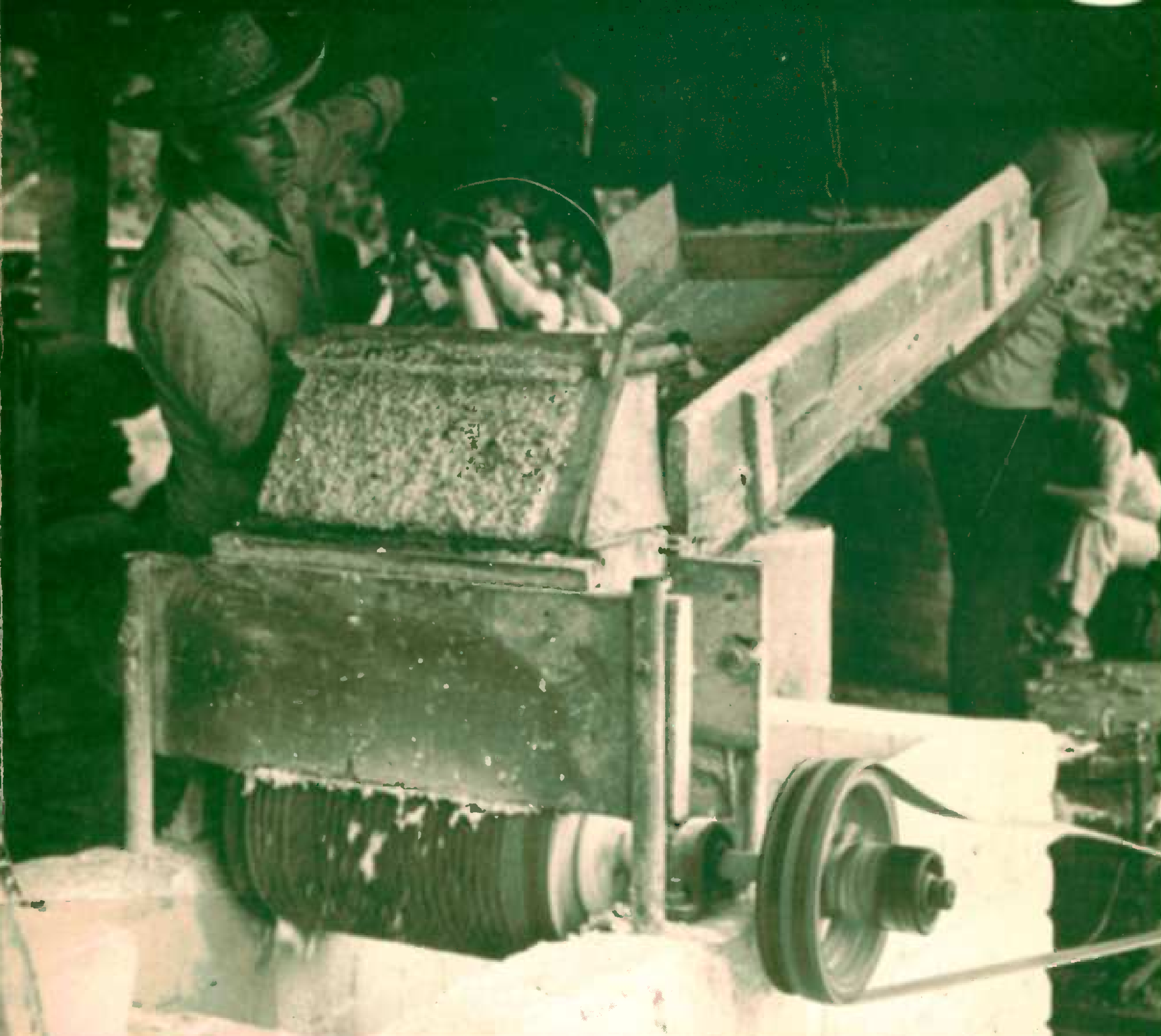
Cassava Harvesting and Processing



PROCEEDINGS OF A WORKSHOP HELD AT
CIAT, CALI, COLOMBIA
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EDITORS: EDWARD J. WEBER
JAMES H. COCK
AMY CHOUINARD

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Proceedings of a workshop held at CIAT, Cali, Colombia, 24–28 April 1978

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Contents

Follow-Up Evaluation of Two Harvesting Machines

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Abstract. Following the workshop, CIAT personnel evaluated further the Richter harvester and the CIAT harvesting aid to determine their performances with different varieties of cassava. Flat plots of MMEX 11, CMC 84, and MCOL 22 — classified as difficult, intermediate, and easy for manual harvesting — were harvested using the machines and by hand for comparison. Percentages of broken, cut, and skinned roots were calculated from samples of the harvested crops. The roots that were not lifted during the harvest were dug up later and the total amount of leavings calculated on a tonnes per hectare basis. The results indicated that both mechanical methods were superior to manual harvesting of the difficult-to-harvest variety in reducing leavings; however, crop losses in the intermediate and easy-to-harvest varieties were fewer with manual harvesting. In general, differences in performance of the two mechanical harvest systems were small, and both, though they damaged roots slightly more than the manual method, cut down the time and effort involved.

After the workshop was over, the two machines described by Kemp (p. 53) were further tested to determine their performance in harvesting different varieties of cassava. The trials were carried out using MMEX 11, CMC 84, and MCOL 22, cassava varieties classified respectively as difficult, intermediate, and easy for manual harvesting. All varieties were planted on flat ground with vertical stakes. A standard row spacing of 1 m was used with plant densities within the rows, 5000, 10 000, and 20 000 plants per hectare. At harvest, the cassava was 7 months old.

Two rows per plot were harvested using each machine, and the results were compared with manual harvesting. Samples of five plants were taken from each row, i.e., 10 plants per harvesting method. The tops were removed, and the roots were counted, weighed, and evaluated for damage.

The weight of the leavings — roots that were not lifted — was extrapolated to tonnes per hectare. The percentages of broken, cut, and skinned roots were based on the total weight of roots in the samples.

The objective of the trials was to compare the efficacy of three harvesting methods (manual and two mechanical) in lifting cassava varieties that have contrasting rooting patterns.

Results

The results, which are summarized in Table 1, were slightly different from the earlier findings. Leavings in manual harvesting of the MMEX 11 (difficult to harvest) were two to three times those in mechanical harvesting; however, the opposite was true in the intermediate- and easy-to-harvest varieties. As might have been expected, manual methods were associated with the least root damage. In all the parameters, the CIAT implement (Fig. 1) performed better than the Richter harvester, but both machines broke a surprisingly high percentage of the easy-to-harvest cassava.

In contrast to the earlier evaluation, root cutting in this trial was negligible, and the amount of overall damage was not related to plant densities. Skinning was greatest using the Richter machine and least in manual harvesting. MMEX 11 was most susceptible to skinning. In general, leavings were greatest at high plant densities.

Discussion

The three varieties used in this trial have different rooting patterns that affect manual harvesting and could be expected to have similar effects on machine harvesting. MMEX 11 shows a spreading type of root system, its long roots being extended both horizontally and in depth; MCOL 22 produces compact, cone-shaped roots that are directly attached to the stem, and CMC 84 is intermediate. The present trial confirmed that manual harvesting is easy for MCOL 22, intermediate for CMC 84, and difficult for MMEX 11; however, it suggested that the same was not true for mechanical harvesting. Mechanical methods

Table 1. Manual and mechanical harvesting of three cassava varieties.[a]

Variety	Harvest system	Yield (t/ha)	Leavings (t/ha)	Broken roots (%)	Cut roots (%)	Skinned roots (%)
MMEX 11	Manual		1.03	1.5	0.0	0.0
(difficult)	CIAT	19.0	0.37	2.4	0.0	2.9
	Richter		0.58	7.6	0.0	10.9
CMC 84	Manual		0.28	0.9	0.0	1.0
(intermediate)	CIAT	20.9	0.58	2.0	0.0	0.0
	Richter		0.68	6.9	0.0	5.1
MCOL 22	Manual		0.29	0.4	0.0	0.0
(easy)	CIAT	15.6	0.44	6.2	0.0	0.0
	Richter		0.42	11.2	2.0	1.7

[a]Figures are equal to the mean for trials of 5000, 10 000, and 20 000 plants/ha.

Fig. 1. The CIAT toolbar-mounted loosening blade harvests two rows of cassava at a time.

were not significantly affected by rooting pattern except that the compact roots suffered more damage than did the other two types. The slightly higher readings observed with the Richter harvester for leavings, breaking, and skinning may have been due to its narrow throat and chain web elevator. The cutting damage, which was recorded in the previous trial, may have been eliminated in this trial by the operators' increased experience in operating the two harvesters.

The mechanically aided harvest systems can be particularly helpful in reducing crop losses through leavings in the difficult-to-harvest varieties of cassava. On the other hand, manual harvesting minimizes root losses and damage in intermediate and easy-to-harvest varieties. The advantage of manual harvesting in this respect, however, is small and is more than offset by its lower harvest efficiency.