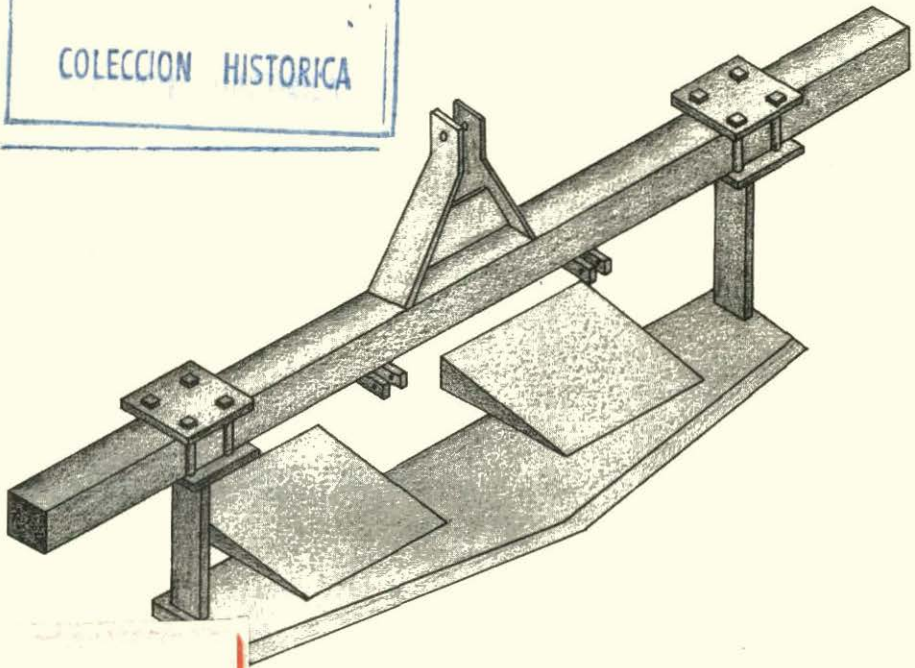


# A CASSAVA HARVESTING AID



Alfonso Díaz-Durán

Cassava Information Center

CENTRO INTERNACIONAL DE AGRICULTURA TROPICAL

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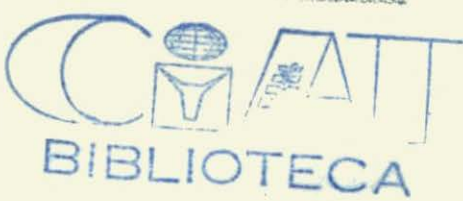
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## A cassava harvesting aid



Alfonso Díaz-Durán



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...OS REFERENCIALES Y BIBLIOGRAFICOS



## A CASSAVA HARVESTING AID

Alfonso Díaz-Durán, PE\*

In order to decrease the amount of labor involved in the manual extraction of cassava roots, the author designed and built an implement at CIAT that can be attached to the three-point hitch of a tractor equipped with a hydraulic system. This harvesting aid is designed to break up the soil and loosen the roots, leaving them semiuncovered, which makes their manual extraction easy.

### Description of the harvesting aid

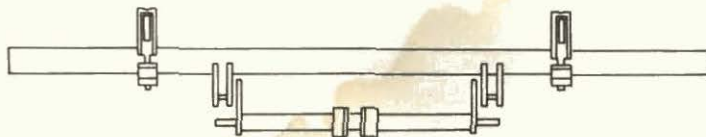
Two types of implements were designed: one to harvest individual rows and the other to harvest two at a time. Basically, the implement consists of a horizontal blade or share with two end supports that couple into a tool bar. On the top of the blade, one or two platforms are placed in the form of inclined planes at an angle of 17 degrees.

The blade and inclined planes act as a wedge when they penetrate the soil; the desired depth is maintained by the action of the tractor's hydraulic system. Blueprints 1 and 2 give the specifications for the different parts of the implement, which is shown in photos 1 and 2.

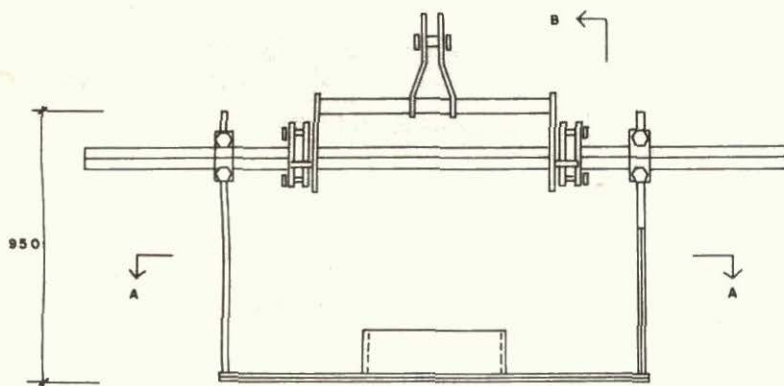
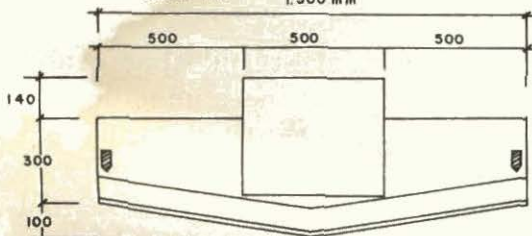
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\* Agricultural engineer, Experimental Farm Superintendent - CIAT

TOP VIEW  
SCALE 1:10

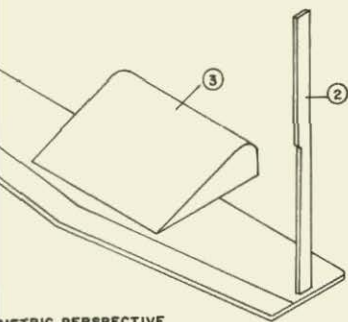


SECTIONAL VIEW AA  
SCALE 1:10 1.500 mm

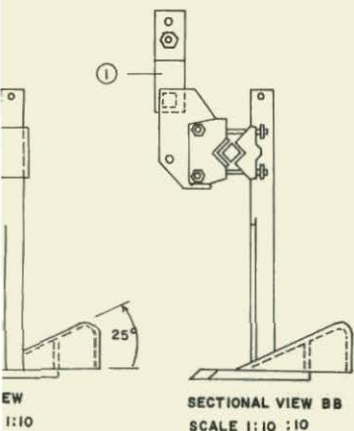


FRONT VIEW  
SCALE 1:10

- 1 - THREE-POINT HITCH FROM A JOHN DEERE 75-hp TRACTOR
- 2 - STEEL SUPPORT, 3" x 1"
- 3 - INCLINED PLANE PLACED AT 25° ANGLE
- 4 - BLADE IN SHEET METAL AND CUTTING EDGE FROM DISCARDED MOTOR GRADER BLADE



ISOMETRIC PERSPECTIVE



EW  
1:10

SECTIONAL VIEW BB  
SCALE 1:10 :10

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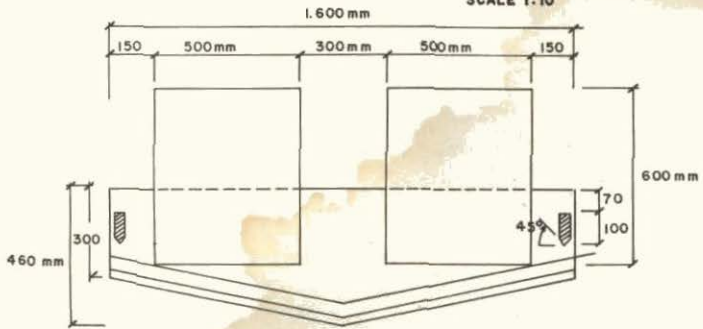
A.A. 6713-Cali, Colombia

IMPLEMENT FOR HARVESTING CASSAVA IN ROWS 1.20 TO 1.40 m  
APART FOR USE WITH A 3-POINT HITCH FROM A JOHN DEERE 75-hp  
TRACTOR

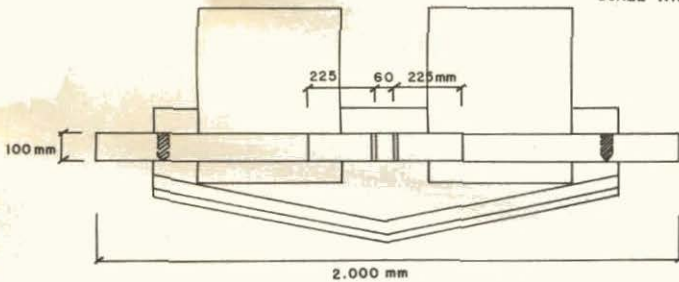
EXPERIMENT STATION OPERATIONS

DESIGN : ALFONSO DIAZ D. Agricultural Engineer, P.E.  
CONSTRUCTION : HUMBERTO MUÑOZ, Maintenance Shop  
DRAWING : OSCAR VARGAS R.

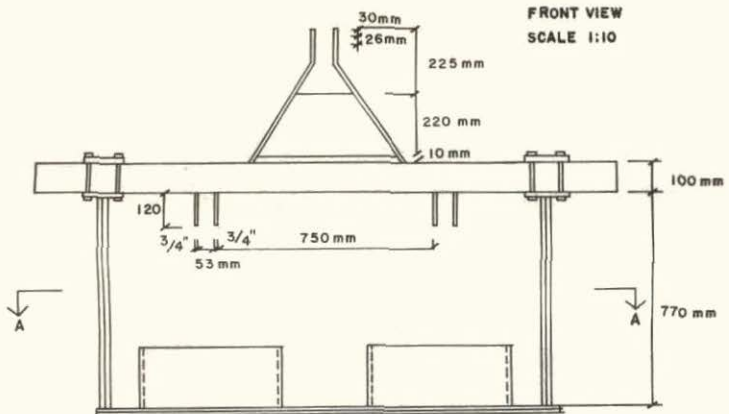
TOP VIEW OF THE BLADE (SECTIONAL VIEW AA)  
SCALE 1:10



TOP VIEW  
SCALE 1:10



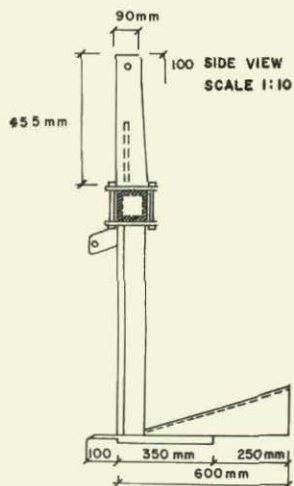
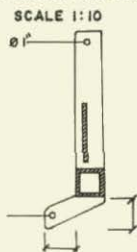
FRONT VIEW  
SCALE 1:10



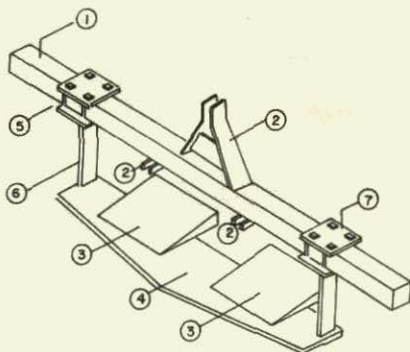


- 1- TOOL BAR FORMED BY 2 WELDED ANGLES, 4" x 4" x 1/2"
- 2- HITCHES, PREFABRICATED PIECES IN 3/4" STEEL FLAT PLATE
- 3- INCLINED PLANES WEDGES AT 17° AND 3/8" SHEETS, REINFORCED INTERNALLY WITH 1/2" WEDGES
- 4- BLADE: CUTTING EDGE FROM DISCARDED MOTOR GRADER BLADE
- 5- BOLTS HOLDING BLADE TO TOOL BAR, 1"  $\phi$  x 7" LONG
- 6- STEEL BAR, SAE 1045
- 7- SUPPORT PLATE, 8" x 8" x 1"

SECTIONAL VIEW OF THE HITCHING POINT



AXONOMETRIC PERSPECTIVE



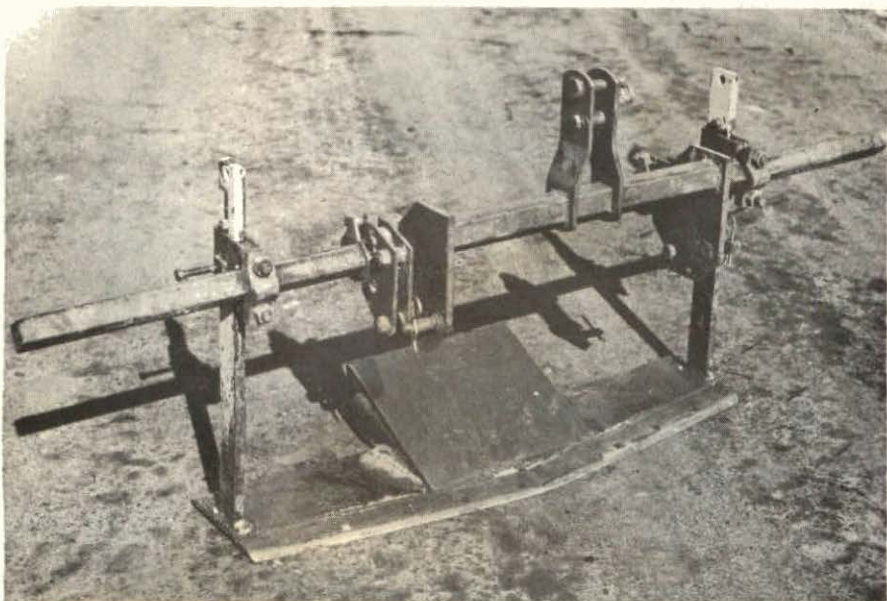
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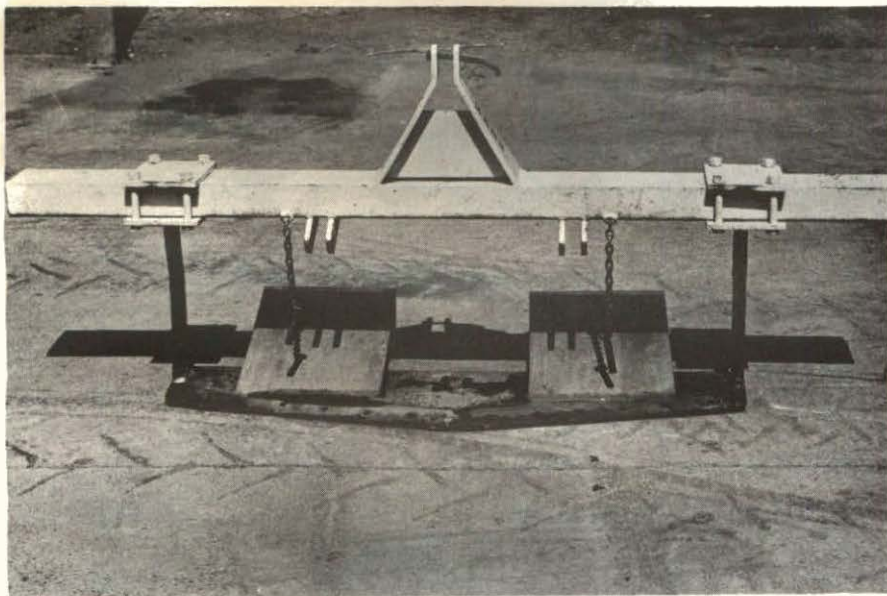
CASSAVA HARVESTING AID

EXPERIMENT STATION OPERATIONS

DESIGN : ALFONSO DIAZ D. Agricultural Engineer, P. E.  
 CONSTRUCTION : HUMBERTO MUÑOZ, Maintenance Shop  
 DRAWING : OSCAR VARGAS R.



**Photo 1.**



**Photo 2.**

## Method of operation

After connecting the blade and the tool bar to the three-point hitch of a tractor provided with a hydraulic system (*photo 3*), the following steps should be taken:

1. Cut or shred the stems, depending upon whether or not they are to be used for planting material. If the stems are to be used for planting material, they should be cut with a chopping knife



Photo 3.

(photo 4). This operation should leave a 15-cm stem portion (photo 5) for pulling out the roots. A flail or rotary mower (photo 6) can be used to shred the stems.



**Photo 4.**



**Photo 5.**

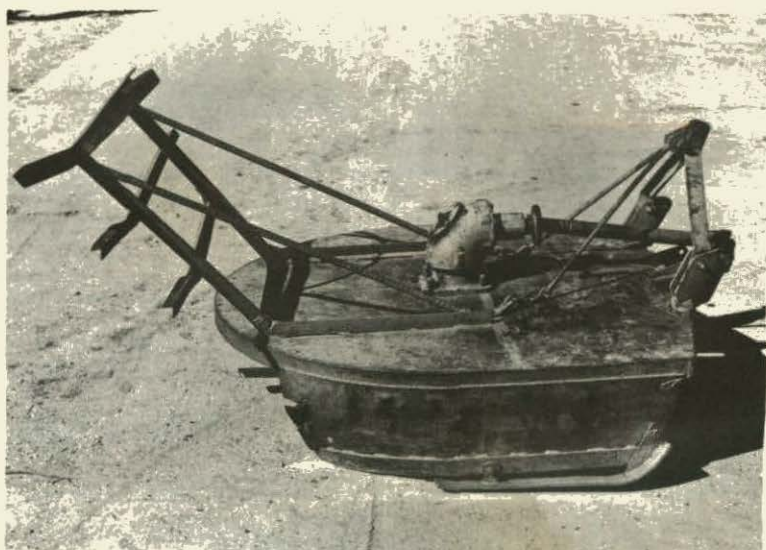


Photo 6.

2. Once the stems have been removed, the harvesting aid should be used to loosen the roots in the soil. The blade is lowered so that it penetrates the soil beneath the roots (photos 7 and 8).



Photo 7.

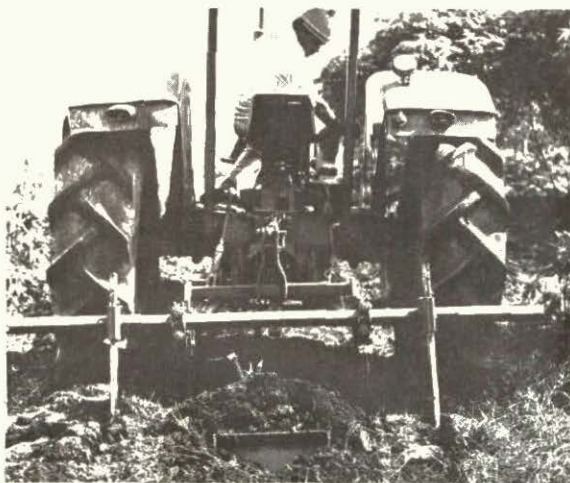


Photo 8.

The depth should be such that the blade barely touches the roots in order not to damage them. As the tractor advances slowly, the inclined plane acts as a wedge due to the angle formed by the blade. A vertical force is created and the roots are pushed upwards. The soil around the roots is loosened so that the roots can be pulled out or picked up with a minimum of effort (photo 9).



Photo 9.

## Evaluation of the harvesting aid

The Cassava Program at CIAT compared this implement with a commercial one-row harvester (photo 10) and a manual operation, the results of which are given in Table 1. In accordance with this evaluation, loss of roots was greatest with the manual harvester since the soil had not been loosened around the roots before pulling them out. The commercial harvester produced relatively greater losses and more broken and cut roots than the CIAT aid since it has a cutting width of 0.80 m (vs. 2.0 m for the CIAT implement), producing losses on both sides of the row. With the CIAT harvesting aid, losses were the lowest and only 0.1% of the roots were cut.

This implement is only the first step towards mechanizing the harvesting of the roots. If vertical disks are added, its use in weedy lots is made easier. A chain belt device can also be added to transport the roots from the ground to a wagon.

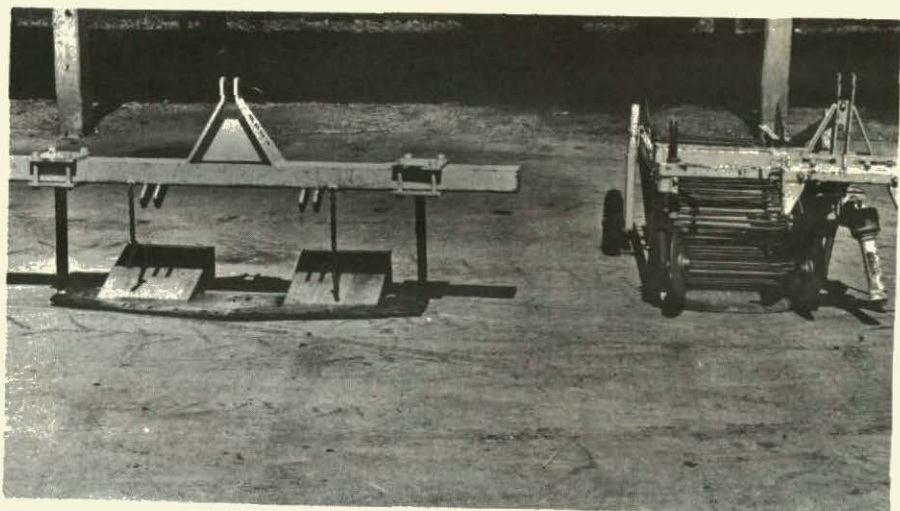


Photo 10.

Table 1. Comparison of a manual harvester with two mechanical systems.\*

Method	Unharvested roots (t/ha)	Broken roots (%)	Cut roots (%)	Bruised roots (0-10)**
Manual	1.62	1.9	0.0	0.0
Commercial harvester	1.55	17.0	0.5	1.5
CIAT implement	0.23	3.3	0.1	1.0

Source: 1978 CIAT Annual Report, p. A-73

\* Cassava harvested at 11 months; fresh root yield, 31 t/ha; values are means of 3 planting systems and 3 densities.

\*\* Visual assessment using a scale of 0-10: 0 = undamaged roots; 10 = half or more of the root surface bruised.