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STUDIES ON THE MECHANISED DIGGING OF CASSAVA.

(A.P.Sharma, Agricultural Engineer, K.R.S.)

Harvesting of root crops involves lifting and separating the crop from the soil. Thus the variables of soil type and condition are added to the usual crop variables encountered in above ground harvesting. Because of this, root-harvesting or digging machines are often adapted only to the area where they have been developed. Harvesting of root crops like cassava, which is one of the most important crops of this country, has been a real problem which has been considered as a bottleneck in the large scale mechanised cultivation of this crop. Under the existing subsistence farming of this crop mostly fork is used as a means of digging this crop which requires as much as 40% of total investment in producing this crop. It has been observed that in doing so some of the tubers are subjected to damage which limits the marketability to some extent. Besides the damage, the work itself is time consuming and laborious.

Field studies were carried out at Koronivia on the farmers fields to find out a suitable machine out of the existing one's for use as a Cassava digger with a view to reduce the cost of cultivation so that the net profit could be enhanced. The results so obtained will assist in establishing the commercial production of this crop in this country.

Research trials were conducted by using a tractor drawn single disc plough, tractor drawn moldboard plough, animal drawn M.B. plough and also manual digging. It was observed that a single bottom tractor drawn M.B. plough can be adopted as a tractor drawn cassava digger.

Two men were usually required for the efficient digging of cassava with tractor drawn single bottom M.B. plough. Before the machine is used, the cassava stems are cut 4" to 6" above the ground level to avoid any damage caused by the tractor to the stems which are used as planting materials. The 4 to 6 inches portion of cassava stems left above the ground enables

easier hand picking after the tubers are exposed to the ground surface. The permissible speed of the tractor for maximum efficiency has to be not more than 3mph. The depth and the angle of the plough has to be adjusted in the digging process according to the requirements to give good turnout of marketable tubers. As soon as the tubers are lifted and exposed to the surface, they should be hand picked and carefully left aside before they are covered by the overturned soil.

It has been observed that a single bottom tractor drawn M.B. plough can be best adopted as a tractor drawn cassava digger as it exposes nearly hundred percent of roots on the surface with only 1.5% of tuber damage whereas in other cases the tuber damage varied from 7.7% to 24%. Time taken to harvest one acre of crop was found to be nearly 5 hours by using a single bottom M.B. plough tractor drawn.

TABLE:1.

Sr.No	Method	No of men	Total wt. of Tubers (Kg)	Market-able wt. of Tubers (Kg)	Unmarket-able wt. of Tubers (Kg)	Dama-ged %	Mark-etable % of Tubers	Time Taken to har-vest 14 cns/	Re-mar- (Tr-act or Spe-ed)
1	Tractor drawn single furrow M.B. plough	2	63.85	62.9	.95	1.5	98.5	4.98hrs say 5hrs	3mph
2.	Tractor drawn single disc plough	2	36.24	33.44	2.8	7.7	92.3	4.15hrs say 4hrs	3mph
3.	Animal drawn M.B. plough	2	64.0	48.0	16	25	75	24hrs	-
4.	Manual digging	1	62.1	60.1	2.0	32	96.8	30hrs	-
TABLE:2									
1.	Tractor drawn M.B. plough	2	57.52	56.80	.72	1.3	98.7	4.15hrs say 4hrs	3mph
2.	Tractor drawn single disc plough	2	57.41	53.81	3.6	6.6	93.4	5.53hrs say 6hrs.	3mph
3.	Animal drawn M.B. plough	2	59.0	46.0	13	22	78	20.58Hrs say 21hrs.	
4.	Manual digging	1	64.9	61.0	3.9	6.2	93.8	38.83hrs say 39hrs.	

TABLE:3.

Sr. No.	METHOD	No. of men	Total wt of Tubers (Kg)	Market-able wt of Tubers (Kg)	Unmark-etable wt of Tubers (Kg)	Dama-ged. %	Mark-etable % of Tubers	Time Taken to har-vest 1 acr	Re-marks.
1.	Tractor drawn M.B. plough	2	198.7	195.40	3.30	1.6	98.4	5.6hrs	(Tractor speed) 3.mph
<u>Average of Tables 1 & 2.</u>									
1.	Tractor drawn single furrow M.B.plough	2	60.68	59.85	.84	1.4	98.6	4.50hrs	3.mph
2.	Tractor drawn single disc plough	2	46.82	43.62	3.2	7.15	92.85	5hrs	3.mph
3.	Animal drawn M.B. Plough	2	61.5	47.0	14.5	23.5	76.5	22.5hrs	
4.	Mannual Digging	1	63.5	60.6	2.95 say 3	4.7 say 5	95.3	34.5hrs	

The results obtained from these tests have been shown in tables 1, 2 & 3. It is very clear from these tables that harvesting of cassava by using a single bottom tractor drawn M.B. plough has minimum of tuber damage i.e. 1.5% and the exposure of tubers on the ground surface for hand picking is 98.5%. In the present study it was found that whole of cassava tubers in bunches are exposed on the surface for manual picking when using a tractor drawn M.B. plough.

Results had also been studied by using a tractor drawn single disc plough. Two men were required to operate the machine to dig the crop. The single disc was adjusted to give maximum penetration and depth was kept under control according to the requirements. During the digging the cassava stems are also required to be cut 4 to 6 inches above the ground level. Though the time required to dig one acre of cassava with single disc is almost same as tractor drawn M.B. plough (about 5 hours), the turnout of marketable tubers in case of M.B. plough is comparatively better. The average damage percentage with tractor drawn single disc is 7.15 while with M.B. plough it is only 1.4%. Most of the damage in case of a single disc plough is caused by the overturning of soil which again buries the tubers and the throwing force of the soil causes much breakages.

Similar studies were conducted by using an animal drawn M.B.plough and manual digging of cassava. Two men were also required for digging with animal drawn M.B.plough. However, it was found that time taken on average basis to dig one acre of cassava with animal drawn M.B.plough is 23 hours and the damage is as high as 24%.

Regarding manual digging of cassava, it was seen that it consumed a lot of time, 35 hours to complete one acre with 5% damage and 95% turn out of marketable tubers.

It has also been observed that the following factors may affect the digging of this crop with machine:

1. Speed of the machine.
2. Moisture content in the soil.
3. Weeds in the field.
4. Physical properties of soil.
5. Pattern of planting.
6. Growth pattern of tubers.
7. Depth of digging.
8. Row spacing.
9. Topography of land.
10. Experience of the operator.

With the field studies carried out it is evident that tractor drawn single furrow M.B.plough would be the answer to the problem of mechanized digging of cassava. However, more field trials and experiments would have to be carried out to establish the economics of mechanized cultivation of cassava.

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