Mechanized Cassava Planting and Harvesting

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Summary

With yields as low as 10 t/ha, cassava farmers in Africa are not competitive in the global market. To be competitive, a minimum yield of 25 t/ha is expected. However, to get higher yields and greater economic benefits, improved management practices will be required. Mechanization of the cassava production system, the use of fertilizers, control of weeds, and the use of improved varieties can increase the yield of cassava beyond 25 t/ha. The planting and harvesting operations of cassava are usually done manually, thereby making it labour intensive and time consuming. Generally, it takes 8 to 10 persons to manually plant one hectare of land in a day against using a two-row mechanical planter that can plant 7-10 ha in a day, which is faster and 50% cheaper than manual planting. Similarly, manual harvesting is slow and associated with drudgery and high root damage in the dry season. Depending on the season, manual harvesting of cassava requires between 40 and 60 persons to harvest one hectare of cassava in a day against the two-row mechanical harvester that can harvest up to 3 to 5 ha of cassava farm in a day, depending on the terrain.

Technical Description

A two-row cassava planter (Model 2AMSU) for planting on flat ground has a planting rate of 0.5 - 0.8 ha/h at 700 mm row spacing. The planter may be drawn by a 90 hp (67.14 kW) tractor to plant at a depth of 60 - 100 mm below soil surface. Stakes loaded on the planter are cut with a power take-off (PTO) driven circular saws to cut the stakes to cuttings of 14 ± 3 cm to 149 ± 3 cm length.

Uses

Mechanical planting and harvesting are needed to break the labor bottleneck associated with cassava production, increase productivity and reduce production cost. The ultimate goal is to enhance the competitiveness of the cassava sub-sector.

Composition

A planter or harvester is driven by a tractor of specific minimum horsepower depending on the model of the planter or harvester. Stakes are loaded to synchronize with the speed of the tractor in order to achieve the predetermined planting spacing. Similarly, a harvester is driven by a tractor of suitable power depending on the model of the harvester.

Means of application

Prior to the use of mechanical planting, the farm is prepared The two-row or four-row planter was designed to plant cassava on flat ground with a planting rate of 0.5 - 0.8 ha/h at 700 mm row spacing. Planter may be drawn by a 90 hp (67.14 kW) tractor. A power take-off (PTO) driven circular saw is installed to cut stakes to cuttings of 14 ± 3 cm to 149 ± 3 cm. Planting depth ranging between 60 and 100 mm below soil surface should be maintained. No ridges are needed for this model of planter. Mechanical harvesting should be done using a two-row or four-row harvester (similar to the planter). The planter needs a 120 hp (89.52 kW) tractor at a forward speed range of 2.1 to 6.7 km/h and at a digging depth range of 300 to 400 mm. The harvesting rate of the mechanical harvester would be between 0.3 and 0.5ha/h.

Agroecologies	All Agroecologies.
Regions	Africa South of Sahara.
Developed in Countries	Nigeria.
Available in	Ghana, Nigeria, Tanzania, Zambia.
Solution Forms	Equipment.
Solution Applications	Vegetative propagation.
Agricultural Commodities	Cassava.
Target Beneficiaries	All farmers.

Commercialization

Commercialization Category

Commercially available

Startup Requirements

The farmer must have access to a suitable farmland of adequate size in an agro-ecology that is suitable for cassava growing. The components of mechanized cassava production include land preparation, cassava stakes, mechanical planting, pre-emergence herbicide and its application, post-emergence herbicide and its application, fertilizer and its application, other forms of weeding, mechanical harvesting and transportation of fresh roots, and other miscellaneous activities.

Production Costs

The yield from mechanically managed farm could increase by 38% over the yield in the manually managed farm. Mechanized planting unlike manual planting of cassava allows for deep tillage whereby the hard pan in the ground is loosened up. This facilitates the development of larger roots with increased number of principal roots, thus greater surface contact between root and soil. Consequently, the improved root system gives the crop better possibility to increase the intake and conservation of soil and mineral, which eventually leads to increase in yield and total production. Cost of mechanized planting (US$13/ha) is relatively lower than manual planting (US$29/ha). Harvesting cost under mechanized operation (US$25/ha) is lower than under manual operation (US$61/ha). The total cost of cassava production using mechanical method is US$367/ha representing US$16.68 per ton of roots while the total cost using manual method was $328/ha representing US$20.5/ton of roots.

Customer Segmentation

Mechanized method of cassava production is suitable for farmers or farmers' associations with large or consolidated farm area. The method is not technically possible to adopt my smallholder farmers.

Potential Profitability

Mechanized cassava production is very profitable and cost-effective. The yield obtained from mechanized operation almost doubles that of the manual operation, while the costs associated with planting and harvesting using mechanized operation is less than 50% of cost spent on manual operation. Our work on mechanized cassava production in Nigeria showed that mechanization of cassava planting and harvesting could reduce costs and thereby increase the competitiveness of cassava production system in Nigeria and other African countries.

Licensing Requirements

No licensing requirements.

Innovation as Public Good

Mechanical cassava production is a public good.

Solution Images

Institutions

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