Policy Briefing

Building Uganda's cassava production base

The AgriTT programme is an innovative trilateral initiative between the UK Department for International Development; the Chinese Government; and the Governments of Malawi and Uganda with the Forum for Agricultural Research in Africa. The programme facilitates the sharing of successful experiences in agricultural development with developing countries to improve agricultural productivity and food security.

AgriTT Pilot Development Projects work with smallholder farmers, agricultural outreach agencies and policy-makers in Malawi and Uganda to introduce agricultural technology innovations from China and embed these in a value chain, of which farming communities will be the primary beneficiaries. **The Uganda Pilot Development Project** supports the development of cassava value chains.

Agri TT Agricultural Technology Transfer

Improving yields with new varieties, good practices and mechanisation

According to the Food and Agriculture Organization, Uganda's total cassava output is around 60% of China's. Although the area of farm land under cassava in Uganda is three times that of China, yield per hectare is only one-fifth that of China. As well as being a staple food in some regions of the country, cassava has unrealised potential for industrial processing. The wider Uganda Pilot Development Project also looked at potential for scaling-up and development of cassava-based products – but possibilities for even small-scale industrialisation depend fundamentally on an efficient and reliable production base for fresh cassava roots and dried cassava chips. In this production component of the project, Chinese technical assistance shared expertise on good agricultural practices for cassava cultivation; the potential of disease-tolerant varieties; the possibilities for mechanised cultivation and harvesting; and methods for successful small-scale production of dried high-quality cassava chips.

Forty cassava farmer groups in four districts of western Uganda were established to pilot recommended production technologies and establish a seed multiplication system. The disease-tolerant cassava variety NASE 14, recommended from previous studies, was grown at 37 specially established nursery gardens managed by the 40 farmer groups. Experts from CATAS, China, demonstrated and taught good agricultural practices for improved cassava cultivation. The project also established eight demonstration gardens (two 1-hectare sites in each of the four districts) for mechanised cassava production, using specialist cassava equipment from China that included deep tilling, ridging, planting and harvesting machinery.

The pilot trials focused on good agronomy, including roguing of diseased plants, hand-made ridging, timely weeding, recommended planting spacing, and use of NASE 14. Yields improved substantially in these preliminary trials even without mechanisation (to around 22 t/ha in Buliisa and Kigumba). However, farmers had to be prepared to invest labour in managing the gardens. Yields for mechanised production were even higher, averaging 41 t/ha for the plots in Kigumba and Matunda. These yields were obtained without use of fertilisers; over the long term it could be difficult to sustain these levels without additional soil fertility inputs.

At the start of the project there was considerable scepticism that mechanised production would be economically viable in Uganda. These trials indicate that machine cultivation of cassava now looks feasible under certain conditions, although more accurate data from controlled trials will be needed to confirm initial findings on both agronomy and mechanisation.

Labour costs are a constraint in many of the project areas. Mechanisation saves labour and ensures an optimum plant population and quick, timely operations to catch up with rains. One tractor with two operators can plough and carry out all operations for planting on up to 10 acres in one day. The same area cultivated manually would take up to 310 person-days to prepare the land and another 100 days for planting. In the project area, mechanisation would enable the opening up of additional land for cultivation. And the greater efficiency of mechanised planting allows farmers to respond better to market opportunities and the demands of processors.

Results from the preliminary demonstration trials showed that returns per hectare are higher using mechanised production (see Table 1), but these results need to be confirmed over several seasons. The improved returns are mainly from good cassava yield due to looser mechanically tilled soil giving better water retention and crop rooting; better weed removal through ploughing; and proper spacing resulting in a good plant population, all leading to vigorous, uniform crop growth. It is therefore critical to break the myth among farmers that mechanised cassava production cannot be a profitable enterprise.

Task	Production costs (USh)	
	Conventional production*	Mechanised production
Land preparation† (labour, fuel)	1,113,728	472,847
Seed preparation and planting (labour plus cost of seed)	379,254	666,900
Weed control (labour)	641,145	370,500
Harvest (labour and fuel)	803,298	605,150
Machinery wear and tear estimates	0	118,560
Operators' wage estimates	0	123,500
Total cost	2,957,425	2,357,457
Yield fresh roots (kg/ha)	18,224	40,508
Sale price fresh roots (USh/kg)	269	269
Gross returns per ha	4,902,165	10,896,652
Annualised capital cost of machines (@20% interest)	0	298,213
Net returns per ha (USh)	1,944,740	8,240,982
Net returns per ha (US$)‡	583	2,472

*Average for project area.
†Includes bush clearing, ploughing twice, and digging planting holes.
‡Based on 1USD = 3,334 USh

Table 1. Comparison of production costs and returns per hectare for mechanised and conventional cassava production

It should be noted, though, that the benefits of mechanised relative to conventional production are location-specific. The opportunity costs of labour and fresh root prices vary between districts, and between seasons, and will greatly influence net returns from cassava cultivation. The appropriateness of machines is also site-specific, with stony sites or those with poor drainage posing a problem for ploughing. Skilled operators to drive tractors and carry out mechanised operations carefully may be in short supply, and training may be needed.

Investment costs in machinery are high (in the region of US$100,000 to purchase a tractor plus plough, rotary tiller, ridge-maker, planter and harvester), and will also include tax and freight costs. This investment could be profitable, based on the returns in Table 1, depending on scale of production and the feasibility of renting equipment to neighbouring farmers.

For this project, the greatest cost was the 130 horsepower (hp) tractor needed to operate the machinery. If available, mechanised options that use a 90 hp tractor, more widely available for hire locally, would reduce investment costs. Maintenance and parts should also be considered, including local fabrication of blades and other components that are subject to wear and tear. Many farmers in the region were also willing to consider sharing costs in order to utilise the machinery.

The project succeeded in raising interest in growing cassava as a commercial proposition rather than just a famine reserve subsistence crop. Cassava is now a much more attractive crop in comparison with maize, sugarcane and tobacco, which have traditionally dominated as cash crops in the area.

Policy recommendations

- **Initial findings suggest that Ugandan farmers from medium scale upwards can reap benefits from mechanised cassava production.** Mechanisation should be cautiously promoted to those farmers with resources, but in some areas it would reduce labour opportunities, so the impact of this will need consideration.
- **Farmers will need access to credit in order to purchase machinery – whether as cooperatives or as individual entrepreneurs.** Information sharing on the technologies available would also be valuable. The government and/or donors could create a portal to share information on suppliers and technology reviews on, for example, the reliability and local suitability of specific equipment.
- **A local agent for cassava machinery in Uganda would reduce transaction costs; suppliers such as those in China need to be made aware of the potential market for their machines.** More research on potential adaptations to machines from countries such as China for the Ugandan context, and ways to encourage the private sector to fabricate spare parts such as blades, would enhance the uptake of mechanisation.
- **The supply of machinery would be facilitated by faster import processes and, for example, streamlining of any taxation exemptions for production machinery.**

It is critical to break the myth among farmers that mechanised cassava production cannot reap profits.

Partners

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