



Australian Centre
for International
Agricultural Research



Alliance



THE UNIVERSITY
OF QUEENSLAND
AUSTRALIA



STAKEHOLDER BRIEF

ACIAR Cassava Value Chain and Livelihood Program

Fertiliser and Density application for cassava in Dak Lak, Vietnam

Introduction

Project AGB/2012/078 “Developing value-chain linkages to enhance the adoption of profitable and sustainable cassava production systems in Vietnam and Indonesia” aims to increase the profitability and sustainability of smallholder cassava production in Vietnam and Indonesia by developing effective linkages between value-chain actors to increase the adoption of improved technologies. In Vietnam the project activities were implemented in Daklak and Son La from 2017-2020 by Tay Nguyen University, NOMAFSI , the International Tropical Agriculture Center (CIAT) and the University of Queensland (UQ) with financial support from ACIAR.

Dak Lak is a province in the Central Highland Region of Vietnam and one of the top three provinces in Vietnam in terms of cassava production volume. Provincial cassava production increased 40 percent over the 10 years from 2008 (509,800 tons) to 2018 (716,400 tons) as a results of expansion of the production area from 25,600ha to 38,700 ha. During the same time period, average fresh root yield declined 7 percent from 19.9 tons/ha to 18.5tons/ha. Yield declines are due to many factors, including degradation of soil and varieties, inappropriate farming practices, pests and disease and unfavourable agro-climatic conditions.

Cassava is mainly planted in poor fertile soils where other crops cannot grow well. In addition, the majority of cassava growers have limited resources both in terms of labour and finance. 30 percent of cassava farmers in Dak Lak are classified as poor by the government. Farmers usually apply 250 Kg NPK (15-5-20) and 100kg Triple superphosphate fertilizer per hectare for one time at planting. Planting density is from 15,000 plants to 17,000 plants per hectare.

Experiments of 6 levels of fertilizer application including no fertilizer and the farmers practices combined with three levels of density were established in order to identify the most ideal combination between fertilizer and density which could have the highest impact on cassava performance as well as profits generated from it.

Three levels of density were trialled including: 15,625 plants per hectare (0.8m x 0.8m); 12,500 plants per hectare (1m x 0.8m) and 10,000 plants per hectare (1m x 1m).

Six levels of fertilizer use per hectare were trialled:

1. No fertilizer
2. Farmer practice: 100kg triple phosphate fertilizer + 250kg NPA (15-5-20) applied one time at planting;
3. 90N+60P₂O₅+90K₂O (195kg Urea + 375kg triple phosphate fertilizer + 150 KCL) (General recommended by MARD's procedures)
4. 99N+66P₂O₅+99K₂O (215kg Urea + 413kg triple phosphate fertilizer + 165 KCL 10% higher than recommendation)
5. 108N+72P₂O₅+108K₂O (235kg Urea + 450kg triple phosphate fertilizer + 180 KCL 20% higher than recommendation)
6. 117N+78P₂O₅+117K₂O (254kg Urea + 488kg triple phosphate fertilizer + 195 KCL 30% higher than recommendation)

One ton of biofertilizer per hectare was used for all treatments at planting. Pocket placement methods were used and fertiliser was applied three times - once at planting and two top dressings except for the farmers practice treatment. KM419 was the variety used for the experiments.

This brief presents results from experiments and recommendations on fertilizer use and policies that can improve profits and sustainability of cassava production.

Research Findings

Fertilizer has a strong impact on yield and starch content: On acrisol soil, the fertilizer level of 108N+72P₂O₅+108K₂O has the highest effect on yield at all three density levels. The yield increase with this level of fertilizer is also highest in comparison with no use of fertilizer (from 72% to 94%). The optimum combination of density and fertilizer is 108N+72P₂O₅+108K₂O and 15,625 plants per hectare (0.8m x 0.8m). Under this combination yield is 10% higher than other densities and 94% higher than without using fertilizer. Applying higher fertilizer than 108N+72P₂O₅+108K₂O has no more effects on cassava yields at all density levels. The fertilizer level of 99N+66P₂O₅+99K₂O has no effect on cassava yield and starch content at all densities.

Cassava starch increases as the levels of fertilizer increase. The highest starch content (31.29%) is found at highest level of fertilizer in combination with the lowest level of density (117N+78P₂O₅+117K₂O combined with 10,000 plants per hectare - spacing 1mx 1m). Starch content when no fertilizer was used was 28.5% on average.

On ferasoil soils, cassava yield is found to be highest at fertilizer level of 117N+78P₂O₅+117K₂O and density of 10,000 plants/ha (45.37tons/ha) or 12,500 plants/ha (45.21 tons/ha). However the starch content at 10,000 plants per hectare (30.53% starch) treatment is lower than at 12,500 plants/ha (31.39% starch). Fertilizer treatment of 99N+66P₂O₅+99K₂O has very little effect on cassava yield and starch content at all levels of density.

Effect of fertilizer and density on profits made from cassava production:

On acrisol soil, the highest return on investment can be achieved if applying 108N+72P₂O₅+108K₂O and planting at 15,625 plants per hectare. Return on investment varies from 1.17¹ to 1.62 depending on the selling price (from 1,900VND/kg to 2,300VND/kg). On ferasol the highest return can be achieved applying fertilizer as farmers usually do and using a density of 12,500 plants per hectare. ROI is 2.44 at a farm gate price of 1,900VND/kg

¹ Implying that every 1VND invested will return 1.17VND in net revenue

Recommendations

Cassava farmers: On acrisol, it is recommended that a fertilizer level of $108\text{N}+72\text{P}_2\text{O}_5+108\text{K}_2\text{O}$ and 15,625 plants be used. This implies an increase in upfront costs of 50 percent in comparison with no use of fertilizer but can result and increase in net revenue of 140 percent. With the current cost of fertilizer and labour wages an additional upfront cost of 8.5 million per hectare is required, but this fertiliser and density could give an additional 22 million VND of net revenue per hectare at farm gate price of 1,900VND/kg.

On ferasol, farmers are recommended to use 100Kg triple superphosphate fertilizer plus 250 kg NPK (15-5-20) but planting at 12,500 plants per hectare to maximize profits. At a farm gate price of 1,900VND/kg, net revenue gained is around 56 million per hectare while only 15 million VND of additional upfront costs are required, implying a 14 percent cost increase but 30 percent net revenue increase in comparison with no use of fertilizer.



Cassava starch processing factories: Fertilizer has a significant effect on cassava starch content. In general, without using fertilizer starch content is about 28%. Once fertilizer is applied it has an immediate effect on starch content. Fertiliser application can make starch content increase by 1% (farmer's practice) to more than 3% (highest fertilizer treatment) compared to no fertiliser use. To maximize return on starch processing, it is recommended that cassava price at farm gate should be paid against starch content instead of paying in bulk as it is now in order to encourage farmers to apply fertilizer on cassava.

This stakeholder brief summarises issues, findings and key policy recommendations related to the use of fertiliser for cassava in Dak Lak, Vietnam from ACIAR Project AGB/2012/078 *Developing value-chain linkages to enhance the adoption of profitable and sustainable cassava production systems in Vietnam and Indonesia*. The project is funded by ACIAR and implemented by Tay Nguyen University, CIAT and the University of Queensland. The intended audience of this brief is the Ministry of Agriculture and Rural Development, Local Government and extension centres and the private sector stakeholders in the cassava value chains.

© 2020



Australian Centre
for International
Agricultural Research



Alliance

