Optimal Land Allocation of Maize, Cassava and Teak for Small Landholders in Southern Togo, West Africa

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Smallholders in Togo depend on subsistence agriculture to meet their family's needs. Southern Togo has a high population density in urban and rural areas. Available agricultural land is becoming limited because of increasing population pressure. Maize and cassava are main staple food crops and are planted on the majority of smallholders' land. Despite limited land and the need to allocate land to maize and cassava for consumption. Togolese farmers are interested in planting teak plantations on their land as a way to generate income.

The purpose of this study was to examine optimal land allocation of maize, cassava and teak for smallholders. I hypothesized that teak production would not be a feasible enterprise for smallholders with a limited amount of land. A linear model was developed to calculate the optimal allocation for maize, cassava and teak. The linear program included decision variables representing the alternative management options, which defined the parameters necessary to solve the linear programming model.

Household farm surveys were conducted of the study area to collect necessary data on cost, labor, and land area for producing cassava, maize and teak. The households where divided into five representative farmer types. The model evaluated different scenarios using farm survey data for cassava, maize and teak. The model was solved for each farmer type using fifteen- and thirty- year teak rotations, sold with black market and government market prices. Discount rates of eight, eleven and fifteen percent were applied to the costs and returns in the model to incorporate the costs involved with using resources over long periods.

The model shows that growing teak is most profitable for smallholders who grow teak on a short-term rotation with a discount rate of eleven percent or less and sell it on the black market, even when constrained by subsistence crop production and limited land.

For land-rich and labor-poor farmers, teak is profitable under all regimes. Evaluating farm data with a linear model showed that although labor and land constrains the feasibility and scale of teak production, the greatest influencing factor on teak feasibility is the discount rate.