

## **Optimal Crop Combination Using Linear Programming for Smallholder Farmers in Moshi District, Tanzania**

**By**

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The main objective was to determine the optimal crop combination by using linear programming approach to smallholder farmers in Moshi district Council, Tanzania. A cross sectional single-visit survey involving smallholder farmers was selected by means of multi-stage stratified random sampling technique. Using descriptive statistics to identify various crops cultivated by farmers, the first priority was banana 44.4%, then coffee 36.1%, Maize 10.2%, beans 6.2%, potatoes, vegetable and cocoyam 2.8%. The analysis of factors influencing production by using multiple linear regression, the model suggested that factors such as farm size, Labour, Capital, education level, age and farm size, were significant at  $P < 0.05$  whereas access to extension services, access to credit and experience of farmer were significant at  $P < 0.1$ . A GM analysis was used to examine and compare competitiveness of a set of selected crops. The analysis showed that banana has the highest profit of TZS 626,583 per acre. The profit for other crops in the order of decreasing was Coffee TZS 88,056, Maize TZS 126,826, other crops (potatoes, vegetable and cocoyam) TZS 74,975 and beans TZS 65,140. A LP model was used to investigate how farmers allocate their scarce resources in order to maximize farm's total net returns. The results indicated that smallholder farmers with 1.44 acres the optimal plan is to allocate 1.20 acres for banana, 0.22 acres for coffee and 0.02 acres for other crops (potatoes, vegetable and cocoyam). As a result of the optimal solution, the farmer's income would be increased from TZS 1,283,237 to TZS 1,611,835.4 showing an improvement of 25.6%. Furthermore, if a farmer reduces coffee production by 50%, farmer's income would increase by TZS 550,109 from TZS to TZS 1,833,346 equivalent to 42.9%. It was concluded that optimal combination model suggested by this study is an inevitable strategic action for smallholder farmers in order to maximize their income.