Biofuels and Food Production: Empirical Evidence from Sugarcane Ethanol in Malawi

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Background of Study

Biofuel production in Malawi is linked to the development of bioethanol & sugarcane product cluster under the Malawi's National Expert Strategy (NES). The sugarcane product has been identified in the NES as one of three clusters, which are expected to drive the country's exports as single most important export crop, which in 2010 accounted for nearly 50% of total exports (Government of Malawi - GOM, 2012).

Malawi has been among the lowest cost producers of sugar in the world due to its favorable climatic conditions, water resources and low labour costs.

Study Objectives

We examine the implications of biofuels development on a major ecosystem service, namely: food production. Specifically, it evaluates household-level interlinkages between biofuel feedstock production and food production of outgrowers integrated in large-scale biofuel investments

Method of Analysis

The analysis is based on a large household survey conducted in a major sugar and ethanol producing region in Malawi. The effects on food crop input expenditures, labour use, land expansions and investments in agricultural assets are econometrically estimated. To address endogeneity problems when estimating net effects on food production and productivity, we apply endogenous switching regression (ESR) and propensity score matching (PSM).

Table 1: Comparison of farm & household characteristics (outgrowers and other households)

Variable	Total	Outgrowers	Other households	z-statistic
Average age of head (years)	44	47	44	1.644*
Female headed household (% of households)	14	11	15	-0.275
Share with at least primary education (%)	80	81	80	0.558
Share with at least secondary education (%)	27	35	23	2.041**
Farming experience (years)	18	19	17	1.949*
Average family size (number of people)	5.5	5.8	5.4	1.028
Average number of members in working age	2.8	3.2	2.6	1.790*
Born in the village (%)	74	76	73	1.269
Years household head is residing in the community	39	42	37	2.171**
Ethnic minority (%)	55	51	57	-2.503**
Average land holding (Ha)	2.96	5.73	1.71	8.633***
TLU (Tropical Livestock Unit)	0.50	0.72	0.39	1.431
Access to credit (%)	22	48	10	4.146***

Impact channels - marginal effects and treatment effects

Outcome	Land expansions	Labour hiring	Input purchase	Asset investments
DH-model (marginal effects):				
Participation stage	0.010 (0.931)	0.118*** (3.192)	0.040 (0.784)	
Output stage	0.290*** (5.74)	0.356 (0.405)	0.297*** (3.328)	
ESR (TT)	0.081** (2.01)	2.172 *** (11.64	1.48***(7.55)	0.22***(6.81)
PSM (TT):				
Kernel	0.183*** (2.71)	1.987*** (3.54)	1.46***(3.37	0.13*(1.84)
NNM	0.158** (2.35)	2.318*** (4.12)	1.46***(3.37)	0.17**(2.47)
Radius	0.163** (2.23)	2.331*** (4.15)	1.47***(3.39)	0.16*(2.24)

Key Findings

We find, *inter alia*, that participating in sugarcane outgrower schemes increases the likelihood of households to expand their land holdings under food crops, hire more labour for agricultural production, and access credit for purchasing farm inputs.

We conclude, among others, that expansion of large-scale agricultural investments to promote biofuels may not necessarily compromise the provision of other key ecosystem services, in this case food production due to positive intra-household linkages and spillovers.

Summary & Conclusion

This study submits that households' participation in outgrower scheme seems to be slightly biased towards better off farmers with larger initial land holding, access to land with sufficient moisture content and overall higher wealth.

Our findings point to the greater financial incentive for smallholder farmers with small landholding sizes to consolidate their land for sugarcane production to benefit from economies of scale.

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