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Determinants and extent of land allocation for *Jatropha curcas* L. cultivation among smallholder farmers in Malawi

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ABSTRACT

This study analysed factors that influence household's decision to plant *Jatropha curcas* and the extent of land conversion to *J. curcas*. Results indicate that age, education of household head, availability of labour and ownership of uncultivated land have a positive influence on land allocation to *J. curcas* whereas ownership of livestock and non-farm income deterred households from cultivating the crop. This suggests that poor households with no off-farm income are more likely to adopt *J. curcas* than richer households with livestock and income from non-farm activities. In general, the results suggest that individual and household characteristics are important determinants of decision to plant *J. curcas* and scale-up its adoption. This calls for designing appropriate strategies and regulatory frameworks to harness the potential economic opportunities from *J. curcas* cultivation, while protecting the environment and rural communities from the adverse effects of land alienation from the mainstream agriculture for *J. curcas* cultivation at the expense of traditional crops.

1. Introduction

The global concerns about energy security, food shortages, climate change and increasing oil prices are rising and countries around the world have set their attention on developing of alternative and cleaner sources of energy [10]. *Jatropha curcas* (*J. curcas*) is recognized around the world as an important feedstock for producing biodiesel which has the potential to replace or complement imported fossil diesel [19]. *J. curcas* is an underutilised crop and has received limited research [15]. In Malawi, there is a growing influx of *J. curcas* projects targeting small-scale farmers in rural areas. Bio Energy Resources Limited (BERL), a private company is spearheading and promoting this initiative throughout the country by providing resources especially seedlings to farmers interested in growing *J. curcas* on unproductive marginal land[1] for the production of biodiesel.

As the impetus for *J. curcas* increases, there are concerns about the potential impact of its extensive cultivation on household food security and the environment. Although markets for *J. curcas* seeds are not well developed in Malawi, it is interesting to note that more and more farmers have started growing *J. curcas* farming as their alternative cash crop. This paper aims at addressing these questions. What makes farmers convert their marginal land to *J. curcas* farming, and what is the extent of land conversion? Providing answers to these questions is vital as it provides important insights on factors to be considered when up-scaling *J. curcas* farming and

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[1] The unproductive land targeted for *Jatropha* farming are those where traditional food and cash crops cannot grow well due to low water retention and poor soil characteristics.

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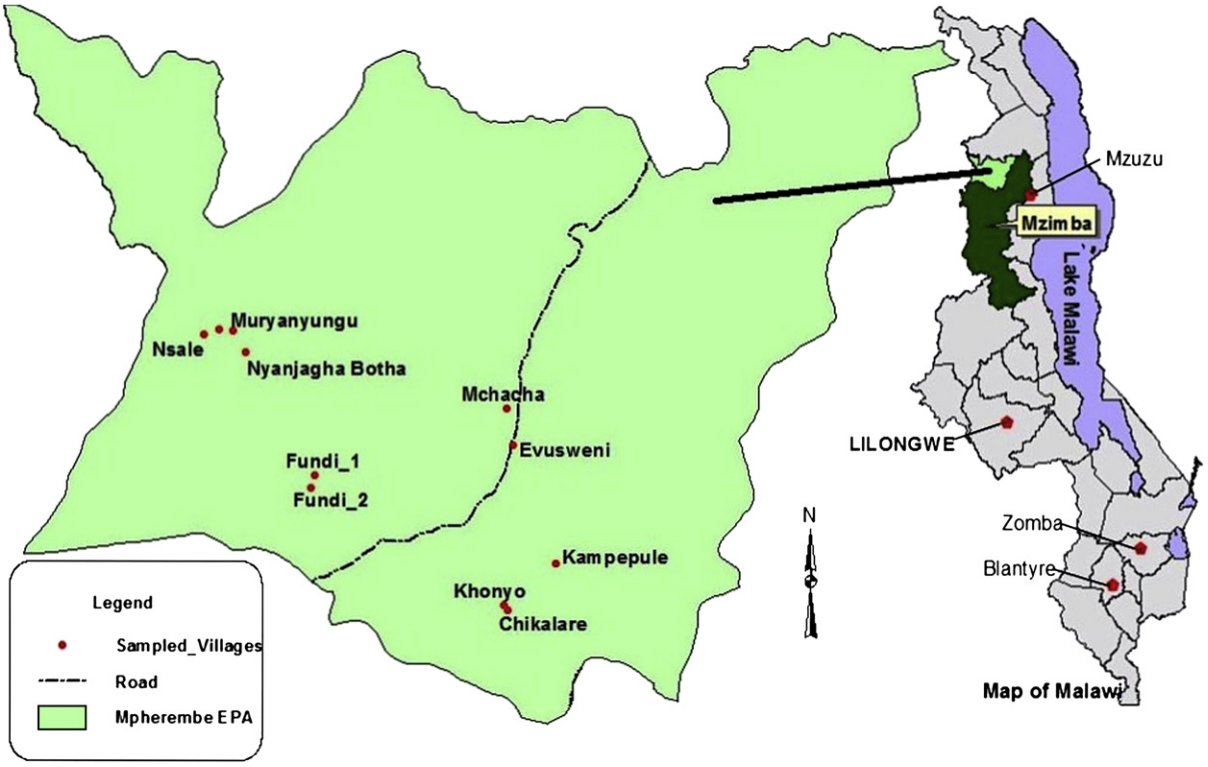

Fig. 1 – Map of study area Mpherembe EPA showing sampled villages.

gives an indication of the appropriateness of promoting *J. curcas* farming as a pro-poor economic empowerment strategy for the local communities.

2. Methodology

2.1. Data sources

Data used in this paper were collected from households in Mpherembe Extension Planning Area[2] (EPA) in Mzimba district in Northern Malawi using a household questionnaire. The sites where data were collected are illustrated in Fig. 1.

The paper employed a multistage stratified probability sampling design. Firstly, the EPA was purposively chosen because households, with support from BERL, have already committed their unproductive land to *J. curcas*. Secondly, three clusters were randomly selected from the selected EPA. Thirdly, two villages from each cluster were randomly selected for the survey, making a total of 6 villages. Households within the sampled villages were then stratified into two based on whether they grow *J. curcas* (adopters) or not (non-adopters). An ordered list of adopters was obtained from BERL District Office at Mpherembe EPA and the list for all villagers, from the Ministry of Agriculture's Agricultural Extension and Development Coordinators (AEDCs). The number of households in each stratum was determined proportional to the size of the stratum. Lastly, individual households interviewed were selected using systematic random sampling procedure. The required sample size (s) was determined using the formula by Krejcie and Morgan [11]:

$$s = x^2NP(1-P) \div d^2(N-1) + x^2P(1-P) \quad (1)$$

x^2 is the table chi-square for 1 degree of freedom at the desired confidence level (3.841); N population size; P the population proportion assumed to have a probability of 0.50 since this provides the maximum sample size that was close to the proportion of adopters in the EPA; d the degree of accuracy expressed as a proportion (0.1). A 10% of the calculated sample size was added for incidence of non-response making a sample of 129 households.

One-off household survey was conducted to collect primary household socioeconomic data. Prior to the household survey, a reconnaissance survey was conducted in November, 2008 during which key informant interviews with village chiefs, and BERL field technicians were held to get a general idea of *J. curcas* cultivation in the EPA. A structured questionnaire was then administered by a team of interviewers in March, 2009. Data collected include, among others, socio- demographic and economic characteristics of the households, land characteristics including ownership and

[2] Extension Planning Areas are the operational units within the structure of the Ministry of Agriculture and Food Security where field officers provide agricultural extension services to farmers. EPAs are headed by the Agricultural Extension Development Coordinators (AEDCs) who report to the District Agricultural Development Officers (DADOs) at the district level. The District Agricultural Offices (DAO) fall under the Agricultural Development Division (ADD) headed by the Programme Managers who report directly to the Principal Secretary in the Ministry of Agriculture. There are eight (8) ADDs in Malawi classified by their unique agro-ecological zones.