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## Biodiesel and Social Inclusion in Rural Areas: A Study Based on Principal Component Analysis in the North of Brazil

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### Abstract

The north of Brazil is located in the so-called Brazilian Legal Amazon and is among the poorest regions of the country. So, aiming at alleviating the regional disparities and promoting the social inclusion, the Brazilian government launched in the year of 2004 the national programme of biodiesel use and production (PNPB). However, after 5 years of the PNPB implementation it is not clear whether the social inclusion is taking place, *i.e.* whether the poorest farmers are being included in the Brazilian biodiesel chain. In this context, a cross sectional study was conducted with small-scale farmers in the north of Brazil, in two sub-study regions situated in a transition area between Cerrado and Amazon rain forest. A range of socio-economic indicators were collected among smallholders who cultivate *Jatropha curcas* and *Ricinus communis*. The explicit factors, relevant to assess living standard in the present study are: (i) family income, (ii) durable goods, (iii) transport mean, (iv) toilet facilities, (v) dwelling facilities, (vi) educational level, (vii) social capital, (viii) crowding factor, (ix) health condition, (x) food security, (xi) resource dependence, and (xii) water shortage. Based on this, the Principal Component Analysis (PCA) and a non-linear logit model were utilised to assess the relationship between farmer's living standard and the adoption of oil seed activity. The results point towards an ambiguity regarding the social inclusion target of the Brazilian programme of biodiesel use and production (PNPB). In one sub-study region poor families are adopting the oil seed activity and therefore are being included in the Brazilian biodiesel chain (*Ricinus communis* region) but in the other sub-study region the poor families continue to be marginalised without access to this new economic alternative and therefore the social inclusion is not taking place (*Jatropha curcas* region). This study is unprecedented in the region and the results are extremely important in obtaining an appropriate method of regional and national government subsidy for an alternative clean energy activity with social inclusion of poor families.

**Keywords:** Biodiesel, Brazil, logit, principal component analysis, social inclusion