



Deutscher Tropentag, October 11 - 13, 2005 in Stuttgart-Hohenheim

"The Global Food & Product Chain- Dynamics, Innovations, Conflicts, Strategies"

Evaluating Agricultural Systems Based on Mulch Technology: A Case Study

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Abstract

In this paper we evaluate the effects of introducing mulch technology, a mechanised chopping of the follow vegetation, in farm family units in the eastern Amazon region of Brazil. The proposed approach includes social research, experimental design and a thematic model to calculate economic performance indicators and technical efficiency scores. These were determined using Data Envelopment Analysis (DEA) models in order to compare agricultural systems applying mulch technology to those using slash-and-burn agriculture. DEA is an optimisation method that generalises single-input/single-output technical efficiency measure to the multiple-input/multiple-output case by constructing a relative efficiency score as the ratio of a single virtual output to a single virtual input. It is a methodology directed to frontiers: instead of trying to fit a regression plane through the centre of the data as in statistical regression, for example, one 'floats' a piecewise linear surface to rest on top of the observations. The results indicate that systems of temporary cultures (e.g. beans, maize and cassava) using slash-and-burn technology were more efficient with a better economic performance. On the other hand, agricultural systems of permanent cultures (e.g. passion-fruit) using mulch technology had higher efficient scores, but lower economic performance when compared to those that used slash-and-burn technology. We conclude that the economic viability of mulch technology demands the reduction of the hour/machine cost, as well as the increase of the family monetary benefit, by intensifying land use with vegetables such as maxixe, sweet pepper and egg plant in the temporary production systems. The aggregated value of the production systems based on this technology can be also reached by the inclusion of organic agricultural techniques and the obtaining of a certification for this ecological process.

Keywords: Economic performance indicators, mulch technology, rural family labour, slash-and-burn agriculture, technical efficiency

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Deutscher Tropentag, October
11-13, 2005, Hohenheim

International Research on Food
Security, Natural Resource
Management and Rural Development
The Global Food & Product Chain –
Dynamics, innovations, Conflicts,
Strategies
University of Hohenheim, Stuttgart
Centre for Agriculture in the Tropics
and Subtropics



Ministério da Agricultura,
Pecuária e Abastecimento



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Introduction

The introducing of the agricultural systems based on mulch technology in farm family units of the eastern Amazon region of Brazil is results of agronomic research of SHIFT 'Capoeira' Project. The mulch technology system is a method agricultural fire free that combine a mechanized chopping of the fallow vegetation and the enrichment of the fallow.

Methodological aspects

The proposed approach includes social research, field experiments and a thematic model to calculate economic performance indicators and technical efficiency scores. These were determined using Data Envelopment Analysis (DEA) models in order to compare agricultural systems applying mulch technology to those using slash-and-burn agriculture. DEA is an optimization method that generalizes single-input/single-output technical efficiency measure to the multiple-input/multiple-output case by constructing a relative efficiency score as the ratio of a single virtual output to a single virtual input. It is a methodology directed to frontiers: instead of trying to fit a regression plane through the center of the data as in statistical regression, for example, one 'floats' a piecewise linear surface to rest on top of the observations.

Results

The results indicate that systems with temporary cultures (e.g. beans, maize and cassava) using slash-and-burn technology were more efficient with a better economic performance. On the other hand, agricultural systems with permanent cultures (e.g. passion fruit) using mulch technology had higher efficient scores, but lower economic performance when compared to those that used slash-and-burn technology.



Figura 3. Slash-and-burn agriculture



Figura 4. Agricultural system based on mulch technology

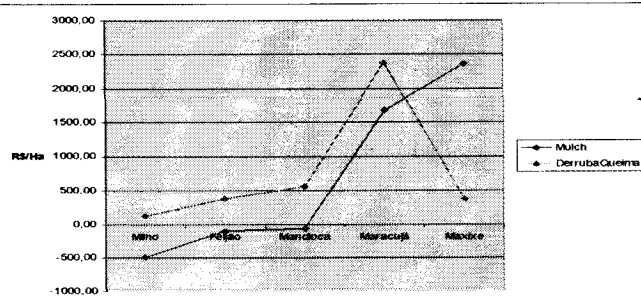


Figura 1: Net revenue per grown hectare

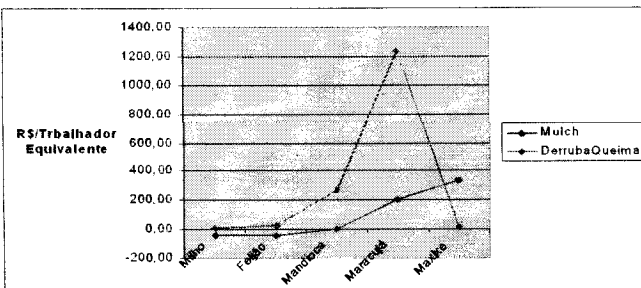


Figura 2. Profitability per worker

Conclusions

The economic viability of the mulch technology demands the reduction of the hour/machine cost, as well an increase of the family monetary benefit, by intensifying land use with vegetables such as 'maxixe', sweet pepper and eggplant in the temporary production systems. The aggregated value of the production systems based on this technology can be also reached by the inclusion of organic agricultural techniques, specially with certification organic agriculture.

FREITAS, A.C.R. de. **Crise ecológica e mudança técnica da agricultura camponesa de derruba e queima da Amazônia Oriental**. Belém, 2004. 163p. Tese (Doutorado) – Núcleo de Altos Estudos Amazônicos, Universidade Federal do Pará.

FREITAS, A.C.R. de; GOMES, E.G. **Desempenho econômico e eficiência técnica de sistemas agrícolas cultivados com tecnologia mulch na Amazônia Oriental**. In: Congresso da Sociedade Brasileira de Economia e Sociologia Rural. 43., Ribeirão Preto. Anais...Ribeirão Preto: SOBER, 2005.