Information System Better-iS

IUW - Output

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Summary:
This paper investigates the socio-economic relevance of sustainability of agroforestry for smallholders using the example of firewood exploitation in rural Tanzania. The results of the logistic regression show that land property rights and environmental awareness increase the sustainable harvest of agroforestry products. Empirical evidence from a quantile regression indicates that the poor increase environmental degradation causing a 'downward spiral' of the poverty-environment trap resulting in income losses in the long run. A threshold of 524 Tanzanian Shilling (TSh) per capita income and day is suggested from where households can manage their tree stocks sustainably. This threshold is slightly below the poverty line of 617 TSh.

Title:
Relevance of Sustainable Agroforestry for Smallholders

Problem and Objective:
Overutilization of agroforestry systems associated with the decline of tree stocks may negatively affect soil fertility, food production, firewood and timber availability, and thus income in rural areas. Agroforestry itself is promoted being a sustainable system (Tambula and Sinden, 2000; Kang and Akinnifesi, 2000). For Tanzania, however, Schwartz et al. (2002) raised serious concerns about the long-term viability of agroforestry systems given current tree harvest rates. They applied a matrix projection model from natural sciences. From the field of economics, the number of empirical papers on sustainability in agroforestry is still small (Schoolman et al., 2012). This paper therefore aims at contributing to this literature by investigating the relevance of sustainability of agroforestry for smallholders from the economic perspective. Three questions are addressed: (1) To what extent do households behave sustainably in terms of firewood extraction from own agroforestry? (2) Which

factors determine sustainable behaviour in agroforestry? (3) Are sustainably behaving households better off in terms of income?

Method:
The sustainability indicator for agroforestry has been defined as a binomial variable taking the value of one in case of sustainable firewood extraction and zero otherwise. Sustainable firewood extraction entails that the wood harvest rate per tree and year is lower than or equal to the rate of increment per tree and year.

In order to determine farm and household characteristics promoting sustainable behaviour, a binary logistic regression is applied to assess the factors influencing the probability to extract firewood sustainably in agroforestry.

To get a comprehensive picture of the influence of the sustainable firewood extraction on household welfare, a quantile regression is applied. The response variable is income per capita representing the economic prosperity of the households. Without splitting the data set, the effects on poor and prosperous households can be assessed and quantified. This allows for the comparison of how some percentiles of income may be more or less influenced by sustainable behaviour than others. A sensitivity analysis shows the influence of sustainability on income with regard to different growth rates ranging from 1, 5, 10, 15, 20 to 25 kg of wood per tree and year.

Results:
Tanzania has emphasized the conservation and sustainable utilization of natural resources including forests (United Republic of Tanzania, 1994). This also applies to private agroforestry to reduce the pressure on natural resources. In order to support sustainable use of private agroforestry, the age of the household head, land property rights and environmental awareness were found to be most relevant. As a result, education and environmental awareness campaigns are expected to increase sustainability in agroforestry. Also the establishment of clear property rights by the government are expected to contribute to sustainability.

Empirical evidence from the quantile regression shows a negative effect of sustainable firewood extraction on per capita income for the poorest 0.05 percentile but a positive impact on per capita income for the non-poor percentiles (0.45-0.95) of households. Income losses related to sustainable behaviour and gains related to unsustainable behaviour for the poorest percentile indicates a poverty-environment trap for this group. A threshold is suggested by 524 Tsh per capita income and day; from that point households can manage their livelihood sustainably in terms of agroforestry. This threshold is slightly below the poverty line of 617 Tanzanian Shilling.

Lessons learnt:

For research:

Further research is needed to assess whether these results are transferable to other questions on agricultural sustainability. It can be argued that sustainable use of other natural resources has a similar impact on income as firewood extraction from own agroforestry. For example, the question of soil fertility loss may play an important role since overutilization of agricultural land might be associated with short-term gains but long-term pains for the rural poor.

For practitioners:

The results suggest that fast growing tree species may help to satisfy the demand of firewood more sustainably. However, this needs to be discussed with forest experts as well as carefully adapted to the local needs.

Policy recommendations :

A threshold slightly below the poverty line has been found from where households can manage their livelihoods sustainably. Determining such a threshold is very important for policy makers for implementing suitable measures and characterizing the target group.

The use of energy substitutes (like solar or bioenergy) to firewood might be promoted to improve the management and conservation of natural assets.

References:

http://www.better-is.com/files/Kohlhase_2010_Master_Thesis_-_Environmental_farm_investments_and_agroforestry.pdf

Faße 2012: Sufficiency and sustainability (abstract): http://ageconsearch.umn.edu/handle/126666

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