Tropentag, September 20-22, 2017, Bonn

"Future Agriculture:
Socio-ecological transitions and bio-cultural shifts"

The Potential of Alley Cropping as a Multi-dimensional Strategy for Climate Change Adaptation in Africa

Lin Bautze[1], Adrian Müller[2], Matthias Meier[3], Andreas Gattinger[4]

[1] *Research Institute of Organic Agriculture (FiBL), Germany*
[2] *Research Institute for Organic Agriculture (FiBL), Department of Socio-Economic Sciences, Switzerland*
[3] *Research Institute for Organic Agriculture (FiBL), Department of Socio-Economic Sciences, Switzerland*
[4] *Research Institute for Organic Agriculture (FiBL), Dept. of Soil Sciences, Switzerland*

Abstract

Climate change is more and more perceived as a global challenge for agricultural production, food security and human well-being. In particular drought prone regions and smallholder farmers face inevitable negative impacts on crop yields, soils and other ecosystem services by progressing global warming, changes in precpitation patterns and extreme weather events. Therefore, indicators and solutions need to be developed that combine several goals at once.

Within the Swiss project "Potential of Sustainable Land-Use Systems to Promote Adaptation to Climate Change", several meta-analyses on the potential of agricultural techniques as climate change adaptation strategies in Sub-Saharan Africa were conducted. Agroforestry is an often recommended potential sustainable agricultural practice. Its ways of implementation are diverse and range from long-term historic systems to newly established alley-cropping systems and its geographic distribution covers almost all parts of the world where trees grow.

This paper presents the results of more than 100 pair-wise comparison from alley-cropping experiements conducted in Africa between 1984 and 2012 It shows the effects of these agroforestry systems on the nutrient-use efficiency (NUE) compared to mono-cropping systems of cereal grain production, such as maize. The NUE is tested as a proxy-indicator to analyse the climate change adaptation potential of such systems. It allows insights into the water efficiency (particularly relevant for drought-prone regions), crop yields (relevant for the farmers) and the effects of management on soil ressources (soil fertility. Additionally, other co-benefits of alley-cropping in Africa are reviewed, such as the influence on ecosystem services (e.g. carbon sequestration potential), on farmers (e.g. diversification of income sources) and other human well-being aspects (e.g. the provision of medicianal plant production). Further, the methodological challenges in comparing complex agroforestry systems with monocultural cropping systems are discussed.

Last, this papers gives insights and recommendations how alley-cropping systems can be utilised in Africa as a climate change adaptation strategy. It presents associated challenges of all dimensions (socio-cultural, economic and environmental) that currently prevent the progress of this agricultural technique. Therefore, the results adress farmers, researchers and politicians alike.

Contact Address: Lin Bautze, Research Institute of Organic Agriculture (FiBL), Postfach 90 01 63, 60441 Frankfurt am Main, Germany, e-mail: lin.bautze@fibl.org

Keywords: Africa, agroforestry, alley-cropping, climate change adaptation, meta-analysis, nitrogen use efficiency, pair-wise comparison