

Optimization of Farming Systems in the Fakara (Sahel) with Regard to Soil Fertility Using a Dynamic Modelling Approach

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4. Conclusion and perspectives

FAKFARM at its present state is not mature to be employed by extension services to estimate the development of soil fertility under given management practices and farm specific input variables. The improvement of water nutrient limitation interrelation, the incorporation of a livestock and household sub model and the implementation of fallow and legumes like cowpea lies still ahead. Nevertheless it is hoped to contribute to the project "Improved livelihoods in the Sahel through the development and implementation of household level bio-economic decision support systems" by raising questions and maybe giving some hints.

In the present situation 86% of the farms in the Fakara do not crop their fields sustainable. 29% are able to harvest enough millet to feed their families but soil fertility, esp. SOM, is decreasing. 57% are struggling to yield enough cereals for human nutrition. The major share of this group is additionally destroying their base of existence by mining their soils.

Simulation results showed that it is possible to achieve the objectives of sustainable crop production for all farmers, although for some it is easier than for others. Attention is turned on the poor, dwelling in villages as well as in camps. Because of their small cropping area they are most dependent to nutrient inputs. Livestock alone is not able to fill this gap. So access to credit and affordable min. fertiliser is crucial for this group of farmers.

The importance of crop residues as mulch to maintain SOM and soil pH can hardly be rated to high. All farmers, with the exceptions of CR, need to leave at least parts of the CR at the field to keep SOM stabile. Again Livestock at usual stocking rates in this area seems to have less effect on SOM compared to CR. The use of CR as mulch has to compete with a wide variety of other uses in these farming systems. To find alternatives for e.g. building material and fuel wood is one of the most important challenges of research and development. Feeding of CR to livestock also seems to be adversarial to the maintenance of soil fertility. But alternatives are hard to find regarding the limited capacity of rangeland and pasture.

Based on GCM simulations in this work and other recent findings, the West African Sahel seems to be one of the few regions benefiting from climatic change. An increase in GHG and the subsequent warming of earth's climate may lead to an increase in precipitation in the area under observation. Although uncertainties are still numerous, this scenario would lead to an increase and stabilisation in millet yields. This would also have positive effects on soil fertility, as higher CR yields would more than compensate higher decomposition rates caused by the rise in temperature.