

# ALUCCSA - Adaptation of Landuse to Climate Change in Sub-Saharan Africa

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| <b>Country/Region:</b>   | Burkina Faso, Ethiopia                          |
| <b>International Agricultural Research Center participation:</b> | World Agroforestry Center<br>ICRAF              |
| <b>Leading scientists:</b>                                       | Prof. Dr. Christoph Kleinn<br>Dr. Oleg Panferov |
| <b>Duration:</b>   | June 2008 - May 2011                            |

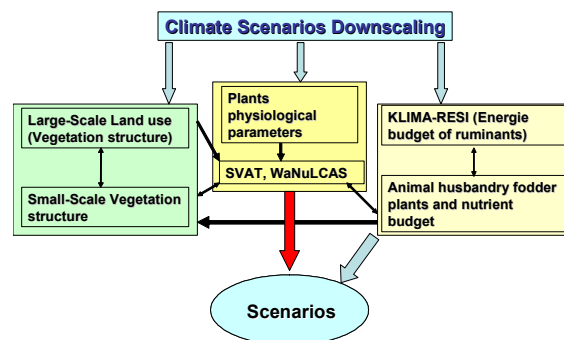
## Initial situation

Farmers and pastoralists of the Sub-Saharan region face severe challenges from unpredictable and vulnerable natural conditions (e.g. observed later onset of the rainy season), as well as the pressure of a growing population. For Sub-Saharan countries climate change increases unpredictability and complicates difficult conditions for sustainability of agroforestry production systems and disturbs a balance of natural ecosystems. A dominant land use in the Sahel zone is formed by the so-called 'Parklands', where a number of tree species are selectively retained from the natural vegetation. Parklands provide products (e.g. Shea butter for export) as well as protective services for animals and adjacent crops through the enhanced microclimate. The mentioned variability of climate conditions reduces the productivity of the system which should be adapted accordingly. More knowledge on possible tendencies of how the climate might develop is required.

However, very few scenarios using regional climate models or statistical downscaling have been run for specific regions of Africa.

## Approach of the project

Regional climate models (CLM, MM5) using as input the SRES climate scenarios B1 and A1B calculated by General Circulation Model ECHAM5 are implemented to produce estimations of future tendencies of the climate in Burkina Faso on regional and local scale. Past vegetation dynamics and current vegetation cover are derived by means of remote-sensing and ground survey. Interconnections between current vegetation composition, agroforestry and livestock husbandry are investigated by field surveys and high-resolution small-scale modelling. The efficiency of different land use types under conditions of climate projections are calculated by means of Soil-Vegetation-Atmosphere-Transfer-(SVAT)-Models (Water, Nutrient and Light Capture in Agroforestry Systems - WaNuLCAS in particular).



The model allows estimating and comparing the productivities of various plant and livestock combinations in agroforestry systems under given climate conditions. Direct physiological measurements and selected ground surveys give the input data and serve as validation for the models.



### Major results achieved

Climate scenario calculations are currently (as of July 2009) running (A1B and B1; Climate scenarios from the Special Report on Climate Scenarios (SRES)). The sample based large area vegetation inventory has started for Burkina Faso. A number of intensive study sites representing the major bioclimatic zones of Burkina Faso are chosen for the more detailed research and data collection on vegetation, livestock and microclimate; these include the assessment of floristic composition of vegetation structure, analysis of tree core samples, baseline studies for animal husbandry and the completion of the network of weather stations of Meteo Burkina by installing 5 automatic ones.

### Expected impact

ALUCCSA aims to estimate the effects of different future climate scenarios on land use for the next 50 years at a regional/local scale for Sub-Saharan Africa

(Burkina Faso, Ethiopia). Scenarios of agriculture interaction with projected climate for the coming decades on a local scale could decisively help to alleviate climate related problems: 1) by helping the single farmers in adapting their cultivars to maintain productivity and income, 2) by upholding the functionality of the relevant silvopastoral agroforestry systems, 3) by giving the right directions of the overall planning in the socio-economic development of these countries.

Therefore, an integrated tool created in ALUCCSA might play an important role as a basis for decision making both for farmers and for political authorities.

It will quantify on regional and local scale future climate conditions as constraints for plant



growth and animal husbandry and help to derive from those options how to react on projected developments.

**Collaborating institutions:** World Agroforestry Centre (ICRAF); Centre for Interdisciplinary Research on Africa (CIRA) of the Goethe-University Frankfurt, Germany; Institut National de l'Environnement et des Recherches Agricoles (INERA), Burkina Faso; Direction de la Météorologie/ Ministère des Transports, Burkina Faso; Laboratoire de Ecologie / Université d'Ouagadougou, Burkina Faso; Centre Régional AGRHYMET, Niger.

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