Tropentag, October 6-8, 2009, Hamburg

"Biophysical and Socio-economic Frame Conditions
for the Sustainable Management
of Natural Resources"

GIS Based Gap Analysis as a Tool for Biodiversity Conservation Optimisation: The IITA Cowpea Collection

Anne Rysavy[1], Dominique Dumet[2], Kai Sonder[2], Joachim Sauerborn[1]

[1] *University of Hohenheim, Institute for Plant Production and Agroecology in the Tropics and Subtropics, Germany*

[2] *International Institute of Tropical Agriculture (IITA), Nigeria*

Abstract

Cowpea (*Vigna unguiculata* (L.) Walp.) is an important grain legume cultivated in most tropical and some temperate regions. It is one of the most widely adapted, versatile grain legumes of high nutritious value. Cowpea production across Africa accounts for approx. 91 % of world output. Cowpea has an impact on nutrition as valuable protein source and livelihoods of small scale farmers and plays a key role in the life of many people, especially in developing countries.

The International Institute of Tropical Agriculture (IITA), Ibadan, Nigeria, holds the largest cowpea germplasm collection worldwide. Many literature sources cite that biodiversity is constantly diminishing and exposed to different hazards accelerating the speed of biodiversity loss. To avoid future losses of cowpea genetic diversity it is important to assess the cowpea accession collection at IITA to get an overview about the current conservation status and to guide future sampling.

For the present study a gap analysis is an evaluation technique to estimate the degree of coverage of already sampled regions, to identify regions that need additional sampling and those where no collections have been performed yet. First the country coverage of georeferenced cowpea accessions was estimated. Then ecogeographical site descriptors (temperature, precipitation, length of growing period, altitude) were extracted to determine areas with environmental conditions favoured by cowpea. Afterwards regions with similar environmental conditions were identified by using GIS techniques to predict areas where the possibility of filling gaps in the collection is most likely.

Furthermore, this study used the spatial analysis tools FloraMap™, Homologue™, ArcGIS™ and DIVA-GIS to identify potential areas for future conservation activities of cowpea.

The geographical scope of the present study was focused on sub-Saharan Africa. Results indicated that cowpea can be found approx. between 15°N and 20°S. With respect to new collections main focus should be put on countries where so fare no collections have been done, but where the spatial analysis showed high probability of encountering cowpea — Burundi, Eritrea, Equatorial-Guinea, Guinea-Bissau, Namibia and Rwanda respectively. In countries with few georeferenced accessions, existing nongeoreferenced passport data need to be complemented or new sampling should be carried out.

Keywords: Biodiversity, cowpea (*Vigna unguiculata* (L.) Walp.), Distribution, DIVA-GIS, FloraMap™, Gap Analysis, Genetic Conservation, Homologue™

Contact Address: Anne Rysavy, University of Hohenheim, Institute for Plant Production and Agroecology in the Tropics and Subtropics, Garbenstrasse 9, 70599 Stuttgart, Germany, e-mail: rysavy@uni-hohenheim.de