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A systematic approach to analyze the eco-geographical origin of germplasm exemplified for pearl millet [*Pennisetum glaucum* (L.) R. Br.] in the genebank of ICRISAT-Niger.

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SUMMARY

Changes in climate and agricultural structures are major reasons for biodiversity decline. Food security is seen to be negatively affected above all in resource-poor regions, which are exposed to harsh climatic conditions, like the semi-arid regions of West Africa. Measures to counteract the negative impacts of this genetic erosion are examined and supported by governmental and non-governmental organizations. Also agricultural research centres all over the world are trying with local genebanks to preserve genetic material of important staple food crops growing in these harsh and vulnerable regions, most threatened by erosion. The present study was done in cooperation with the regional genebank of the International Crops Research Institute for the Semi-Arid Tropics (ICRISAT) at Sadoré (Niger) and aims to help ICRISAT-Niger to conserve local landraces of pearl millet (*Pennisetum glaucum*) in its West African center of origin in a complete and most efficient manner. On the basis of a newly drafted documentation system, a spatial analysis was performed to illustrate the current distribution of the collection sites of the stored accessions. Potential eco-geographical gaps within the present collection were described, to allow ICRISAT to complete the collection of this staple cereal which is most important for food security in the West African region.

The presented work is divided into two parts – data base and spatial analysis - that are depending on each other. The spatial analysis needs as foundation a good data framework, whereas the database benefits from the information extracted by the spatial analysis. The production of the catalogue was based on data of several sources, including passport, characterization and conservation data, which were assembled on-site in the genebank in Sadoré into a database of Access[®]. Besides the improved handling of information for internal use as shown in several examples, the catalogue offers the possibility to integrate data into the worldwide network of SINGER, to make the germplasm data accessible all over the world. Moreover, accessions which occur more than once in the genebank were identified intending to save storage costs by removing them from the genebank. To examine completeness of the collection, gaps were identified, by a GIS-based, spatial analysis. In the geographical extent of Western and Central Africa, different attribute layers were compared with the origins of the accessions to detect systematically attributes which were not covered by any accession in the collection. Prediction maps of pearl millet were calculated in DIVA-GIS, by means of climatic variables to indicate probabilities, where the identified gaps could be actually be filled in. Gaps could be noted within different countries, regions and soils. Moreover, all wild forms of pearl millet form a big gap, as they do not exist in the entire collection. The work is

presented in a form, which helps to introduce the same methods to genebanks with similar challenges. Also a short guideline is included, to provide an overview about the methods used, to ease standardization of the procedure for other collections.