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Soil and Land Resources Information System (SLISYS-Tarim) for Sustainable Management of River Oases along the Tarim River, China

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The Tarim River Basin is the largest continental basin in China. The region has extremely continental desert climate characterized by little rainfall <50 mm/a and high potential evaporation >3000 mm/a. The climate change is affecting severely the basin causing soil salinization, water shortage, and regression in crop production. Therefore, a Soil and Land Resources Information System (SLISYS-Tarim) for the regional simulation of crop yield production in the basin was developed.

The SLISYS-Tarim consists of a database and an agro-ecological simulation model EPIC (Environmental Policy Integrated Climate). The database comprises relational tables including information about soils, terrain conditions, land use, and climate. The soil data implicate information of 50 soil profiles which were dug, analyzed, described and classified in order to characterize the soils in the region. DEM data were integrated with geological maps to build a digital terrain structure. Remote sensing data of Landsat images were applied for soil mapping, and for land use and land cover classification. An additional database for climate data, land management and crop information were linked to the system, too.

Construction of the SLISYS-Tarim database was accomplished by integrating and overlaying the recommended thematic maps within environment of the geographic information system (GIS) to meet the data standard of the global and national SOTER digital database. This database forms appropriate input- and output data for the crop modelling with the EPIC model at various scales in the Tarim Basin.

The EPIC model was run for simulating cotton production under a constructed scenario characterizing the current management practices, soil properties and climate conditions.

For the EPIC model calibration, some parameters were adjusted so that the modeled cotton yield fits to the measured yield on the filed scale. The validation of the modeling results was achieved in a later step based on remote sensing data.

The simulated cotton yield varied according to field management, soil type and salinity level, where soil salinity was the main limiting factor.

Furthermore, the calibrated and validated EPIC model was run under several scenarios of climate conditions and land management practices to estimate the effect of climate change on cotton production and sustainability of agriculture systems in the basin.

The application of SLISYS-Tarim showed that this database can be a suitable framework for storage and retrieval of soil and terrain data at various scales. The simulation with the EPIC model can assess the impact of climate change and management strategies. Therefore, SLISYS-Tarim can be a good tool for regional planning and serve the decision support system on regional and national scale.