
Geographic Information Systems Unit

Introduction

GISU was established in January 2005 to address ICARDA's growing needs for spatial database development and analysis, and to ensure that GIS services would be equitably shared among the new MegaProjects. GISU provides services to all of ICARDA's research. These services include producing international public goods, such as map products, methods of spatial analysis, scientific databases, training and technical back-stopping, as well as the provision of meteorological data and maintenance of ICARDA's meteorological station network.

Achievements

A regional spatial information system was established covering major aspects of CWANA's agricultural environments, including: climate, landforms, soils, land use/land cover and change trends, agroecological zones, land suitability for major crops, farming systems and other characteristics at a spatial resolution that can assist the targeting of germplasm, natural resource management practices and poverty. In addition, new methodologies have been developed for agroecological characterization at different scales. The main methodologies are:

- Land suitability classification for different land uses or land management systems (e.g. crop suitability, suitability for water harvesting or supplemental irrigation);
- Similarity analysis: quantifying similarity in climatic and land use systems between a match location and a target area;
- Mapping drought risk using synthetic climatic data produced by a weather generator model;
- Use of low-resolution satellite imagery to map land use change in CWANA and identify 'hot-spots' of possible land degradation;
- Participatory techniques for agroecological characterization at local levels;
- An agricultural resource poverty index for targeting;
- Mapping agricultural regions: development of a mapping framework specifically for planners and decision-makers.

Awareness was created in the region about the benefits of agroecological research and GIS. The training activities emphasized teamwork and linkage to specialized training institutes, and to upgrading the GIS skills and literacy within ICARDA. Emphasis on formal training was reduced and replaced with on-the-job training within the context of collaborative ICARDA/NARS projects.

During the review period the GIS Unit supervised one Ph.D. and four M.Sc. students from Belgium while three more Ph.D. students (from Syria and Iran) are currently working on land degradation and land suitability classification under a joint supervision.

Current Activities

Development of methodologies for assessing the biophysical potential for water harvesting and supplemental irrigation as well as generation of regional map products.

- A geospatial tool, the ICARDA Agro-Climate Tool, was developed in collaboration with the Plant Stress and Water Conservation Laboratory of the USDA- ARS in Lubbock, Texas. The tool can be used to predict the risk of climatic (drought, heat, cold) stress for specific environments in CWANA.
- Establishment of a comprehensive spatial database on land resources in CWANA at 1-km resolution and expansion of this database to the whole of Europe and continental Asia.
- Remote sensing analysis for the detection of large-scale land use change trends in the CWANA region.
- Developing methods for the assessment and mapping of land degradation at meso-scale level.
- Developing map products and methodologies for targeting different crops and varieties to specific environments.
- Collaboration with NARS in Syria, Turkey and Iran for agroecological zoning and land suitability mapping.
- Mapping agricultural incomes using a resource-based approach for disaggregating statistical information.
- Extension of the agricultural resource poverty index mapping to all developing countries, providing a simple but objective tool for comparison of resource potentials.
- Upgrading ICARDA Meteorological Database (MetDB).
- Finalizing the Soil Database.
- Developing a Web-based data portal for delivery of map products and database access to external users.

Future Plans

1. Out-scaling the potential for water harvesting will be expanded to all dryland areas, and development of a decision-support system of mapping potential for supplemental irrigation and map the incidence of drought in the CWANA region.
2. Further remote sensing studies in CWANA will focus on whether any large-scale land use change trends can be associated with change in land degradation.
3. In collaboration with MP2, GISU will expand ICARDA's climatic/edaphic database from CWANA to all non-tropical dryland areas. The ICARDA Agro-Climate Tool for

characterization of climatic stresses (heat, cold, drought, aridity) in non-tropical drylands will be upgraded.

3. Multi-scale spatial frameworks will be developed for land degradation research within MP3, including methods for up-scaling micro-scale participatory land degradation assessments to meso- and macro-levels, and characterization of the meso-scale in terms of current and potential degradation. Additionally, GISU will have joint research activities related to water erosion risk mapping and rangelands condition assessments.
4. Large-scale assessment of suitability for commodity crops and the development of methods for assessing suitability for specialty crops will be undertaken. Mapping and characterization of production systems will be undertaken by linking spatial frameworks of agricultural regions to data obtained from farming systems research.
5. Multi-scale poverty mapping studies, ranging from local-level resource endowment assessments to the quantification of resource poverty in the global drylands will be carried out.
6. Development of natural resources databases will continue.