Assessing agricultural resources and potential in support to food security and sustainable development

Context
As a result of the unprecedented increase in land pressures and the unsustainable use of natural resources as a whole, the need for up-to-date and credible information on the current state of agricultural resources, their present productivity, and future is huge. Indeed, the 2030 Agenda for Sustainable Development, adopted by all United Nations calls for better planning of land use and agricultural resources.

The Food and Agriculture Organization of the United Nations (FAO) and the International Institute for Applied Systems Analysis (IIASA) have cooperated over several decades to develop and implement the Agro-Ecological Zones (AEZ) modelling framework and databases.

The evolution of agro-ecological zoning

<table>
<thead>
<tr>
<th>Year</th>
<th>Event</th>
</tr>
</thead>
<tbody>
<tr>
<td>1978</td>
<td>AEZ Methodology</td>
</tr>
<tr>
<td>1984</td>
<td>FAO and IIASA collaboration</td>
</tr>
<tr>
<td>1993-1994</td>
<td>Regional and Country Assessments (Kenya, China)</td>
</tr>
<tr>
<td>1995</td>
<td>Start Global AEZ</td>
</tr>
<tr>
<td>2016-2021</td>
<td>GAEZ v4</td>
</tr>
</tbody>
</table>

The AEZ methodology is a successful approach used in land evaluation to support sustainable agricultural development that contributes to several of the United Nations Sustainable Development Goals (SDGs) by providing information about current and future agricultural production risks and opportunities, irrigation water demand, and crop development and adaptation options.

This fourth version of the Global Agro-Ecological Zones Data Portal (GAEZ v4) represents the agronomic backbone for various applications including the quantification of potential land productivity.

Objectives
- Represents a multidisciplinary and collaborative framework for e.g. land use planning, sustainable land management, food policies and climate change impact assessment;
- Supports to resilient agriculture, ecosystems and livelihoods to climate change and food crisis;
- Provides additional functionality to users through ESRI ArcGIS Image Services, dynamic web services that allow for visualization, analysis and extraction of raster-based datasets. This interactive and dynamic web application allows to report on the current state and trends of agricultural production and crop suitability;
- Enables public access to data and information, becoming a gateway to global, regional and local geospatial and tabular information on agricultural resources and potential.

Challenges
- **Sustainable development.** The Global AEZ is fundamental to address food security and at the same time improve land productivity and sustainable value chains (SDGs 1, 2, 3, 12, 13, 15)
- **Early action, emergency, and rehabilitation.** The Global AEZ addresses natural hazards, human-induced crises and protracted crises and improve resilient livelihoods, that rely on agriculture for their subsistence
- **Policy formulation and planning.** The Global AEZ plays a key role in building resilience and achieving and maintaining food security in the future.

Actors and stakeholders
FAO and IIASA released the updated GAEZ v4 Data Portal, a database widely and easily accessible that provides information about the current and future agricultural production, irrigation demand, and development options.

The Global AEZ provides comprehensive information relevant for decision-making. It is of particular interest to national and international organizations dealing with aspects of agriculture, land and water resources, food security, agricultural development and policies, or with climate variability and climate change.
What GAEZ v4 provides

GAEZ v4 provides a standardized framework for the characterization of climate, soil and terrain conditions relevant to agricultural production. It identifies crop-specific limitations of climate, soil and terrain resources in a consistent and empirically founded way. It systematically computes spatial and temporal data on maximum potential and attainable crop yields as well as expected sustainable agricultural production potentials at different specified levels of inputs and management conditions.

The GAEZ computations were completed for a range of climatic conditions, with quantifications of impacts on land productivity from historical climate variability as well as of potential future climate change. Climatic conditions are based on a time series of historical data of 1961-2010 and a selection of future climate simulations using recent IPCC AR5 Earth System Model (ESM) outputs for four Representative Concentration Pathways (RCPs).

Results are presented in a regular raster format of 5 arc-minute (about 9 x 9 km at the equator) grid cells. Selected maps related to AEZ classification, soil suitability, terrain slopes and land cover are provided at 30 arc-second (0.9 x 0.9 km) resolution.

The GAEZ v4 Model Documentation contains updated information on the methodology and the conceptual framework of individual assessment modules.


GAEZ v4 Data Portal

GAEZ v4 Data Portal is an interactive data access facility enabling data visualization and providing free access to data and information.

It comprises a large volume of spatial natural resources indicators and results of agro-ecological crop analysis.

In addition, the Data Portal provides access to the GAEZ v4 methodology and supporting documentation, crops summary statistics tables, and detailed scientific metadata and document.

Related resources


Contact: GAEZ@fao.org