



# Global Agro-Ecological Zoning version 4

## *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



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.

### 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.

### 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

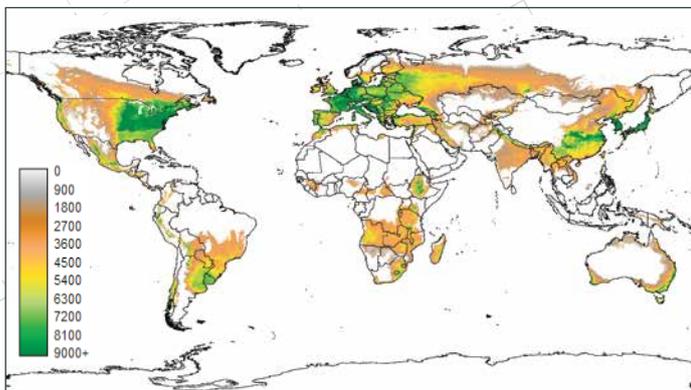
- **Sustainable development.** The Global AEZ is fundamental to address food security and at the same time improve land productivity and sustainable value chains (SDGs 1, 2, 3, 12, 13, 15)
- **Early action, emergency, and rehabilitation.** The Global AEZ addresses natural hazards, human-induced crises 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.

## What GAEZ v4 provides

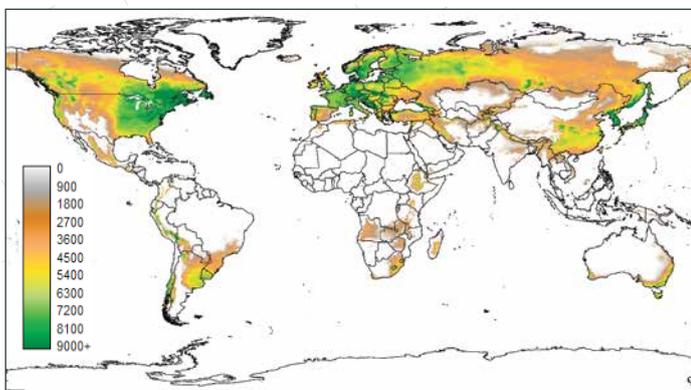
GAEZ v4 provides a standardized framework for the characterization of climate, soil and terrain conditions relevant to agricultural production. It identifies crop-specific limitations of climate, soil and terrain resources in a consistent and empirically founded way. It systematically computes spatial 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).

### Agro-climatic potential yield (kg DW/ha) of rain-fed wheat, high inputs, climate of 1981-2010



### Agro-climatic potential yield (kg DW/ha) of rain-fed wheat, high inputs, climate of 2070-2099



Source: FAO and IIASA, 2021 (both maps) modified to comply with UN. 2020. Map of the World [online]. [Cited May 2021]

The boundaries and names shown and the designations used on this/these map(s) do not imply the expression of any opinion whatsoever on the part of FAO concerning the legal status of any country, territory, city or area or of its authorities, or concerning the delimitation of its frontiers and boundaries. Dashed lines on maps represent approximate border lines for which there may not yet be full agreement.

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.

The GAEZ v4 spatial data are organized in six themes: (1) Land and Water Resources, (2) Agro-climatic Resources, (3) Agro-climatic Potential Yield, (4) Suitability and Attainable Yield, (5) Actual Yields and Production, and (6) Yield and Production Gaps.

## 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

FAO and IIASA. Global Agro Ecological Zones version 4 (GAEZ v4) <http://www.fao.org/gaez/>

Contact: [GAEZ@fao.org](mailto:GAEZ@fao.org)



Some rights reserved. This work is available under a [CC BY-NC-SA 3.0 IGO](https://creativecommons.org/licenses/by-nc-sa/3.0/) licence