The Abdus Salam International Centre for Theoretical Physics

United Nations Educational, Scientific and Cultural Organization

IAEA
International Atomic Energy Agency

2242-12

Joint ICTP-IAEA Workshop on Uncovering Sustainable Development CLEWS; Modelling Climate, Land-use, Energy and Water (CLEW) Interactions

30 May - 3 June, 2011

AEZ Land Assessments and Applications in Global/regional/national Analyses

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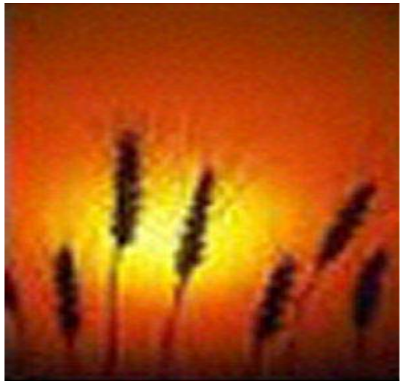
AEZ Land Assessments and Applications in Global/regional/national Analyses

1 June 2011, Joint ICTP-IAEA Workshop, Trieste

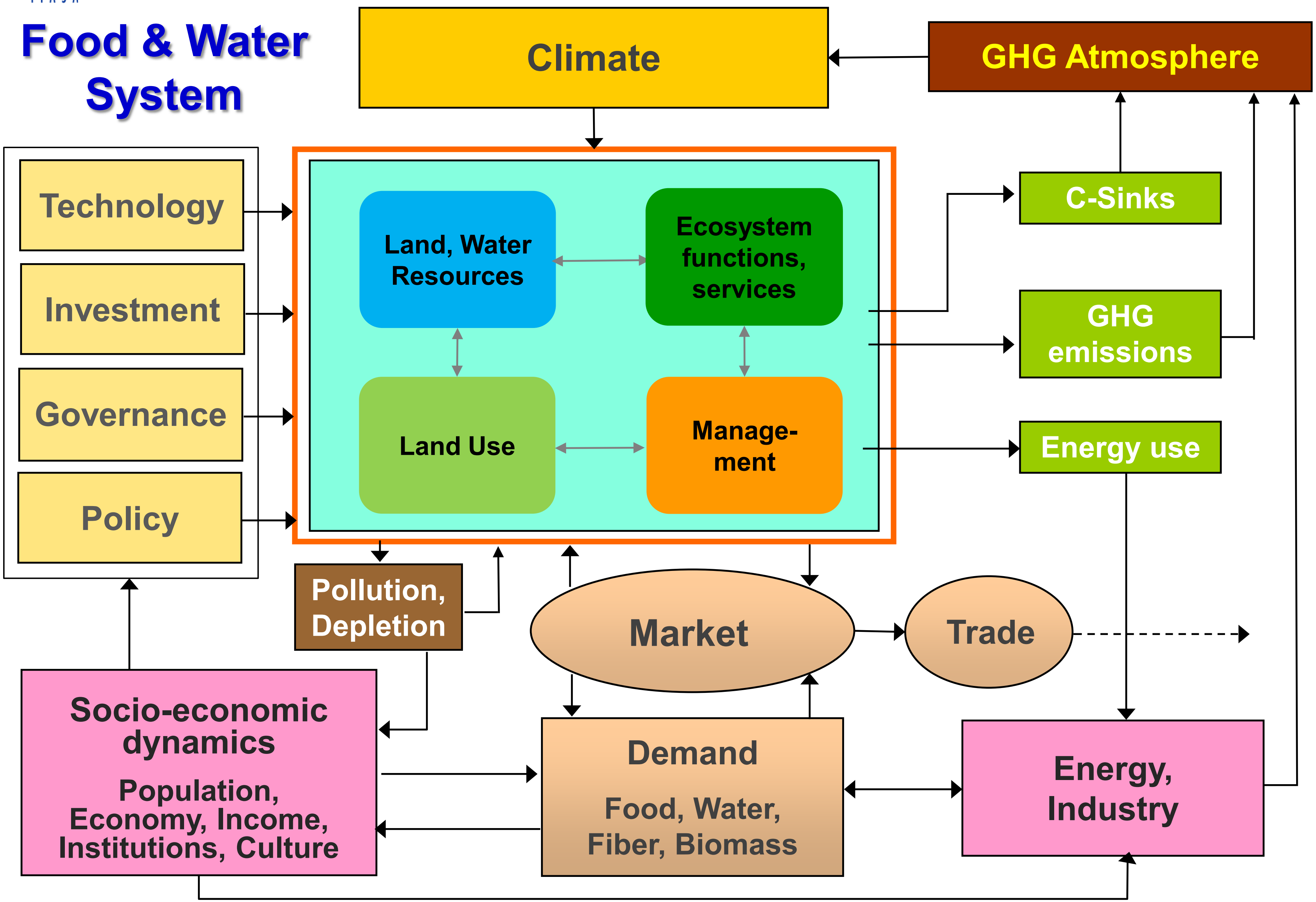
Günther Fischer

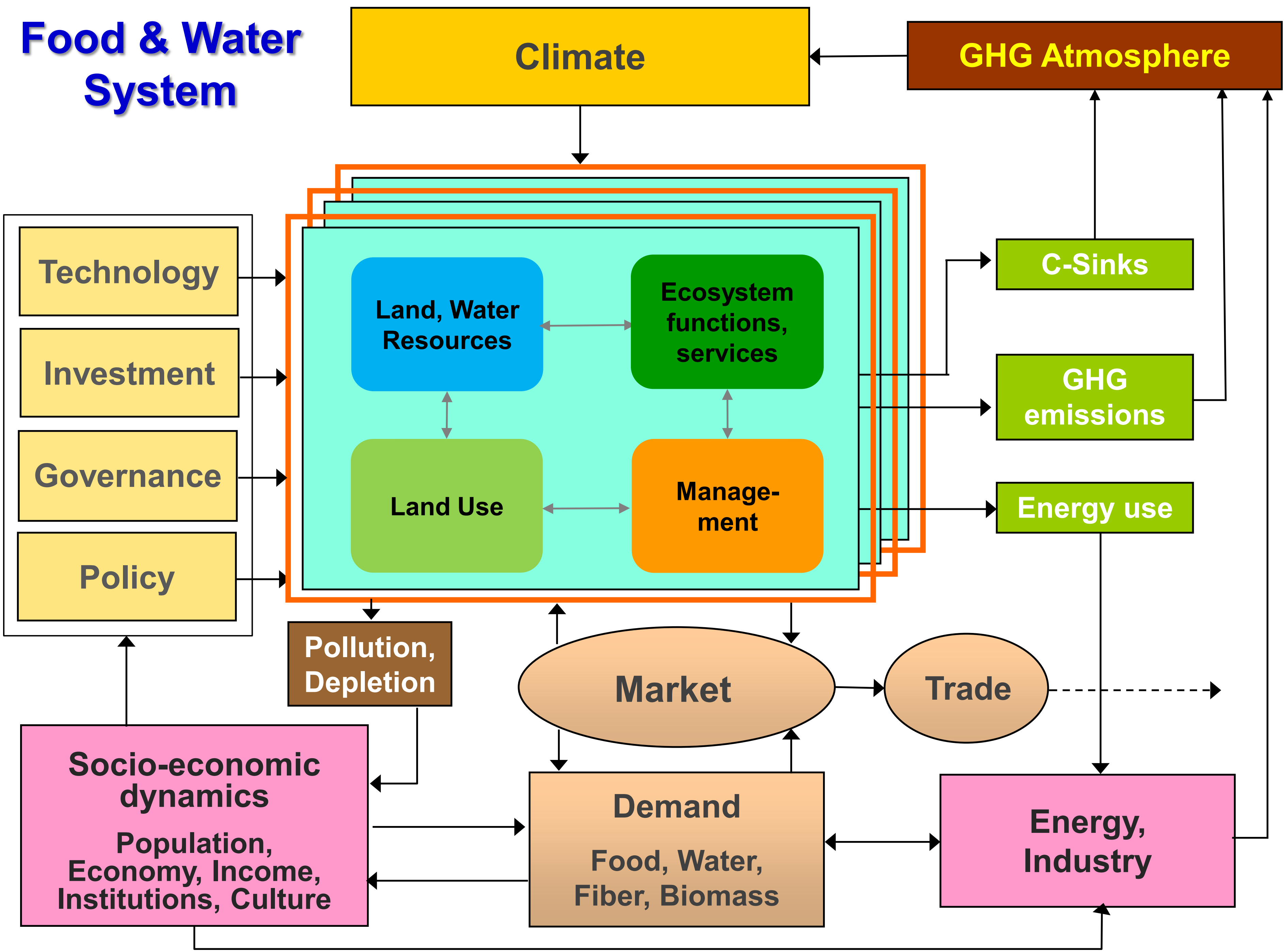
International Institute for Applied Systems Analysis, Laxenburg, Austria

Food & Water: Some key issues

- Population increase by 2050 will be +50% globally, +60% in LDCs, more than doubling in Sub-Saharan Africa. Agriculture demand will grow +70% globally, a doubling of food provisioning is needed in LDCs.
- Agriculture is the largest user of water; the sector is highly dependent on water resources. It accounts for 70% of total water withdrawals; some 40% of the global food crop is derived from irrigated agriculture.
- Food and water supply are key human sectors exposed to and dependent on climate change. Climate-change impacts are already being felt in many countries, further global warming will be unavoidable.
- Agriculture is a major source and sink of greenhouse gases via land use changes, land management and livestock production.
- Ecosystems and species losses occur at alarming rates. Competition over usage rights is at the core of social and environmental conflicts; integrated land use, water and ecosystem management strategies are rare.
- Widespread poverty and inequity. Achieving food security can only be realized within the overall framework of poverty eradication.

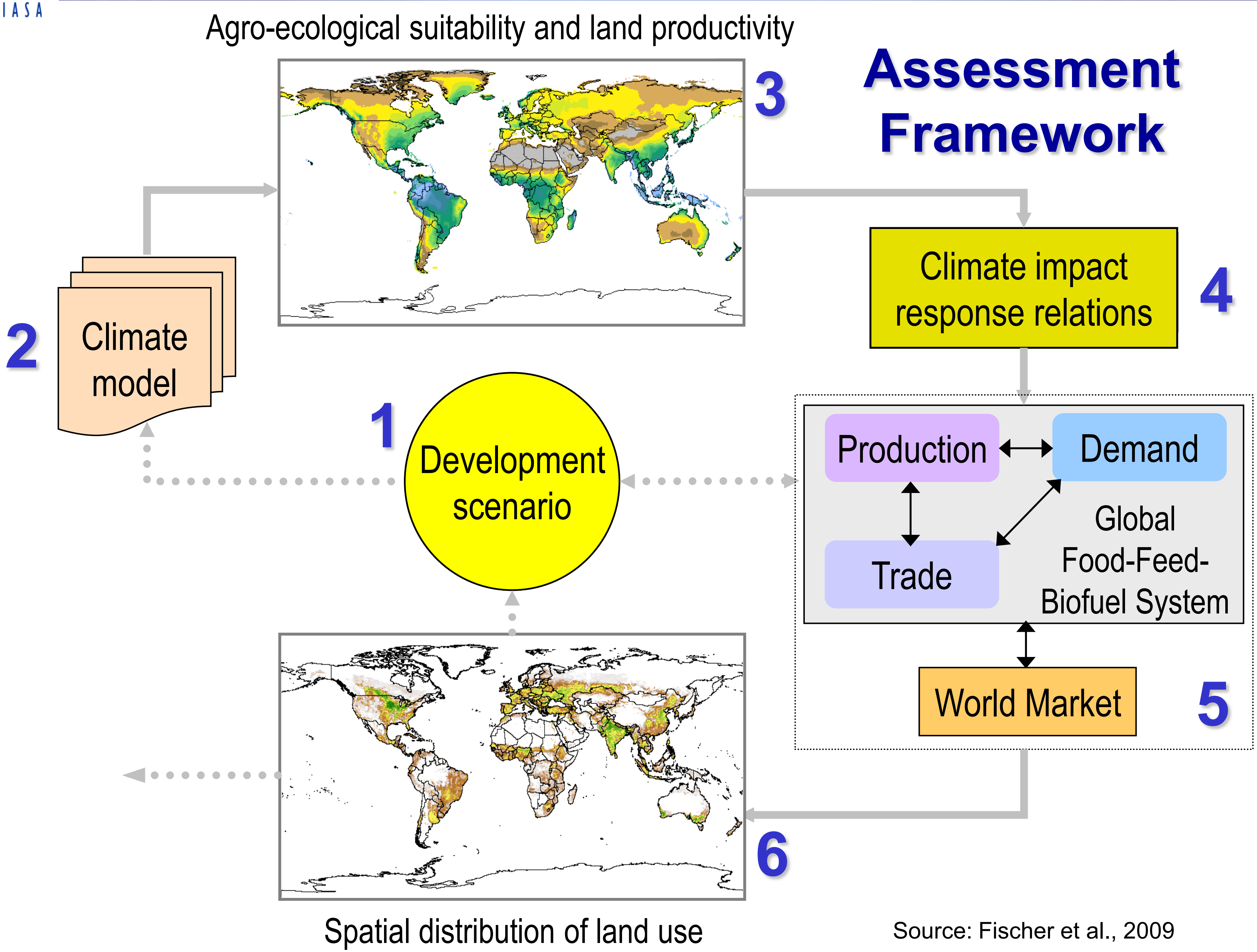
Food & Water System





Food & Water System
Climate
GHG Atmosphere
Technology
Investment
Governance
Policy
Land, Water Resources
Ecosystem functions, services
Land Use
Manage-ment
C-Sinks
GHG emissions
Energy use
Pollution, Depletion
Market
Trade
Socio-economic dynamics
Population, Economy, Income, Institutions, Culture
Demand
Food, Water, Fiber, Biomass
Energy, Industry

Assessment Framework



Source: Fischer et al., 2009

Land Resources & Agro-ecological Zoning:

- FAO and IIASA have developed a spatial analysis system that enables rational land-use planning on the basis of an inventory of land resources and evaluation of biophysical limitations and production potentials of land.
- The AEZ methodology follows an environmental approach; it provides a standardized framework for analyzing synergies and trade-offs of alternative uses of agro-resources (land, water, technology) for producing food and energy, while preserving environmental quality.
- The AEZ analysis yields knowledge about current and future production potentials of land, helps identify land and water limitations and provides insight into current yield and production gaps and their causes.

Conceptual framework of Agro-ecological Zones methodology

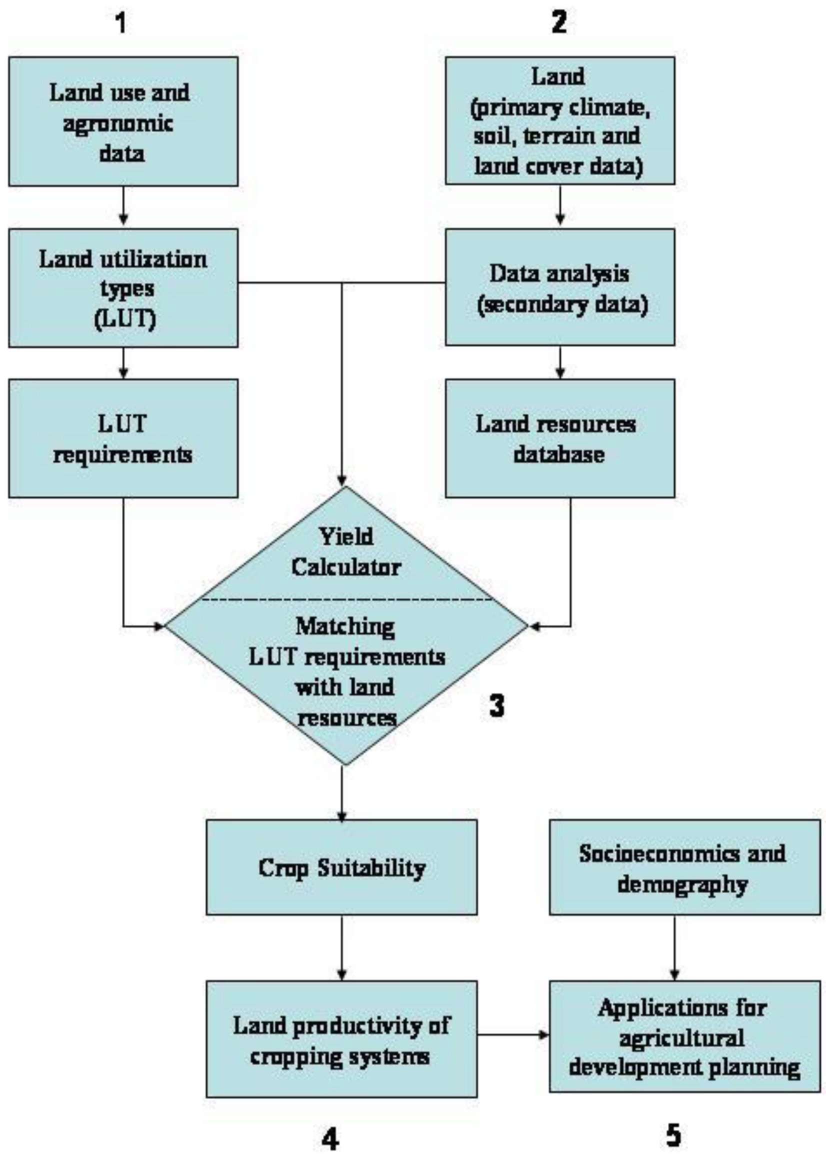
1. Land Utilization types (LUTs) - Selected agricultural production systems with defined input and management relationships, and crop-specific environmental requirements and adaptability characteristics. These are termed Land Utilization Types (LUT);

2. Land Resources database - Geo-referenced climate, soil and terrain data which are combined into a land resources database;

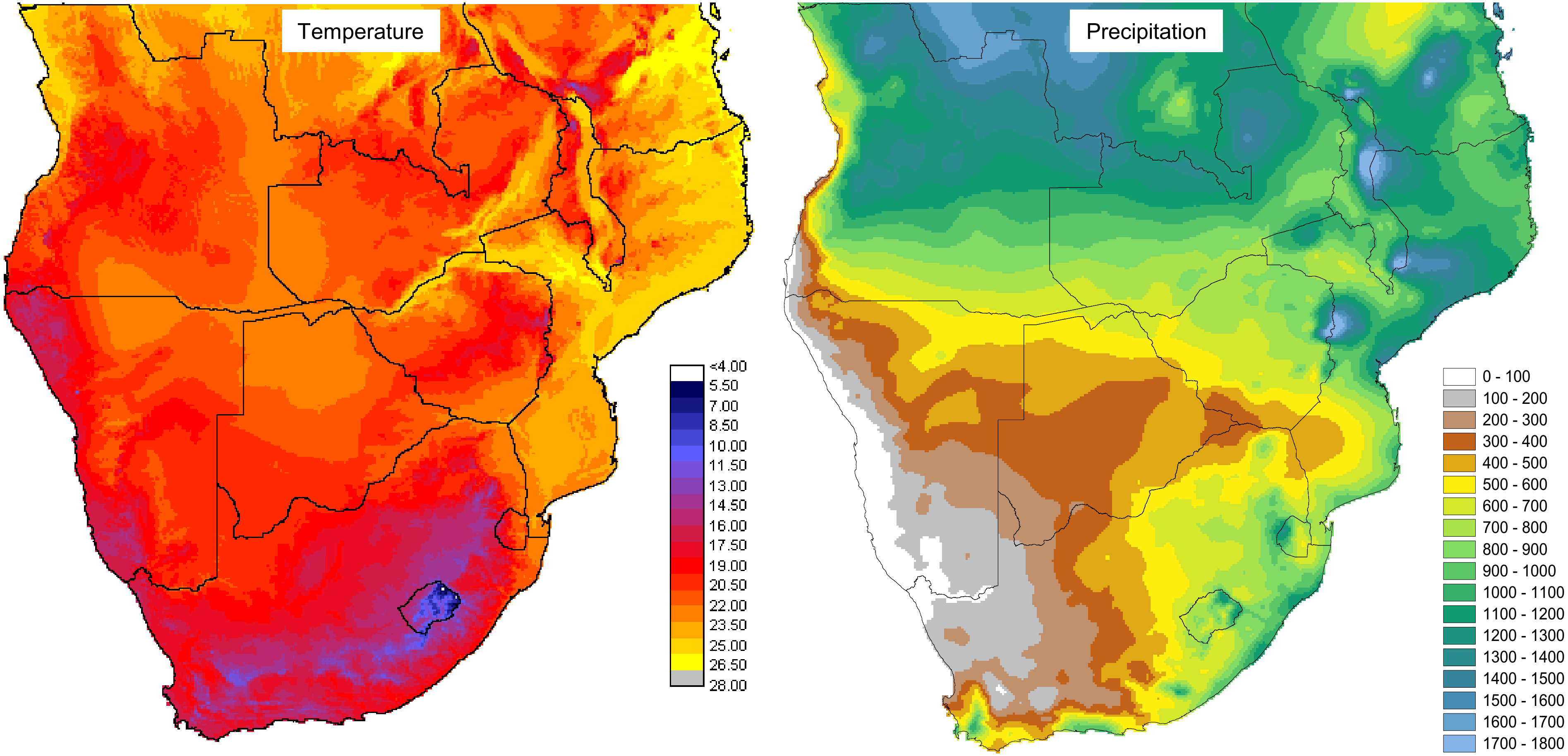
3. Crop biomass and yield and LUT requirements matching - Procedures for the calculation of potential yields and for matching crop/LUT environmental requirements with the respective environmental characteristics contained in the land resources database, by land unit and grid-cell;

4. Assessments of crop suitability and land productivity, and

5. Applications for agricultural development planning.

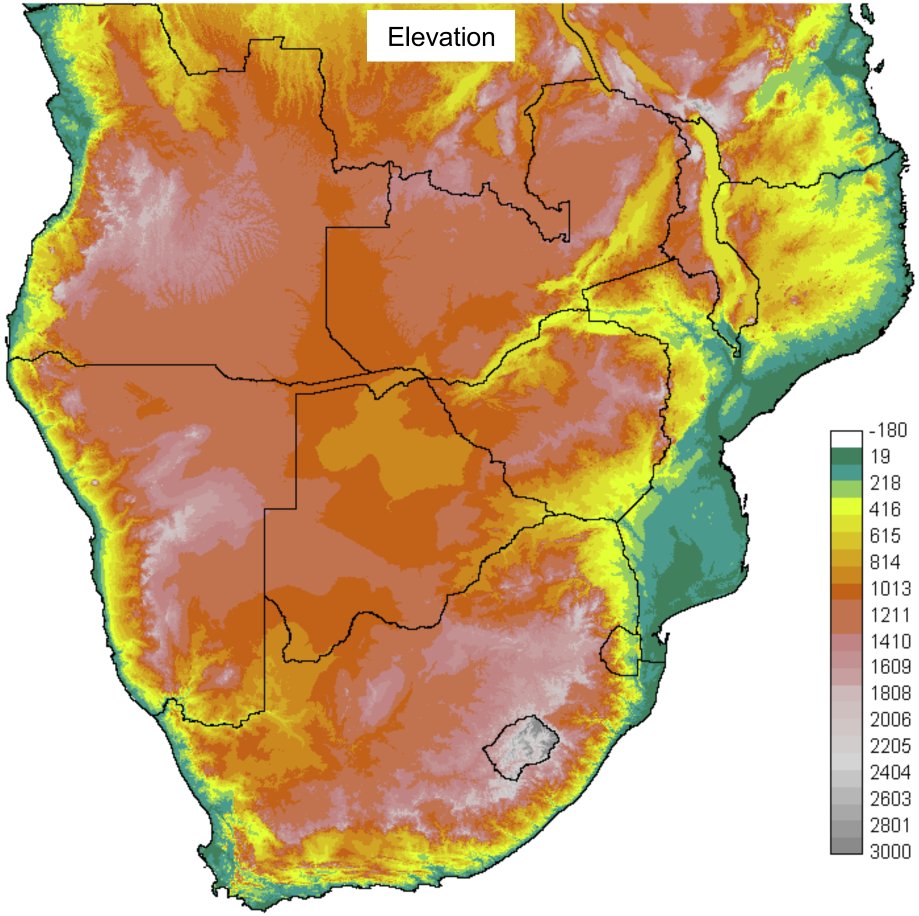


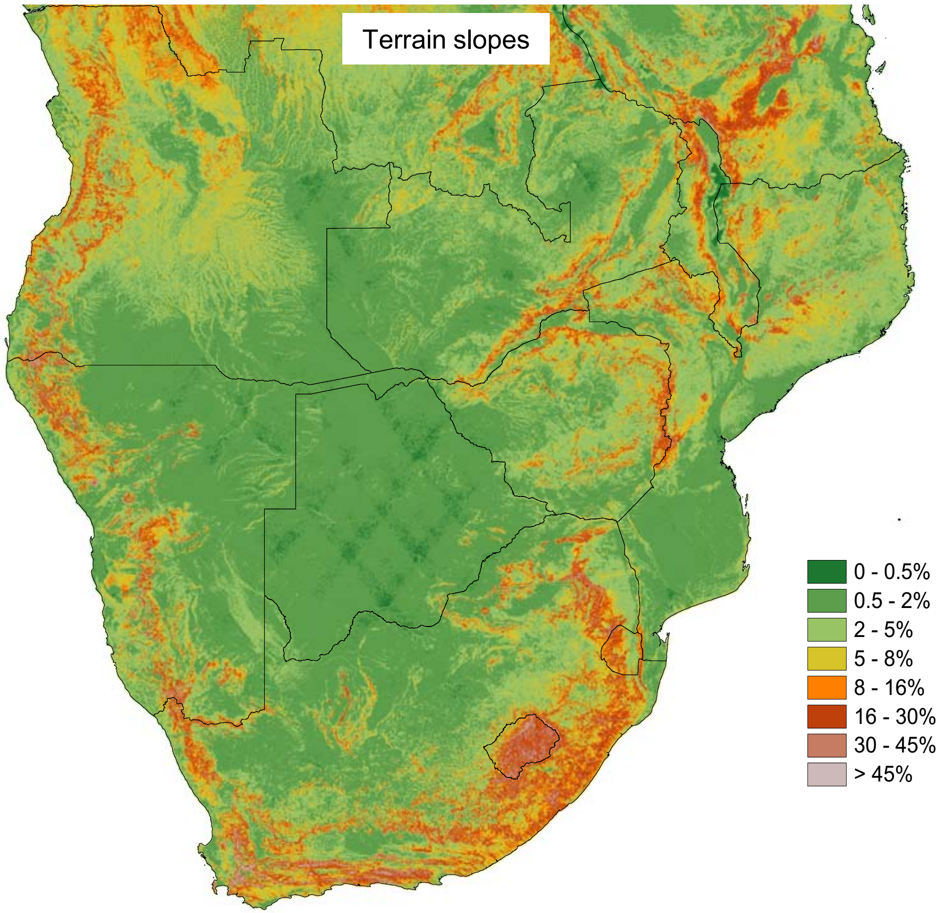
Global Agro-ecological Zones Land Characterization Database (Climate)



Monthly climatology 1901 – 2002; CRU at University of East Anglia; interpolated at 5 arcmin latitude/longitude (example: average annual temperature, mean annual precipitation)

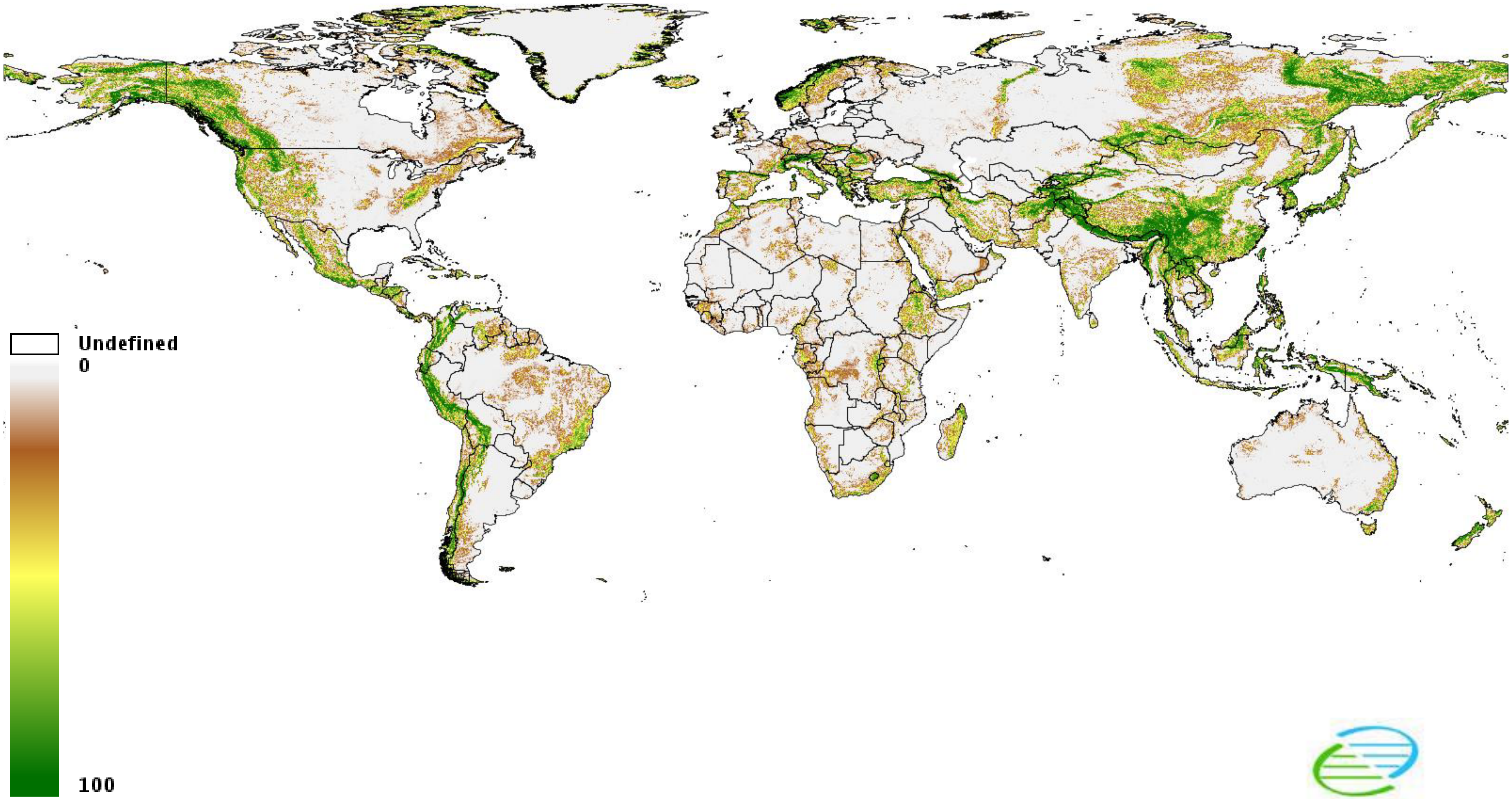
Global Agro-ecological Zones
Land Characterization Database (Terrain)





Median altitude, terrain slope and aspect database derived from NASA-SRTM digital elevation data at 3 arc-seconds latitude/longitude

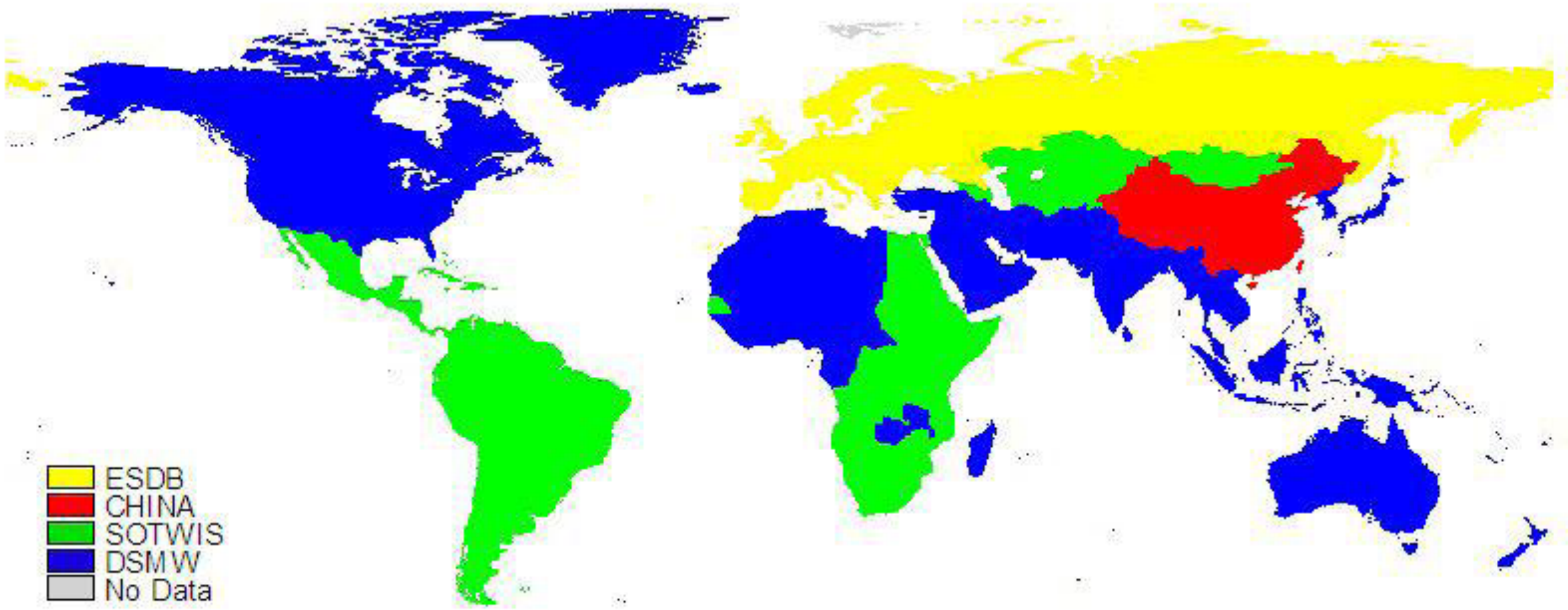
Global Agro-ecological Zones
Example: Share of grid-cell with Slope>16%

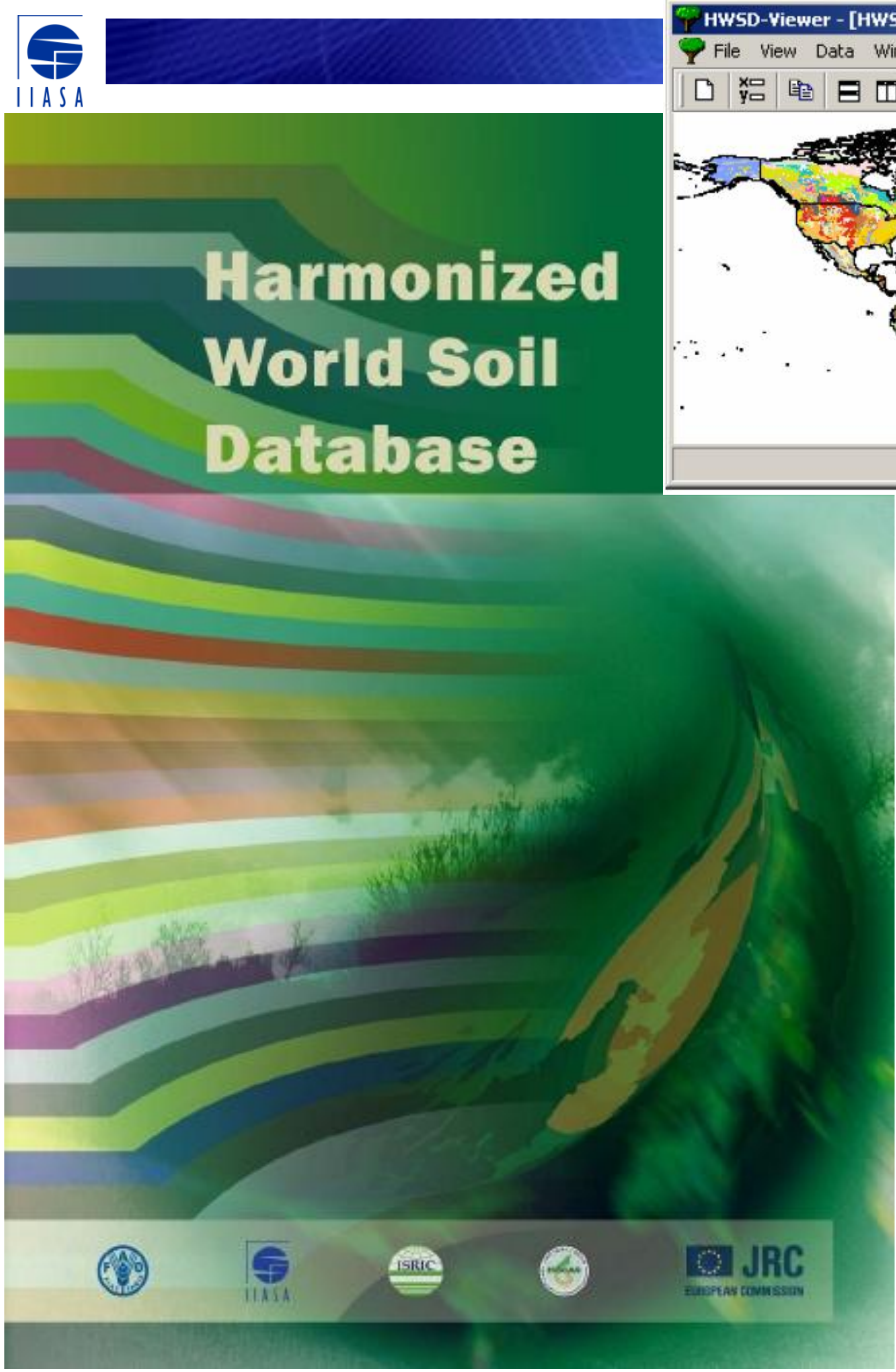


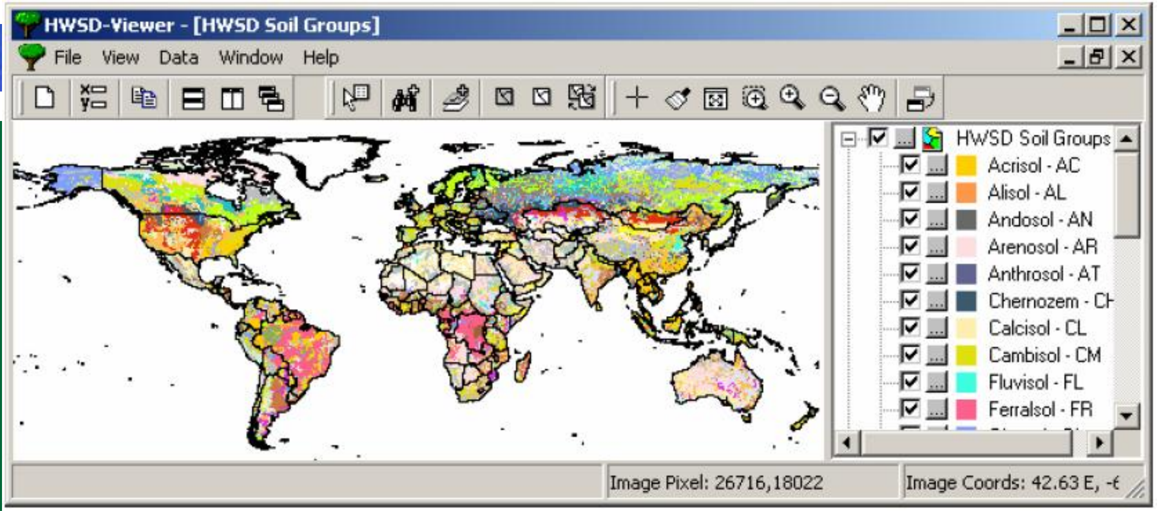
GAEZ
Global Agro-ecological Zones

Harmonized World Soil Database

- As part of an ongoing significant update of the global Agro-ecological zones study, FAO and IIASA since 2005 have prepared a number of new digital products:
  - Enhanced terrain module (aggregated 5' grid slope and aspect based on 90m SRTM analysis)
  - Improved climatic modules (including 40 year LGP and T variations)
  - Expansion of the number of crops evaluated (~300 crops, including varieties)
  - More management options (6 including water harvesting)
- IIASA and FAO with other partners have produced a **new harmonized world soil database** (HWSD) by combining the major regional soil/SOTER maps/databases produced over the last 10 years and using soil profile information derived from WISE and other sources.



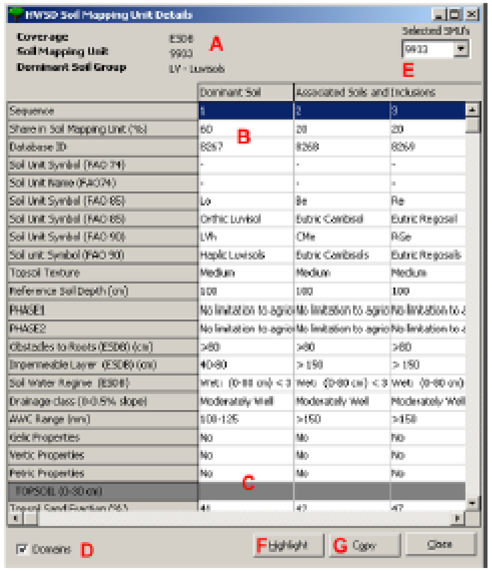




The HWSD Soil Mapping Unit Details

The HWSD Soil Mapping Unit Details page lists the soil mapping unit properties for the selected soil unit in the HWSD.

There are seven areas (A to G) in the form.



A The most important properties of the selected SMU: the coverage, the SMU identifier (MU_GLOBAL) and the Soil Mapping Unit code.

B The data area, listed by share, with the dominant soil in the first column.

C Beginning of the soil physico-chemical properties (scroll down).

D Display the domain values of data or the numerical entries from the database.

E List of selected SMUs. You can return here to a previously selected unit and display its properties.

F Highlight the selected SMU on the map. In order to find the selected SMUs, you might need to use the legend manipulation tools in the icons . The selection color can be changed from the *HWSD Query Tool*.

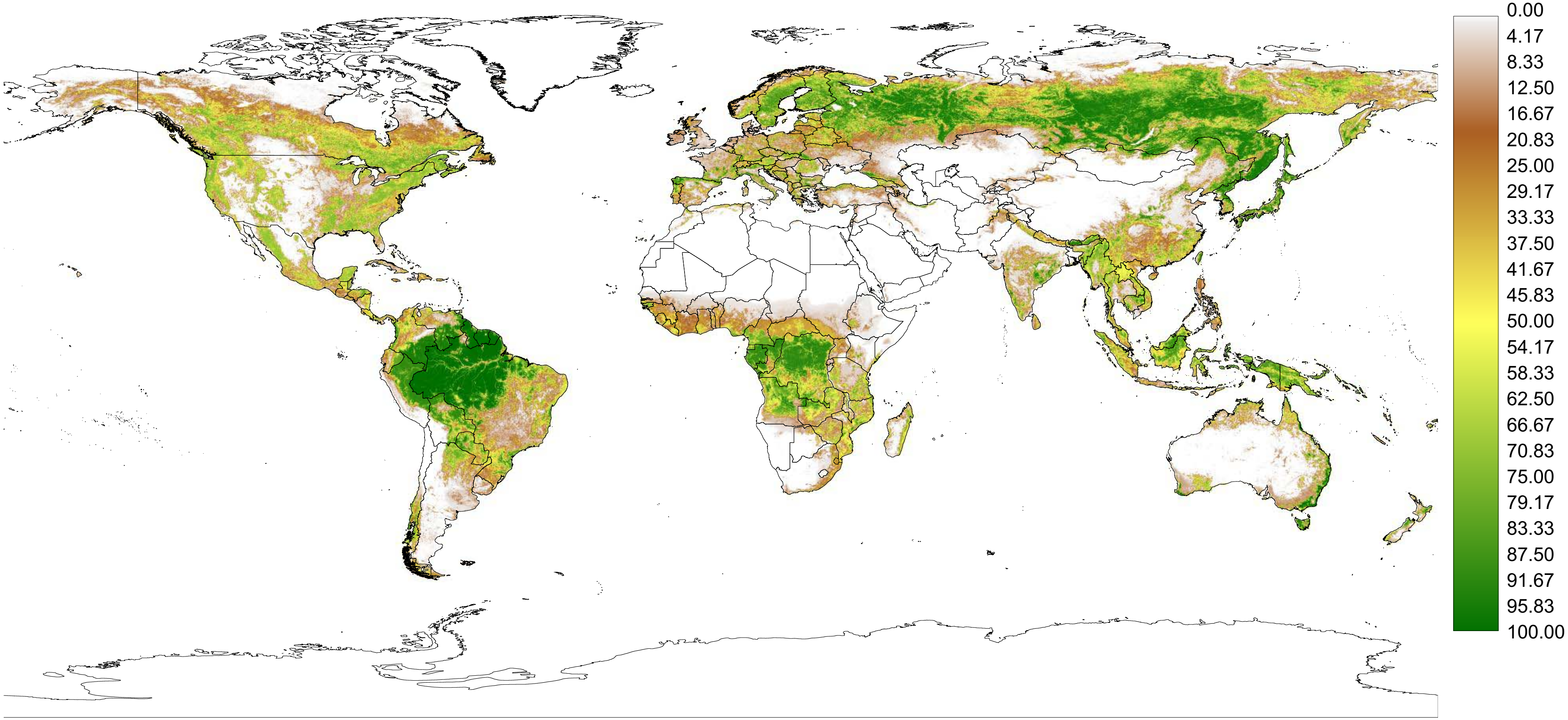
G Copy the contents of the table to the clipboard, to be directly pasted in Microsoft Excel.

Standardized Soil Attributes present in the HWSD

- Soil depth**
- Organic Carbon*
- pH(H2O)*
- CEC soil*
- CEC clay fraction*
- TEB*
- Base saturation*
- ESP*
- Calcium carbonate*
- Gypsum*
- Sand fraction*
- Silt fraction*
- Clay fraction*
- ECe*
- USDA Texture
- Reference Bulk Density
- Soil Drainage**
- Gelic properties**
- Vertic properties**
- Soil Phase information***

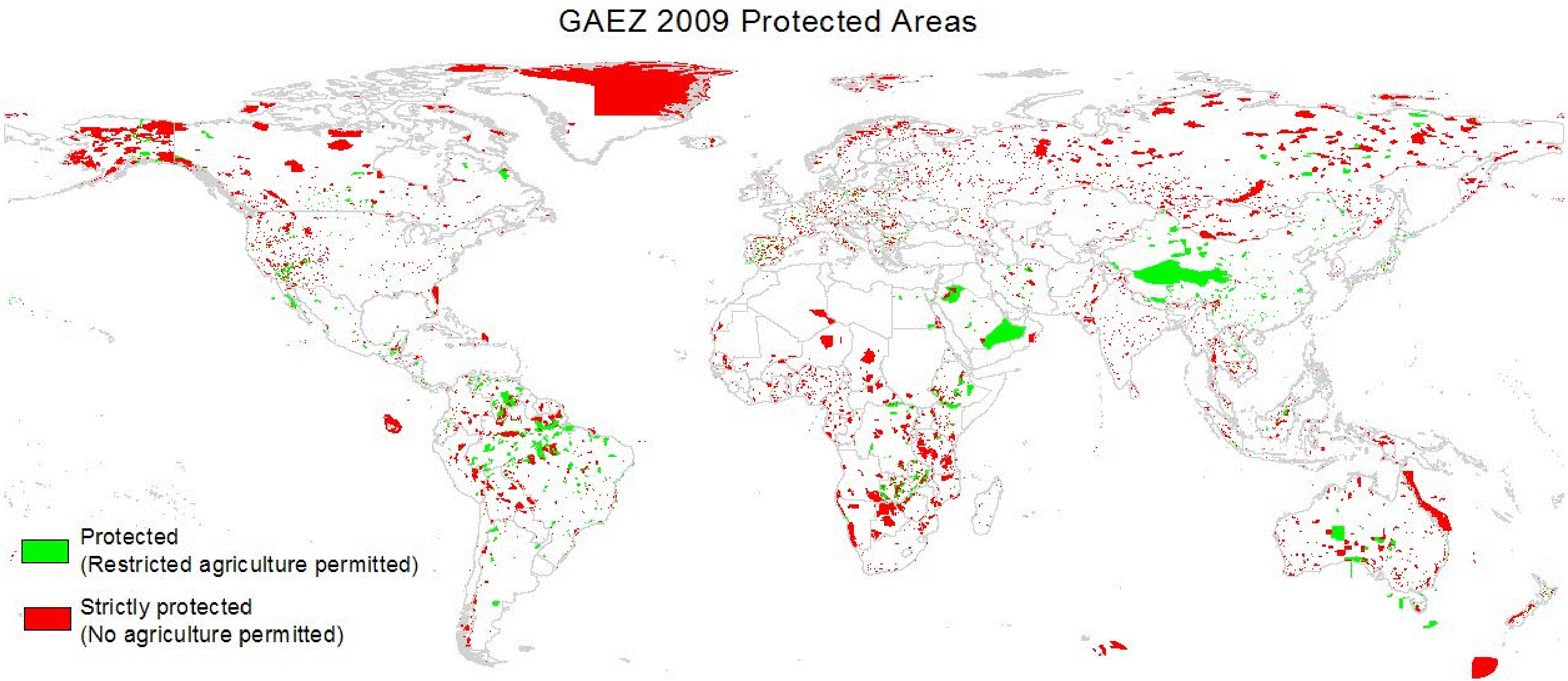
*   As specified in "Soil data from WISE for use in Global and Regional AEZ Studies" (Version 1.0)
**   Derived from soil unit, soil texture, soil phase and terrain slope data.
***   Additional information for DSMW, ESDB, and China.

Spatial Distribution and Intensity (percent) of Forests, year 2000



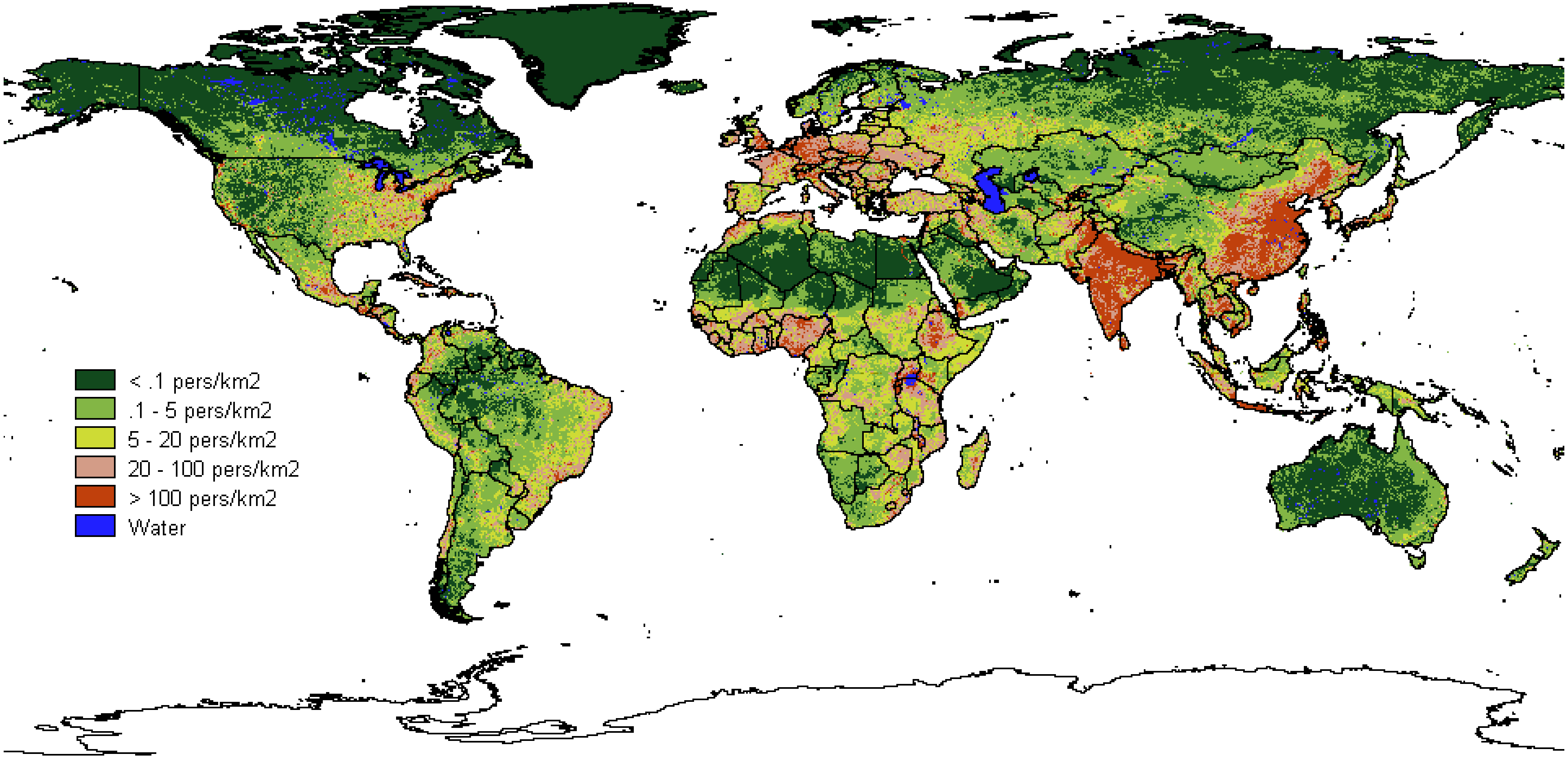
Note: calibration of GLC2000 class weights starts from estimated reference weights and is based on an iterative scheme to match national / sub-national FRA2000 statistics.

Spatial Distribution of Protected Areas



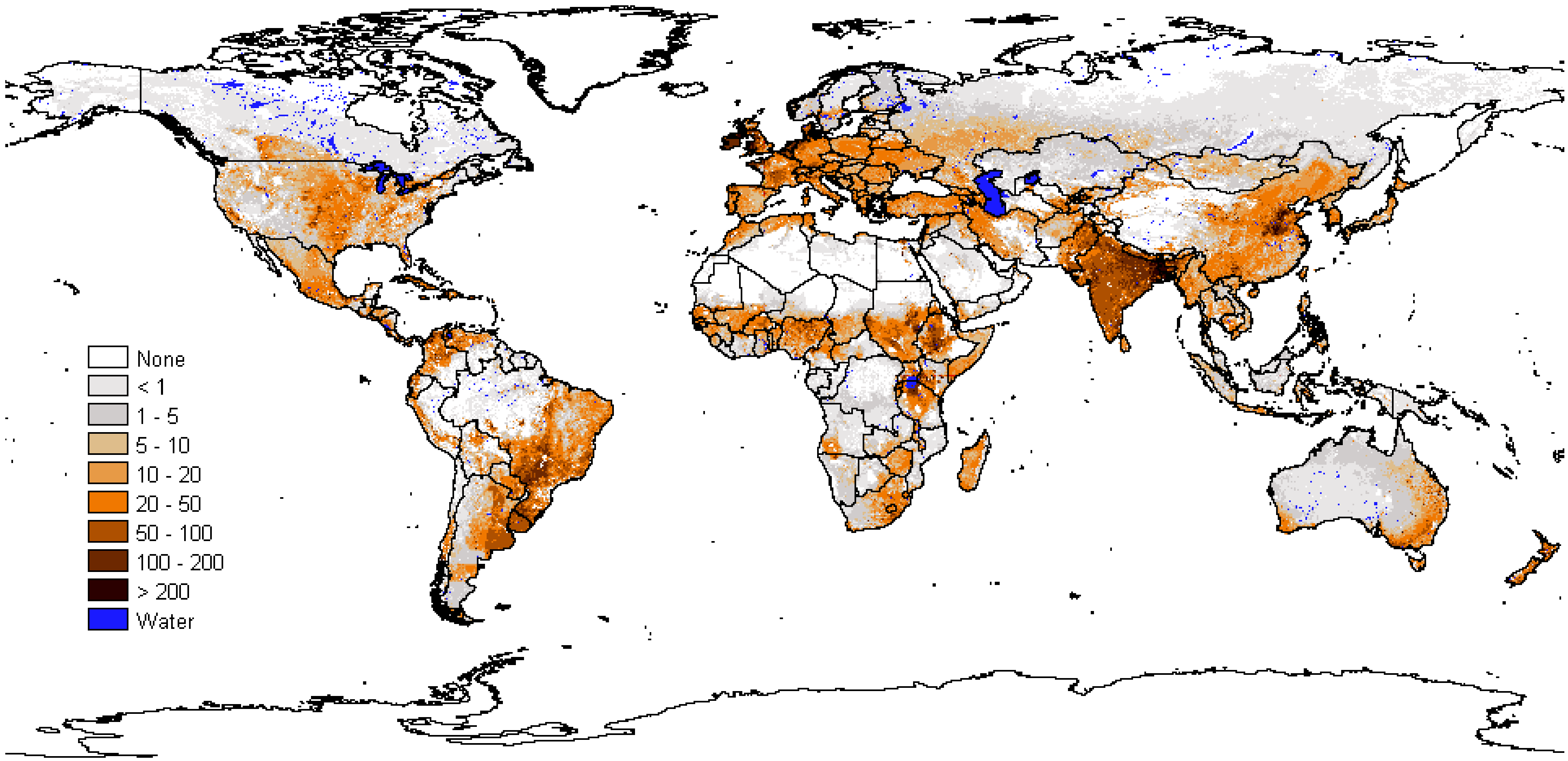
Source: WCMC, EEA

Spatial Distribution of Population (pers/km2), year 2000



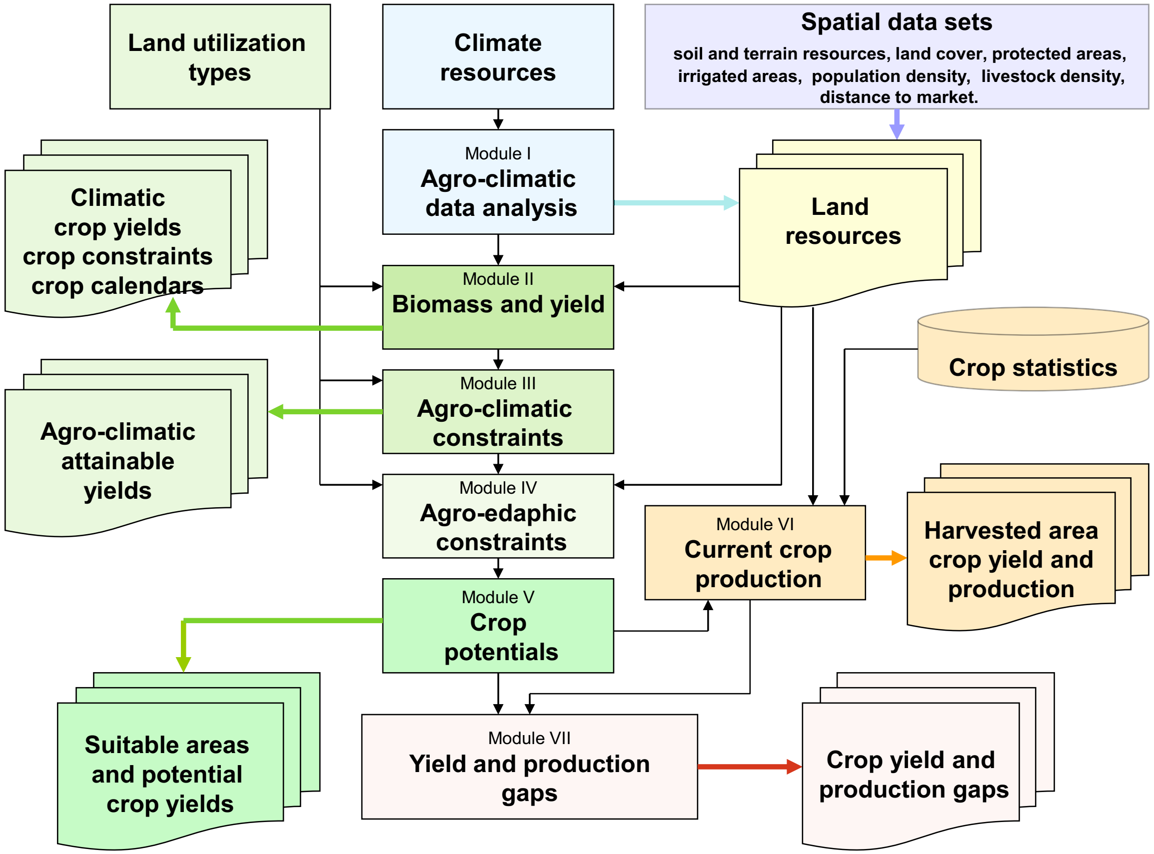
Source: LandScan, FAO

Ruminant livestock density (cattle equiv./km2), year 2000

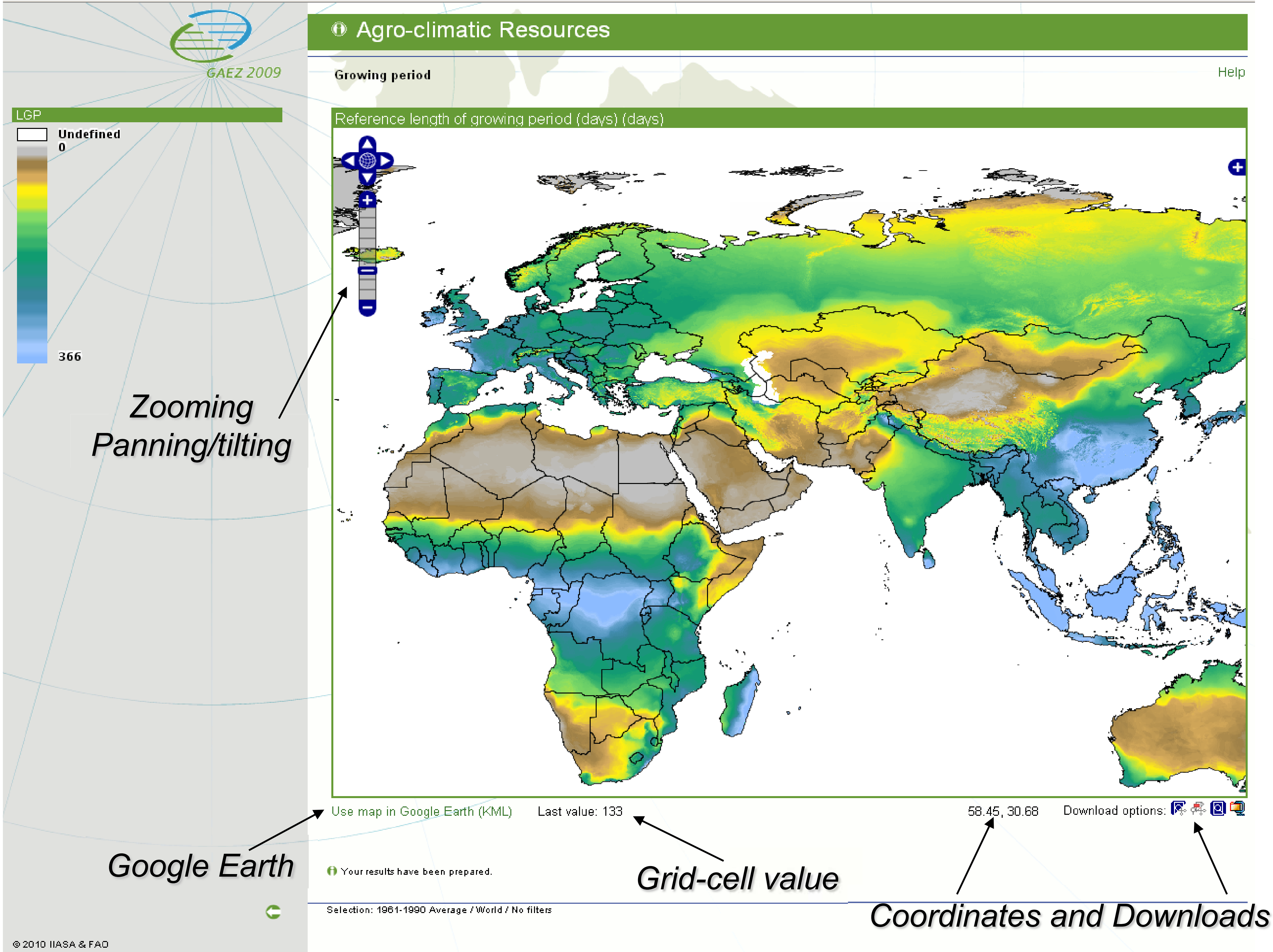


Source: FAO

GAEZ v3.0 Modules

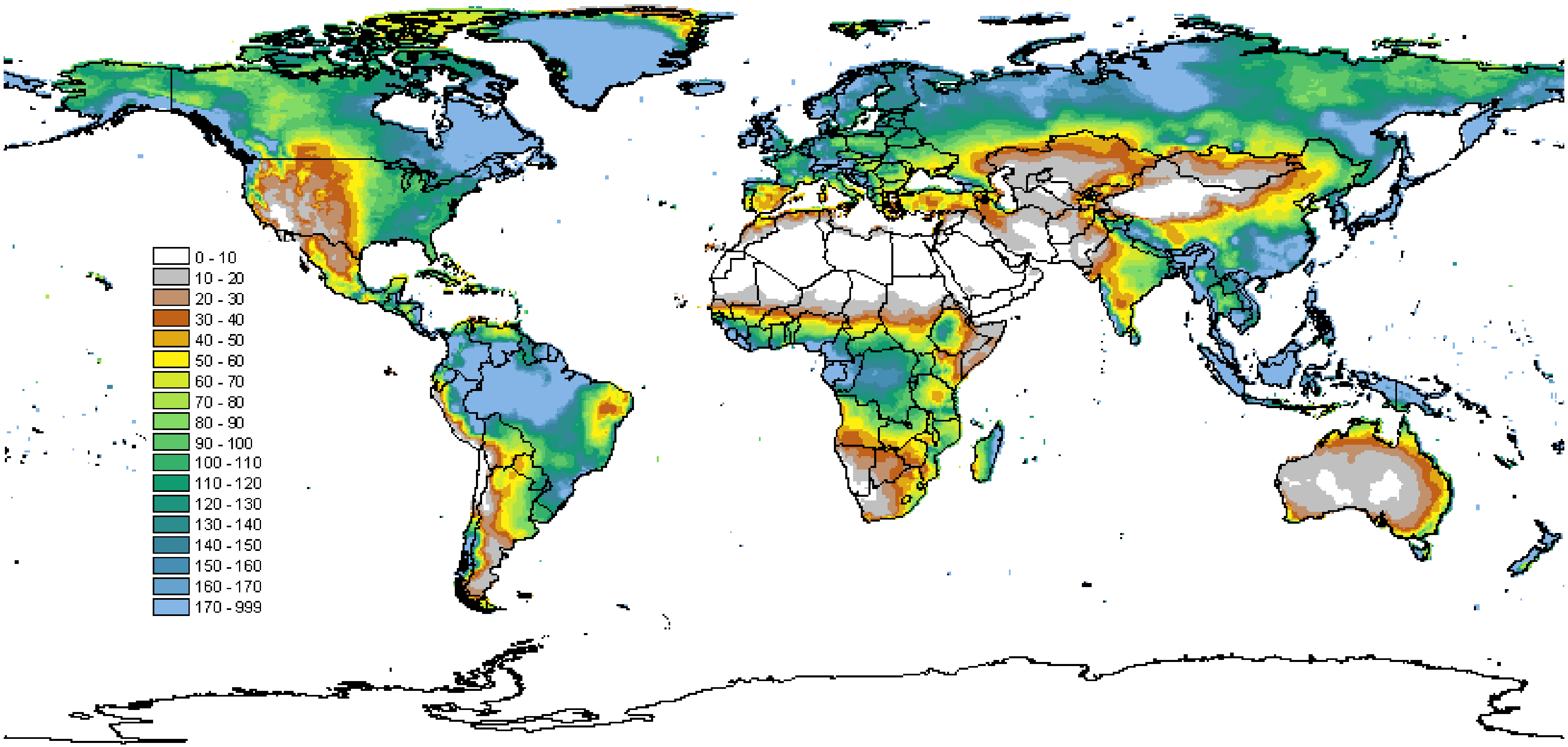


- Climate data analysis (MODULE I)
- Crop-specific potential biomass and yield calculations (MODULE II)
- Water-limited crop yields (MODULE II)
- Application of agro-climatic constraints; estimation of agro-climatic attainable crop yields (MODULE III)
- Application of agro-edaphic suitability classifications (MODULE IV)
- Crop suitable area and agro-ecologcical attainable crop yields (MODULE V)
- Current crop production (MODULE VI)
- Yield and production gaps (MODULE VII)


GAEZ 2009
Agro-climatic Resources
Growing period
Help
LGP
Undefined
0
366
Reference length of growing period (days) (days)
Zooming
Panning/tilting
Use map in Google Earth (KML)
Last value: 133
58.45, 30.68
Download options:
Google Earth
Grid-cell value
Coordinates and Downloads
Your results have been prepared.
Selection: 1961-1990 Average / World / No filters
© 2010 IIASA & FAO

Moisture Ratio (P / PET)

Reference Climate



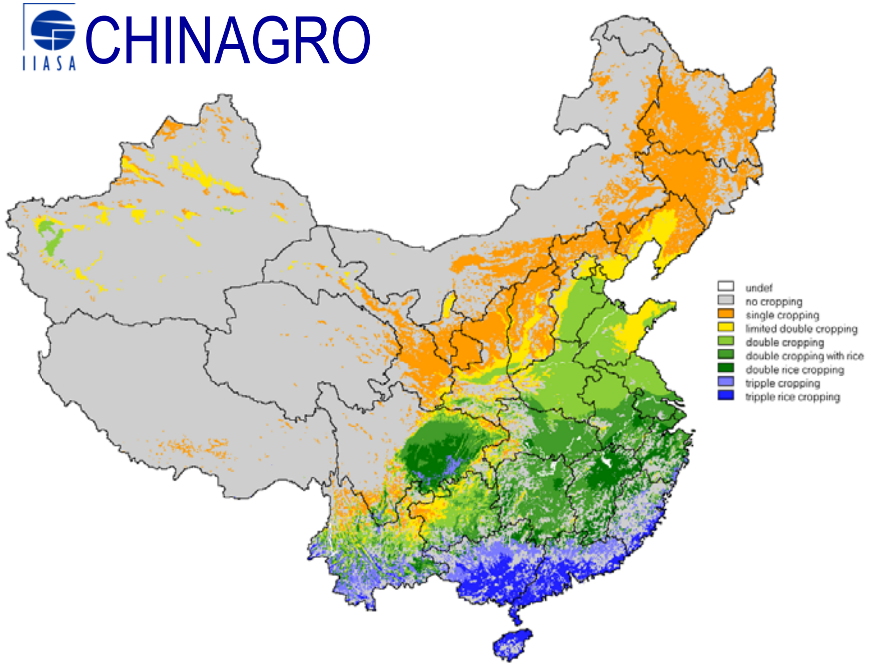
Source: Global AEZ v3.0, FAO-IIASA

Note: Annual ratio of precipitation over potential evapotranspiration (FAO reference crop) based on monthly temperature (using grid-based climatology of CRU, UK) and precipitation (from GPCC, Germany).

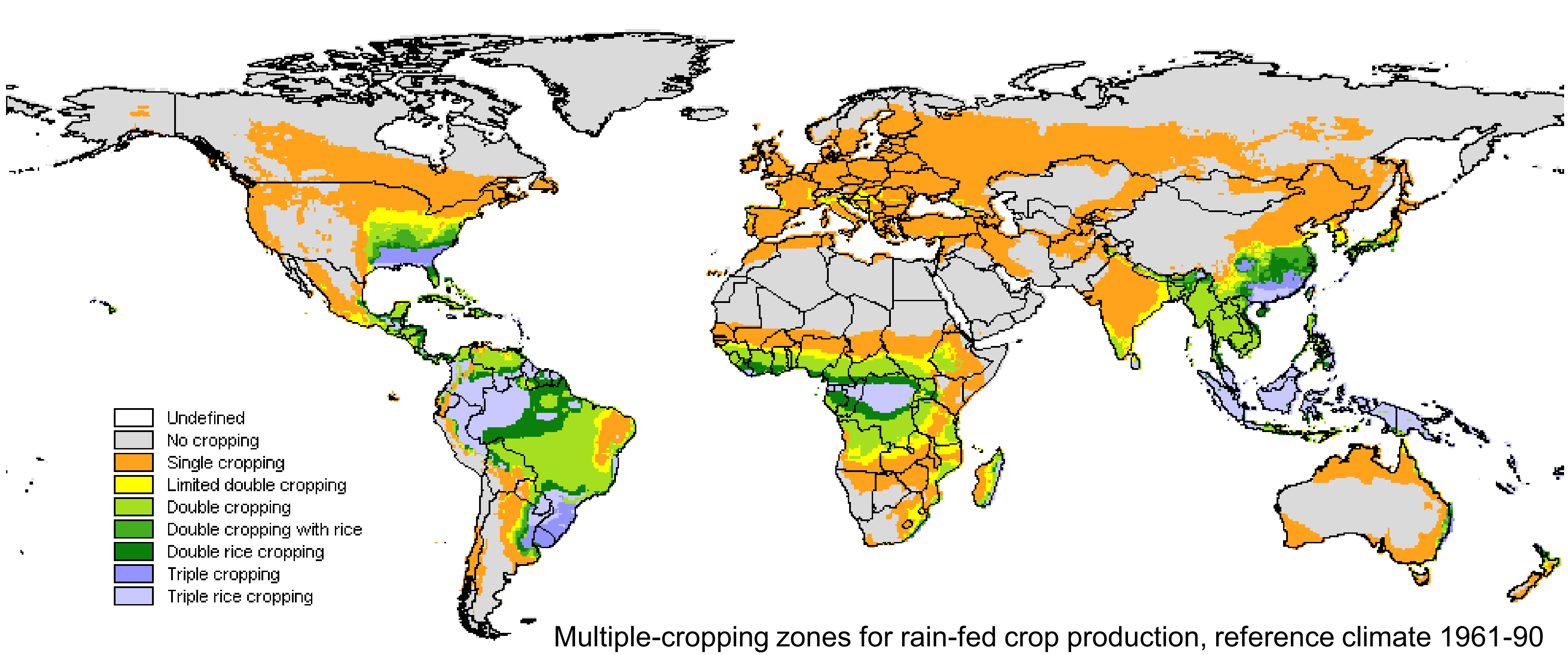
Multiple cropping Zones

CHINAGRO

Rain-fed & irrigated conditions

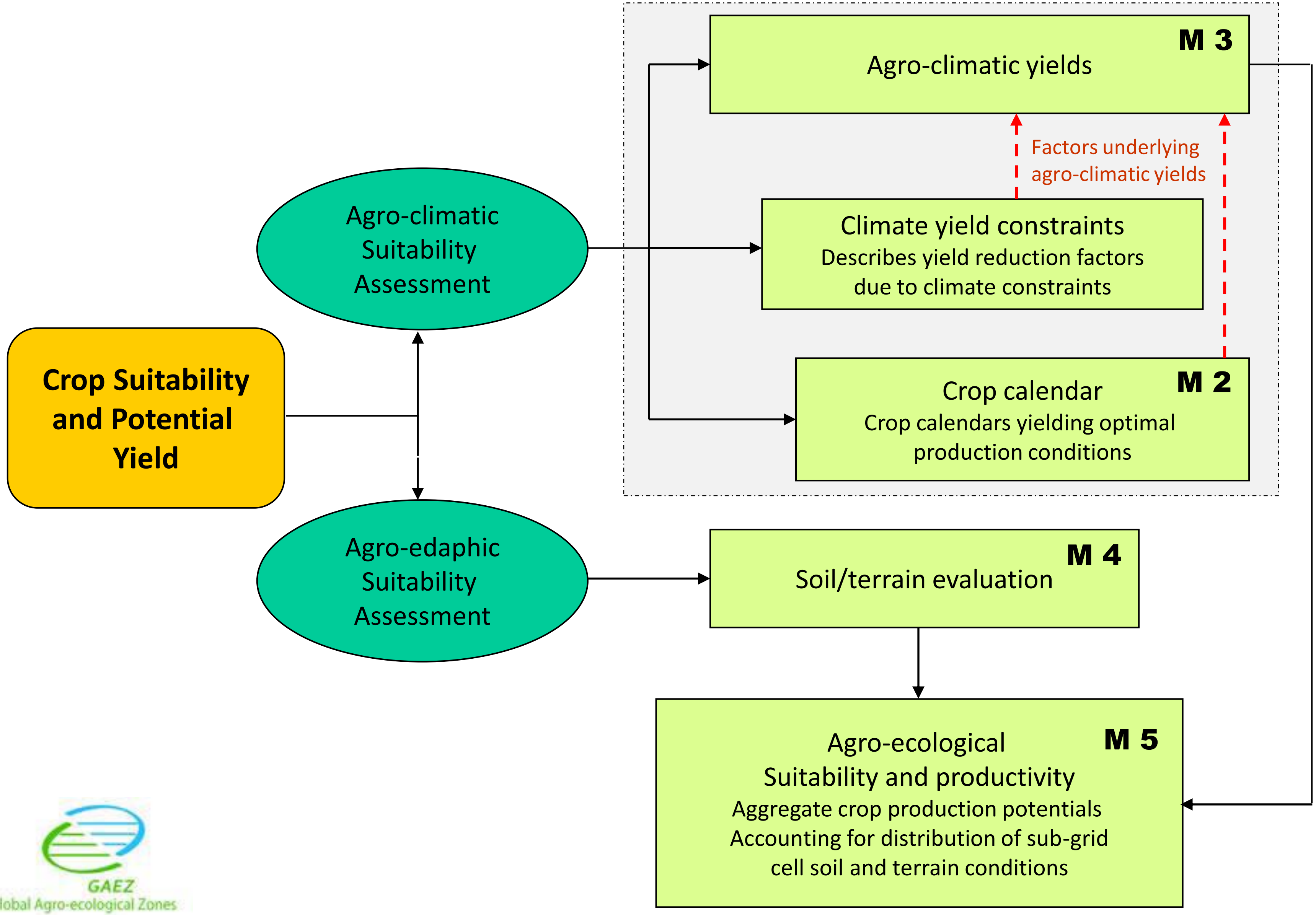


Rain-fed conditions

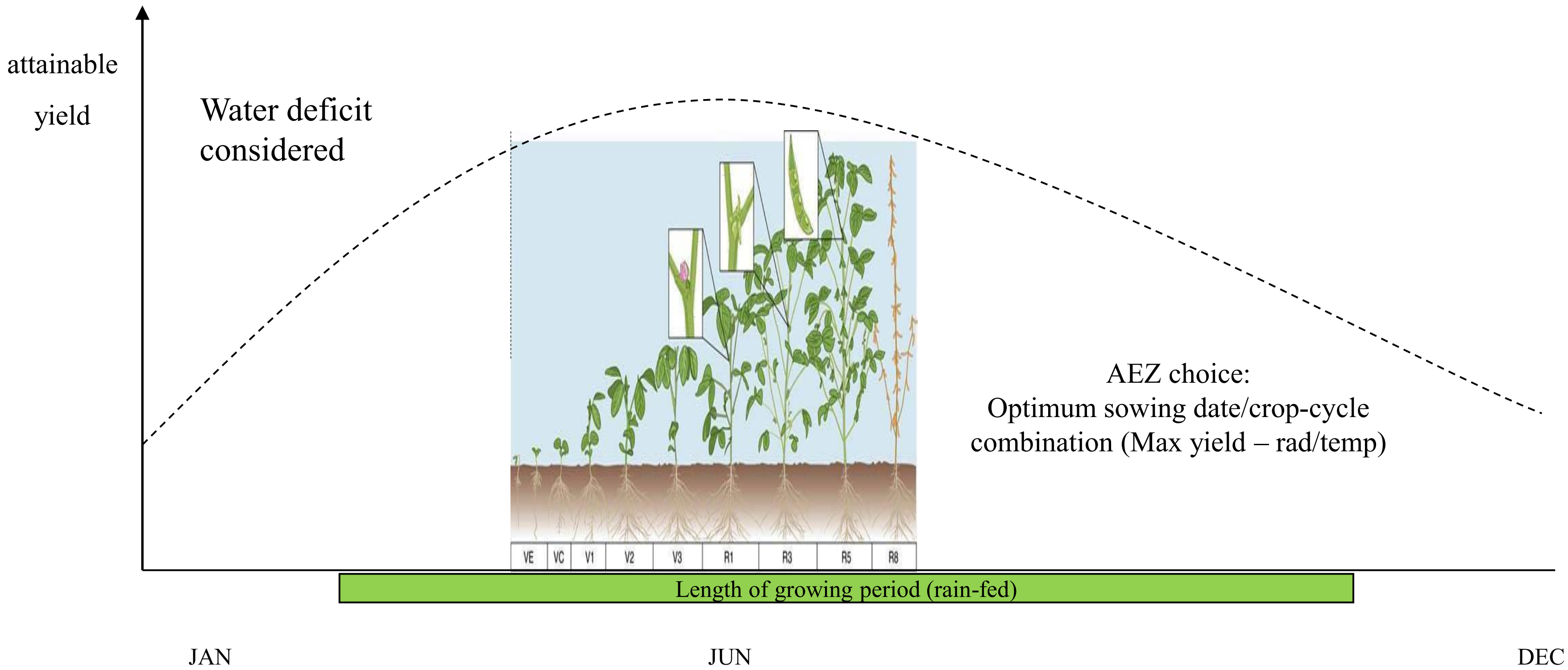


Multiple-cropping zones for rain-fed crop production, reference climate 1961-90

Crop Suitability and Potential Yield



Automatic crop calendar in AEZ



Note: For each grid-cell and LUT the algoithm determines the highest attainable yield, which then defines the respective outcome for that location

Crop Parameters

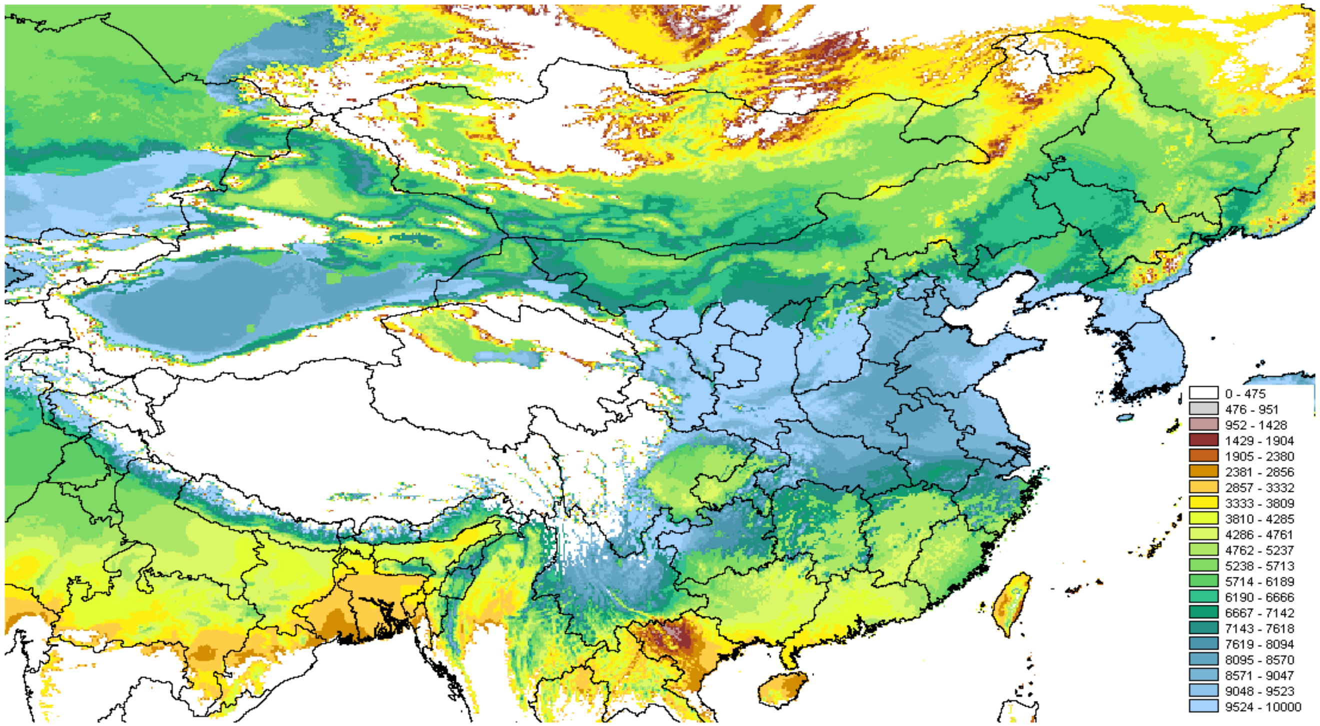
Crop characteristics
Adaptability Group
Growth Cycle
Pre-dormancy period
Post-dormancy period
Maximum Leaf Area Index
Maximum rate of photosynthesis
Crop water requirements
Crop development
Moisture-stress related yield reduction

Crop conversion factors
Harvest index
Cereal equivalent ratio
Extraction rate
Energy contents (Kcal/1000 g)
Protein contents (g/1000 g)
Crop residue-factor (kg dry matter/kg yield)
Crop residue utilization rate
Crop by-product factor (kg dry matter/kg yield)
Crop by-product utilization rate

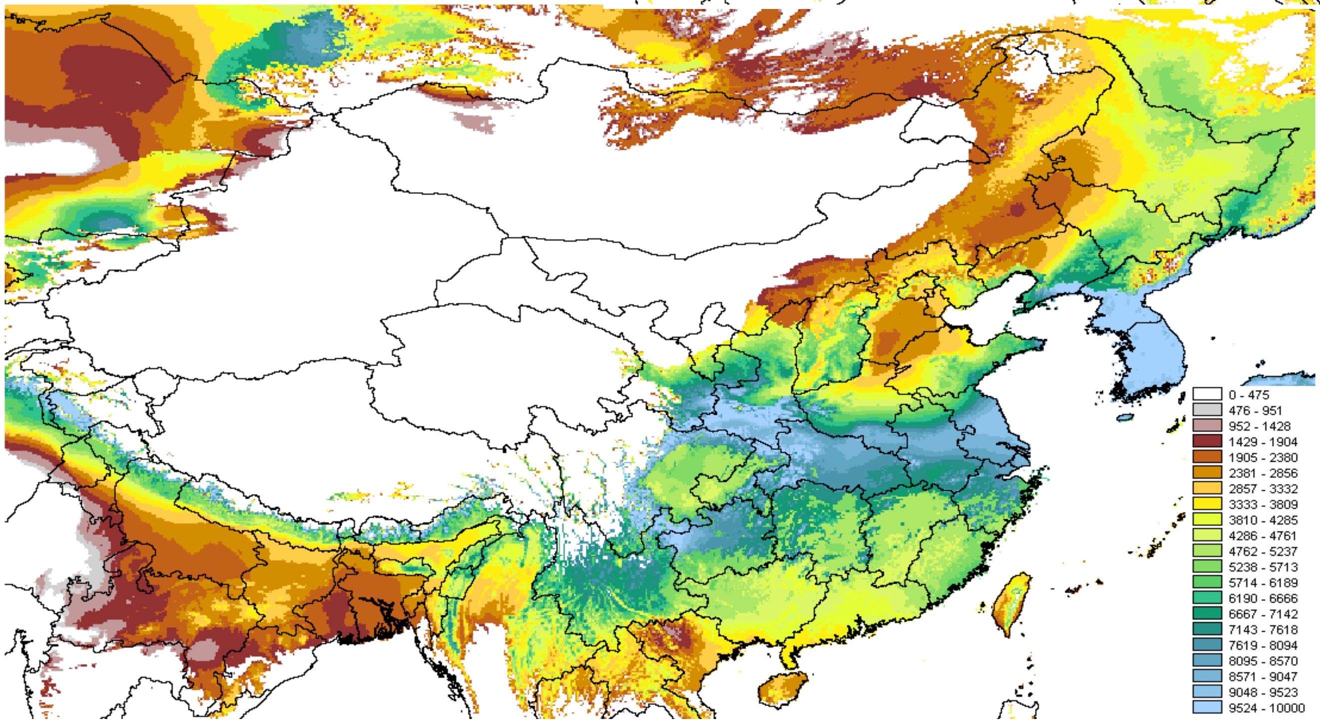
Crop environmental requirements
Thermal climates
Temperature profile
Growing period
Dormancy
Post-dormancy accumulated temperature (optimal)
Post-dormancy accumulated temperature (sub-optimal)
Sensitivity to soil moisture depletion
Soil and terrain conditions

IIASA

Irrigated



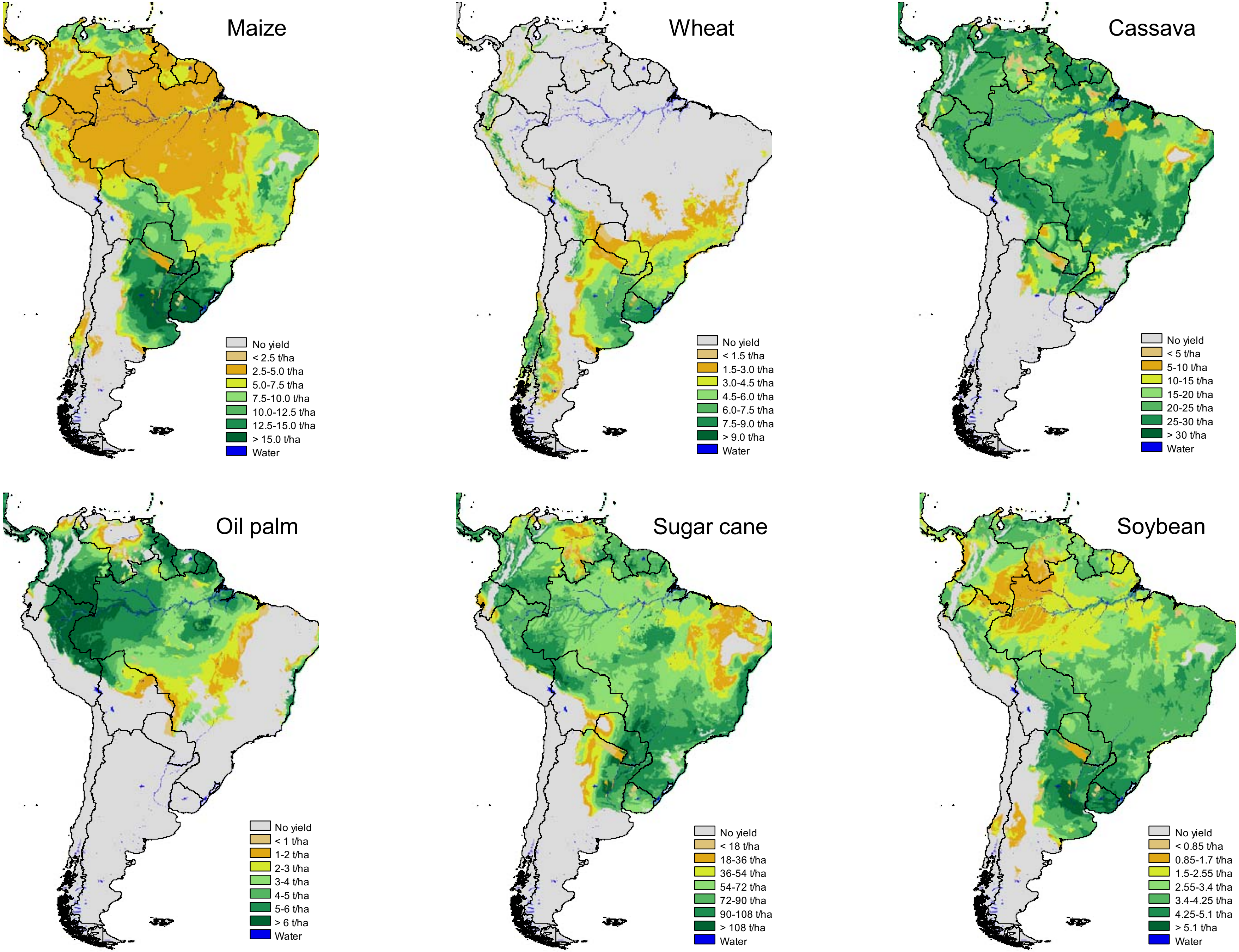
Rain-fed



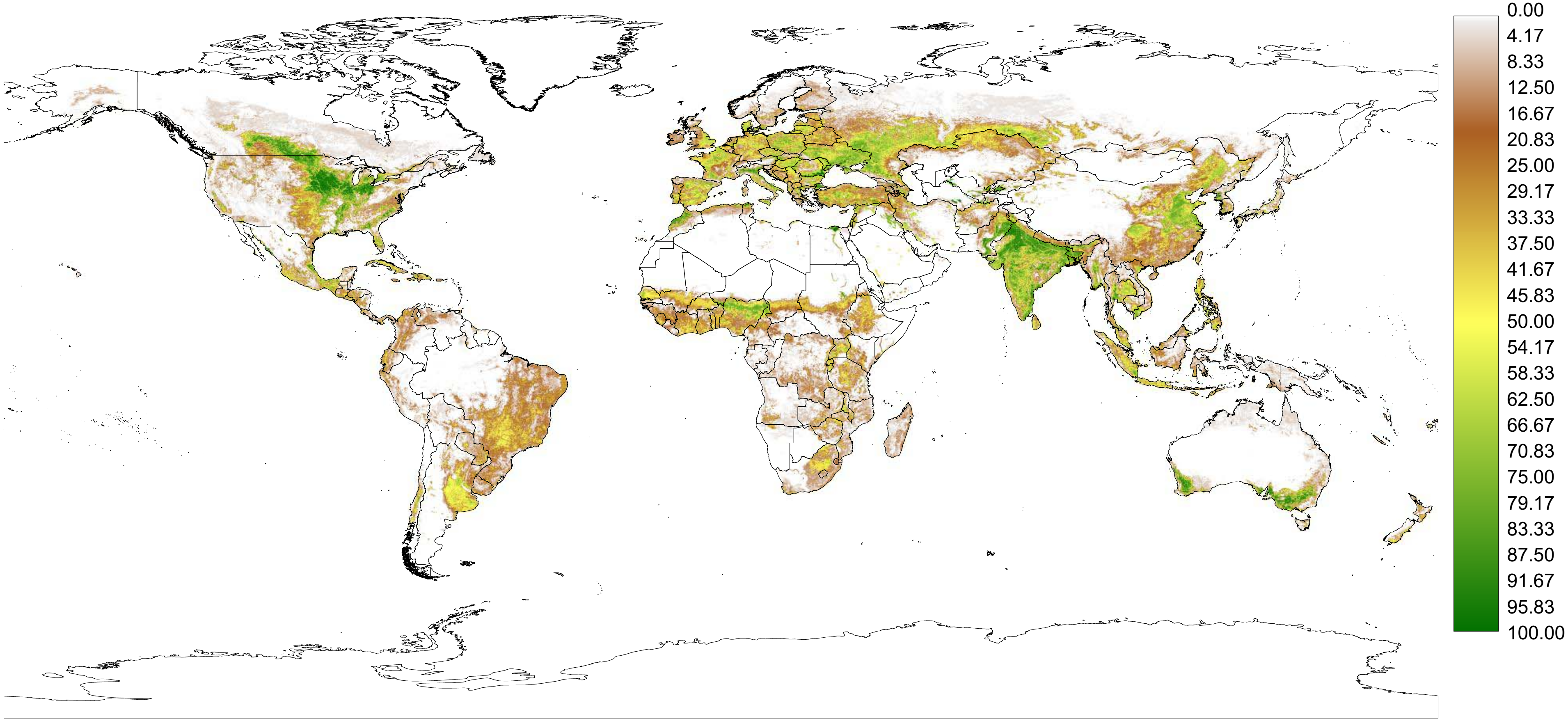
Agro-climatic Wheat Yield

Reference, 1961-1990

GAEZ
Global Agro-ecological Zones

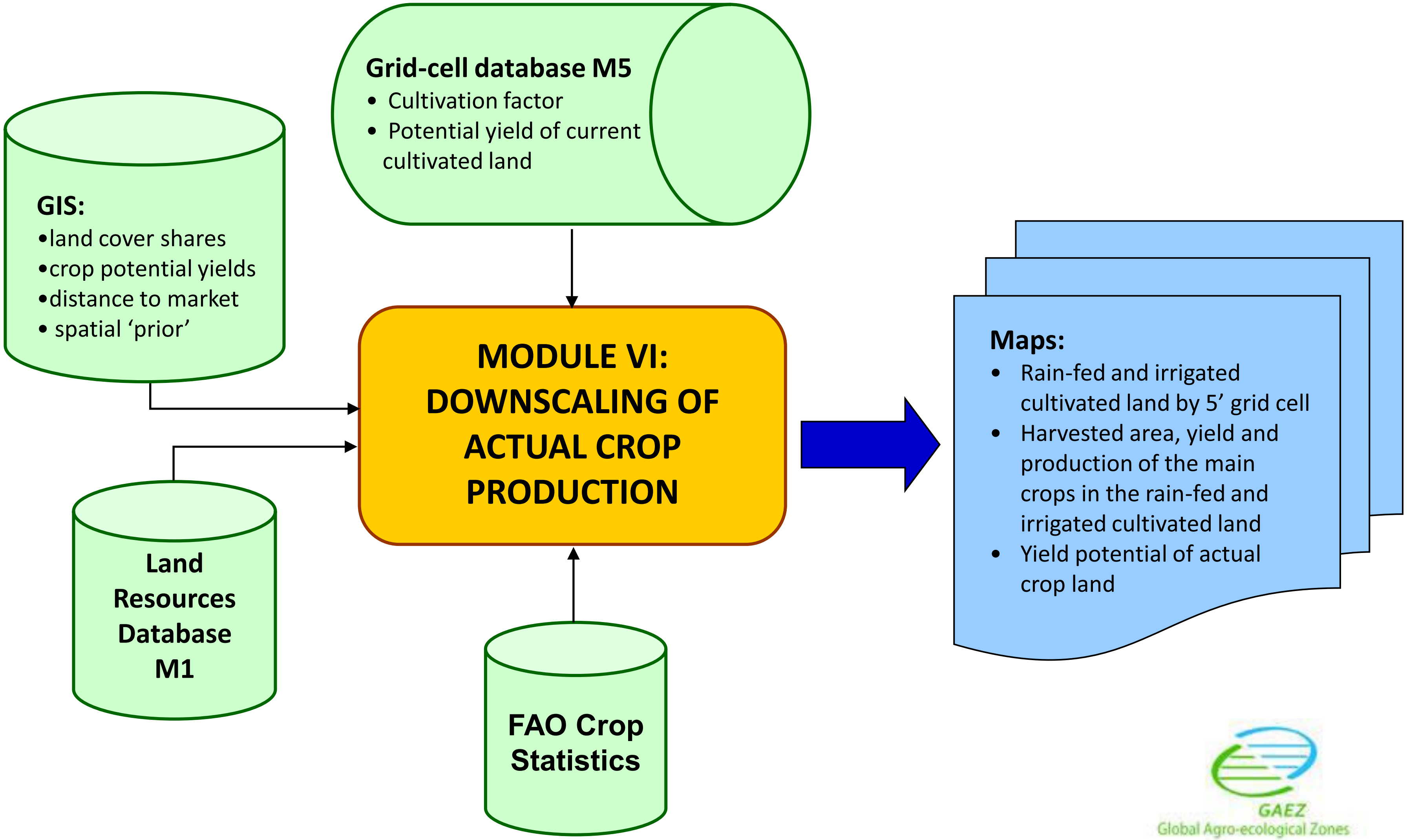

Maize
No yield
< 2.5 t/ha
2.5-5.0 t/ha
5.0-7.5 t/ha
7.5-10.0 t/ha
10.0-12.5 t/ha
12.5-15.0 t/ha
> 15.0 t/ha
Water
Wheat
No yield
< 1.5 t/ha
1.5-3.0 t/ha
3.0-4.5 t/ha
4.5-6.0 t/ha
6.0-7.5 t/ha
7.5-9.0 t/ha
> 9.0 t/ha
Water
Cassava
No yield
< 5 t/ha
5-10 t/ha
10-15 t/ha
15-20 t/ha
20-25 t/ha
25-30 t/ha
> 30 t/ha
Water
Oil palm
No yield
< 1 t/ha
1-2 t/ha
2-3 t/ha
3-4 t/ha
4-5 t/ha
5-6 t/ha
> 6 t/ha
Water
Sugar cane
No yield
< 18 t/ha
18-36 t/ha
36-54 t/ha
54-72 t/ha
72-90 t/ha
90-108 t/ha
> 108 t/ha
Water
Soybean
No yield
< 0.85 t/ha
0.85-1.7 t/ha
1.5-2.55 t/ha
2.55-3.4 t/ha
3.4-4.25 t/ha
4.25-5.1 t/ha
> 5.1 t/ha
Water

Spatial Distribution and Intensity (percent) of Cultivated Land, year 2000



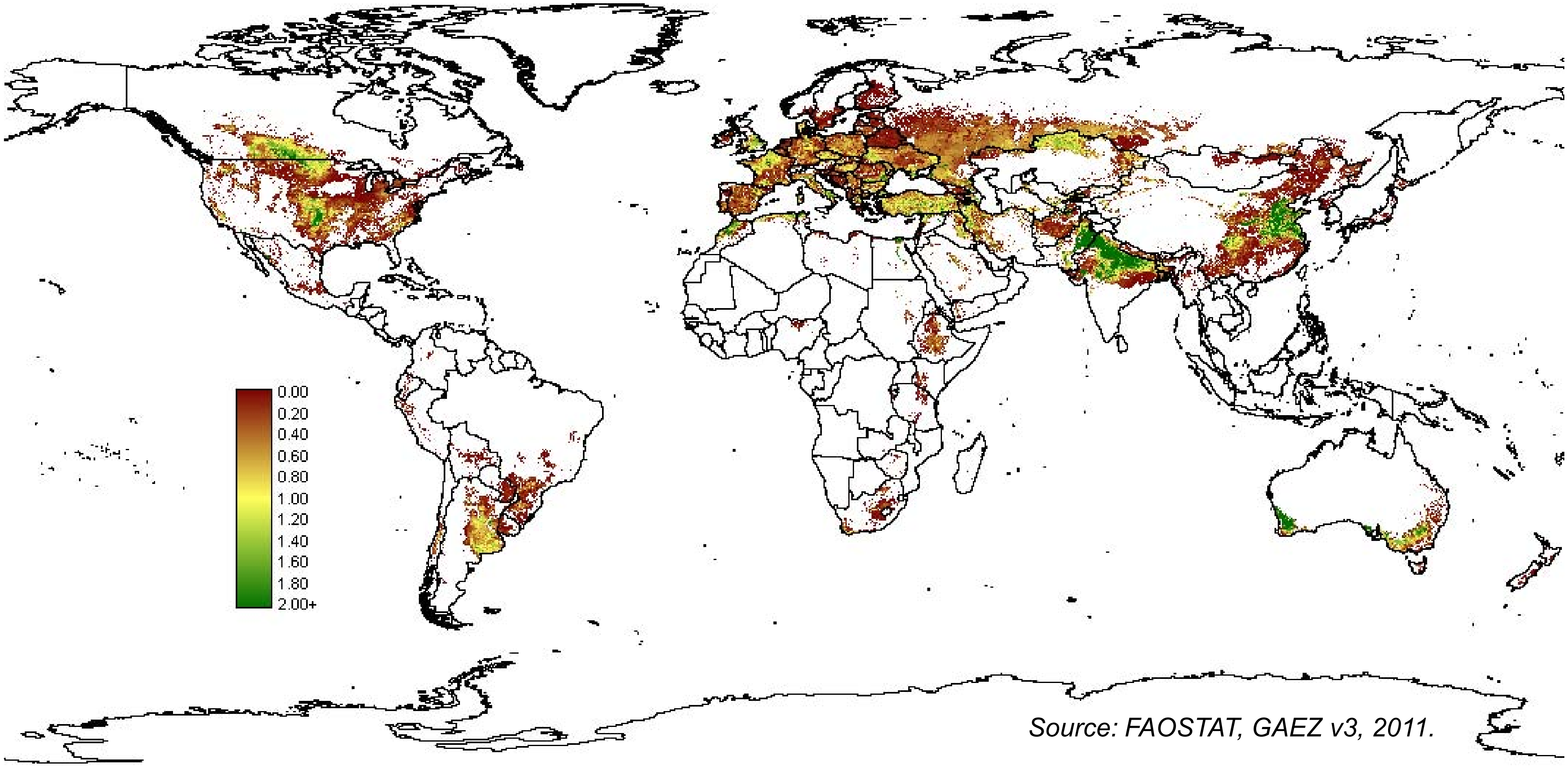
Note: calibration of GLC2000 class weights starts from estimated reference weights and is based on an iterative scheme to match national / sub-national statistics of year 2000 (FAO AT2015/2030 adjusted cultivated land).

MODULE VI: DOWNSCALING OF AGRICULTURAL PRODUCTION STATISTICS



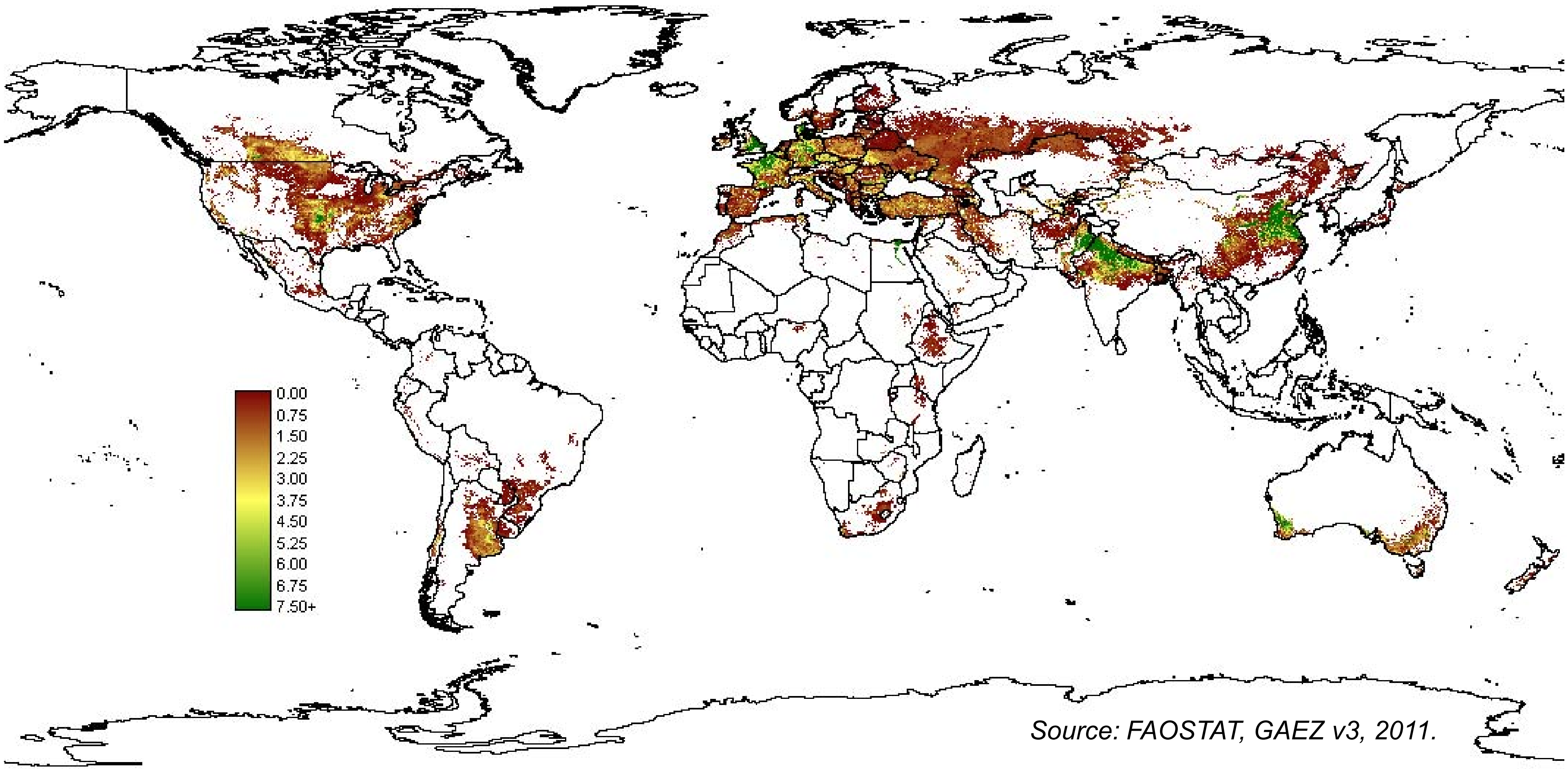
GAEZ
Global Agro-ecological Zones

Harvested Wheat Area in 2000



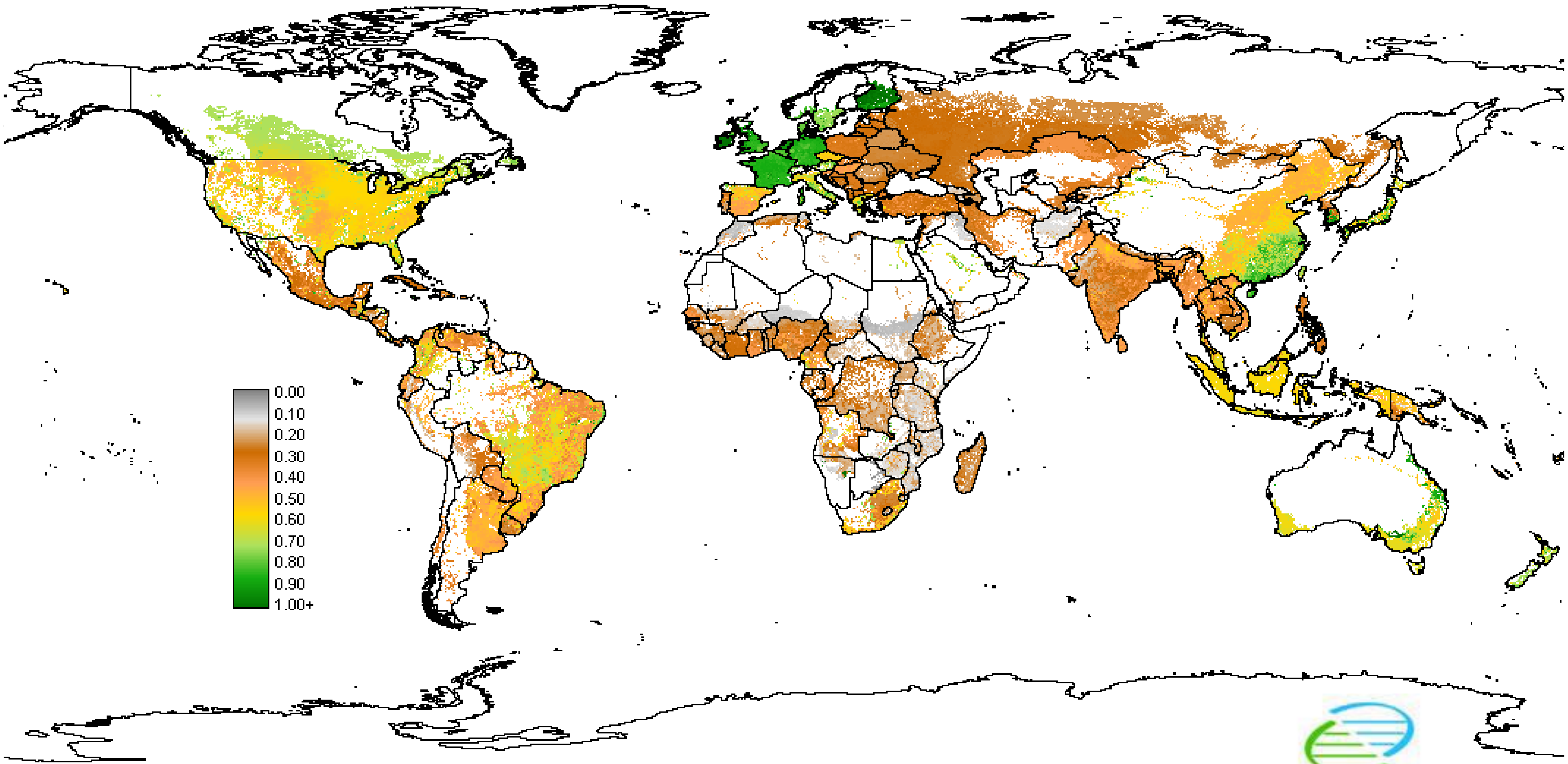
Note: Downscaling of 1999-2001 average harvested wheat area to a 5 arc-min global raster (in 1000 hectares per grid cell).

Wheat Production in 2000



Note: Downscaling of 1999-2001 average wheat production to a 5 arc-min global raster (in 1000 tons per grid cell).

Ratio of actual (in year 2000) to potential crop production

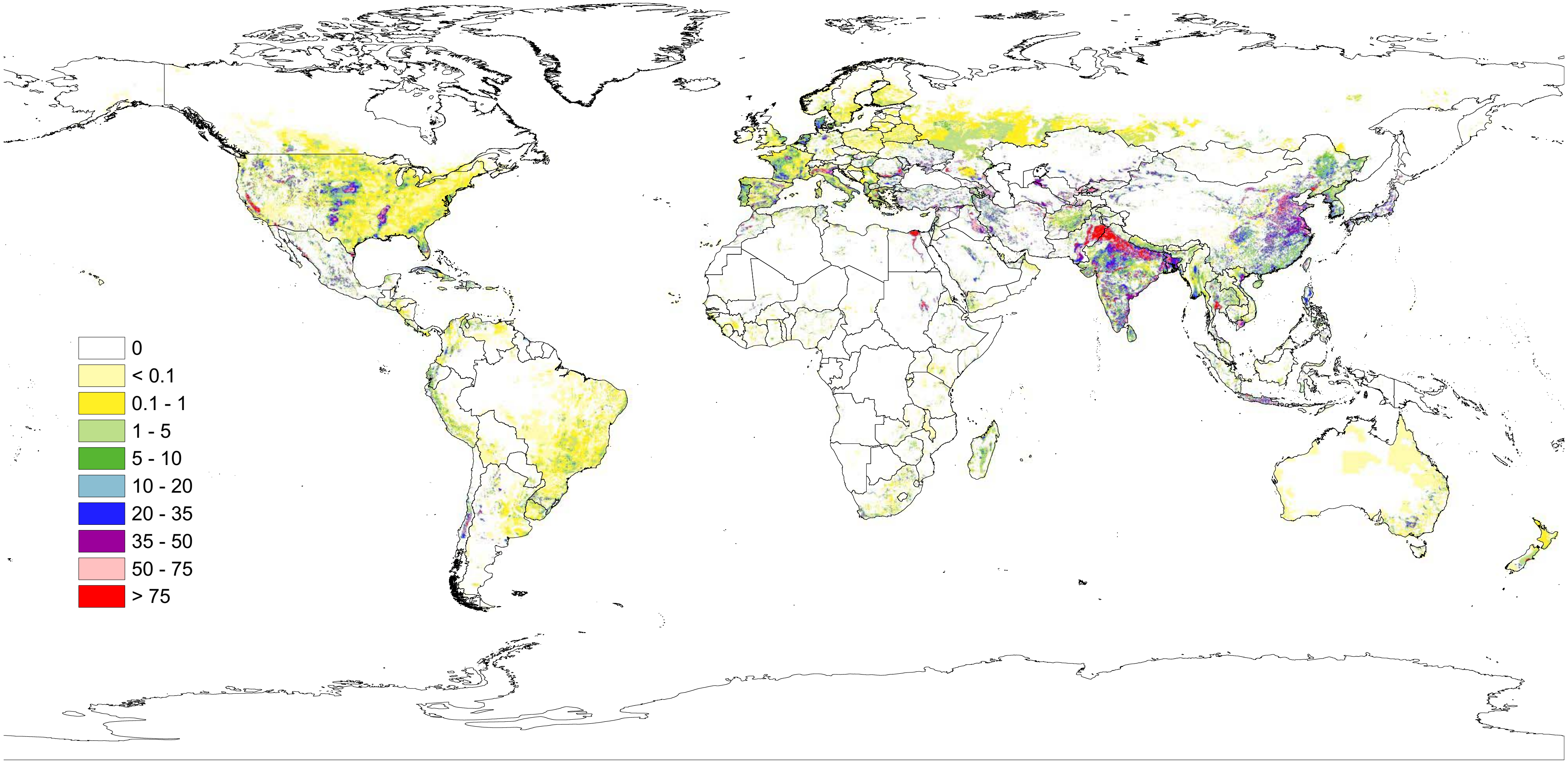


GAEZ
Global Agro-ecological Zones

Water and Agriculture:

- Irrigated area has expanded to about 300 million ha worldwide, about 19% of total cultivated land.
- Agriculture is the largest user of water among human activities: irrigation water withdrawals are 70% of the total anthropogenic use of renewable water resources.
- Agriculture is in competition with other water users and has impacted negatively on the environment.
- In many areas water availability rather than warming per se is expected to be the most critical CC impact factor.

Global Map of Irrigated Areas



Source: GMIA ver 4, FAO/University of Frankfurt (2007)

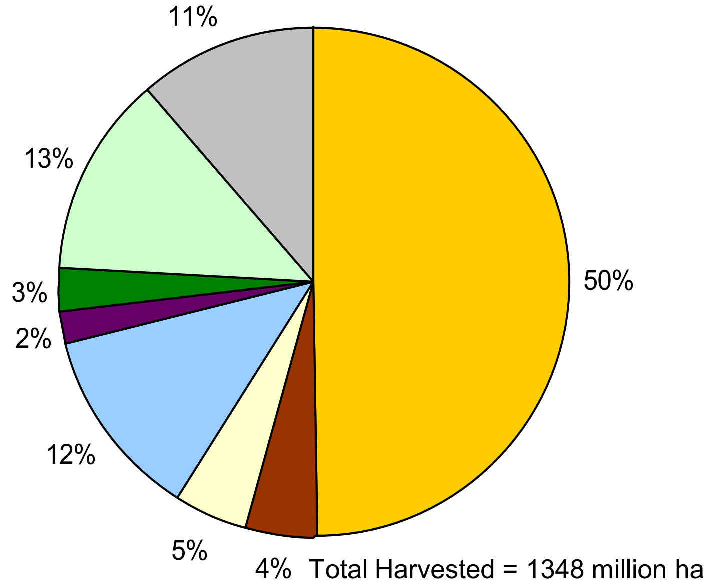
Harvested Area and Production by Water Source, in 2000

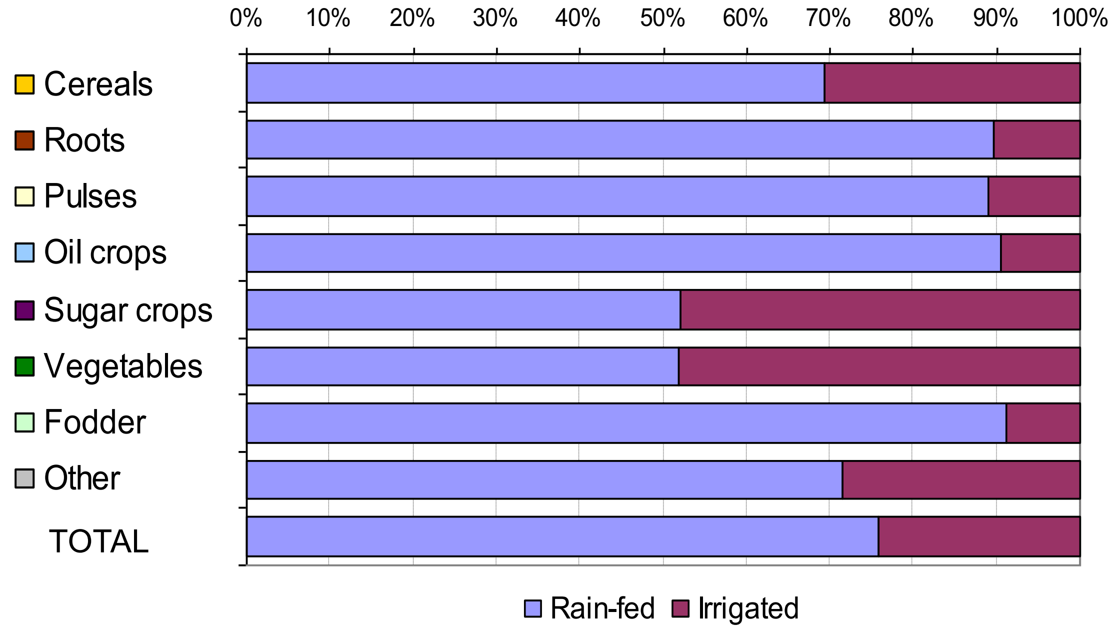
Region	Harvested (mill. ha)	Area % with Irrigation	Production (bill. $\$_{2000}$)	Prod. % irrigated
North America	196.6	14.5	150.4	28.8
Europe & Russia	244.7	11.0	168.8	21.6
Oceania	50.5	6.5	20.5	23.5
South America	104.3	9.6	76.3	19.7
Sub-saharan Africa	166.6	4.3	56.9	10.6
N. Africa & W. Asia	53.7	36.6	44.2	69.0
Asia (excl. W. Asia)	531.9	43.2	436.9	56.1
TOTAL	1348.3	24.1	953.1	40.0

Note: Crop areas and production were calculated as 3-year averages for 1999-2001. Production was aggregated from the detailed FAOSTAT crop list using international price weights (Geary-Khamis prices) for year 2000.

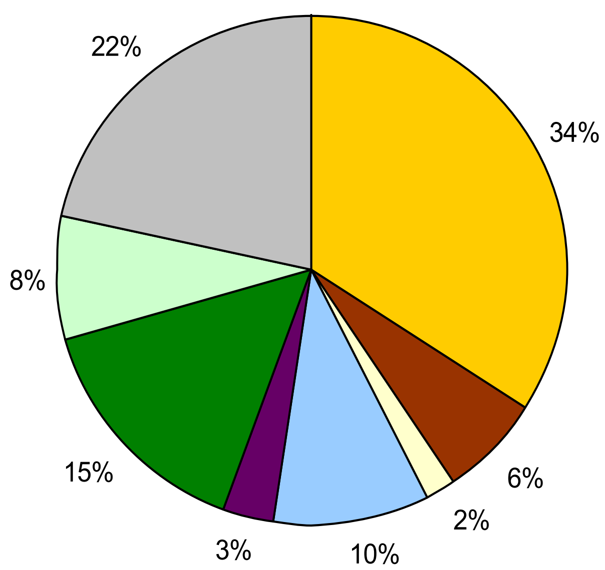
Source: FAOSTAT, GAEZ v3, 2011

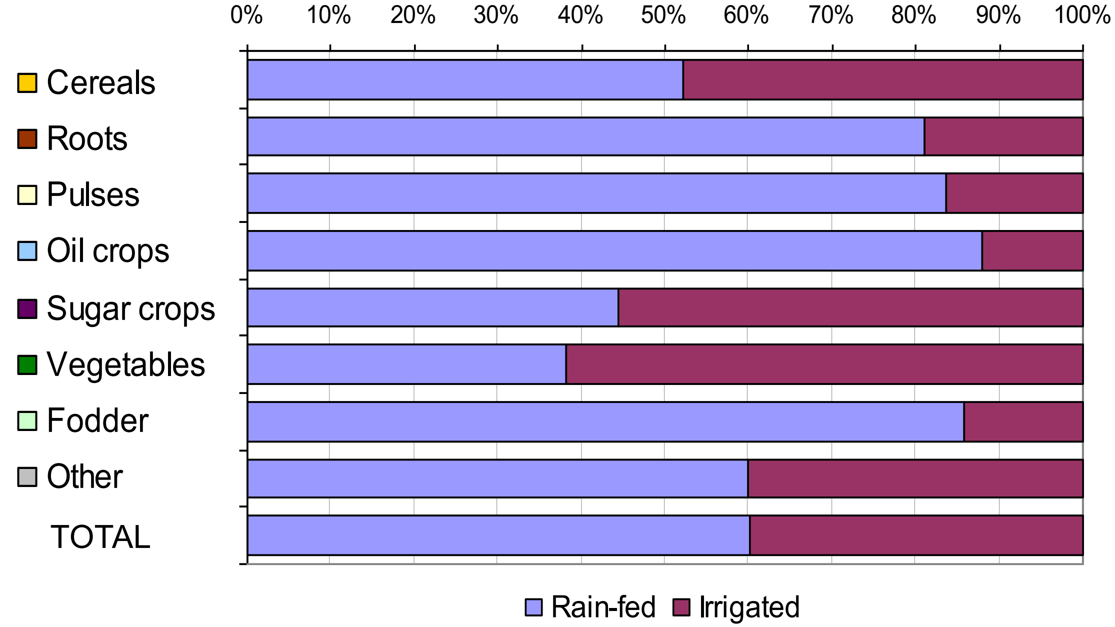
Global Harvested Area by Crop Group and Water Source, in 2000





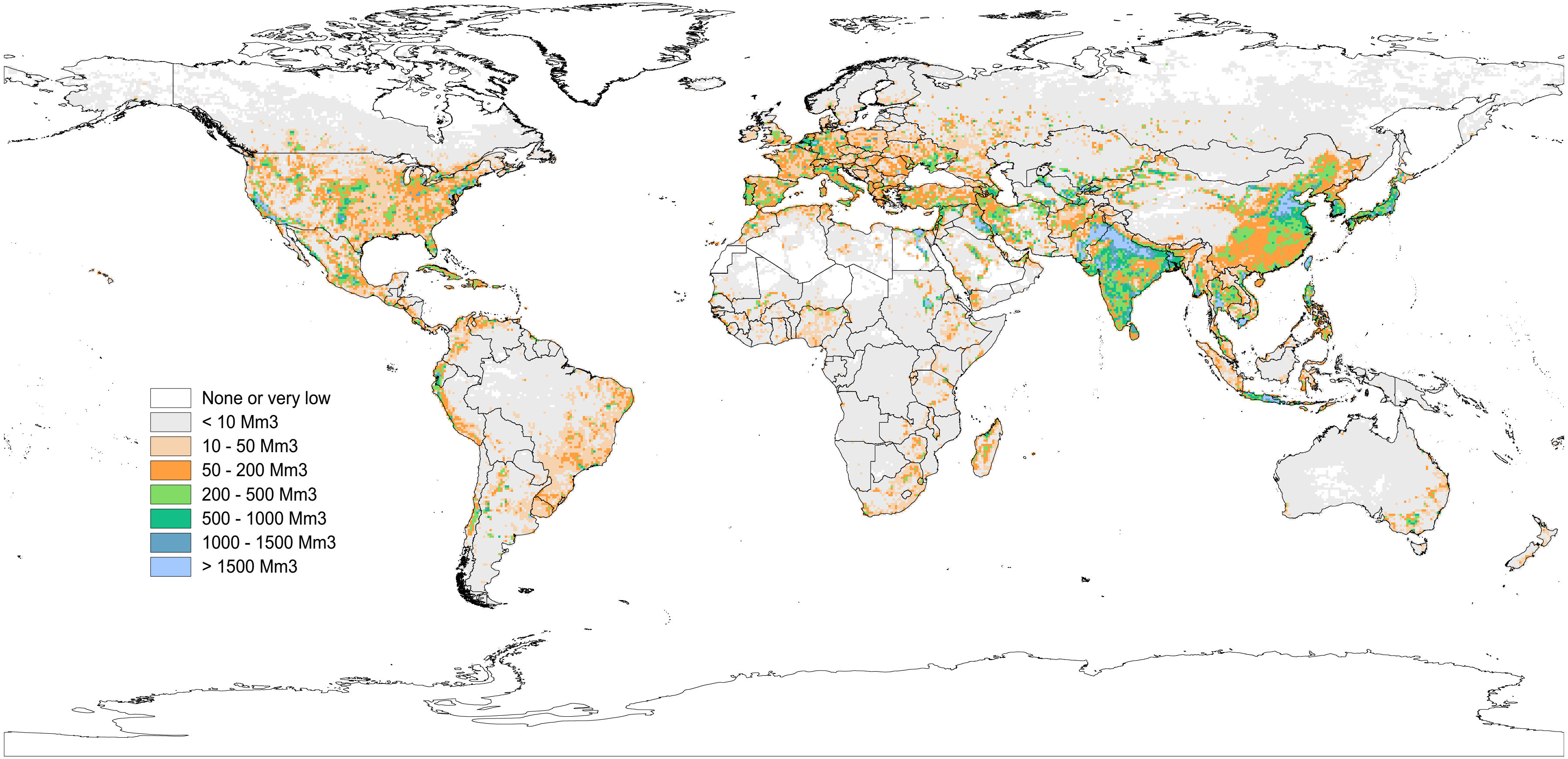
Global Production by Crop Group and Water Source, in 2000





Source: FAOSTAT, GAEZ v3, 2011

Annual water withdrawal (million m3/year)



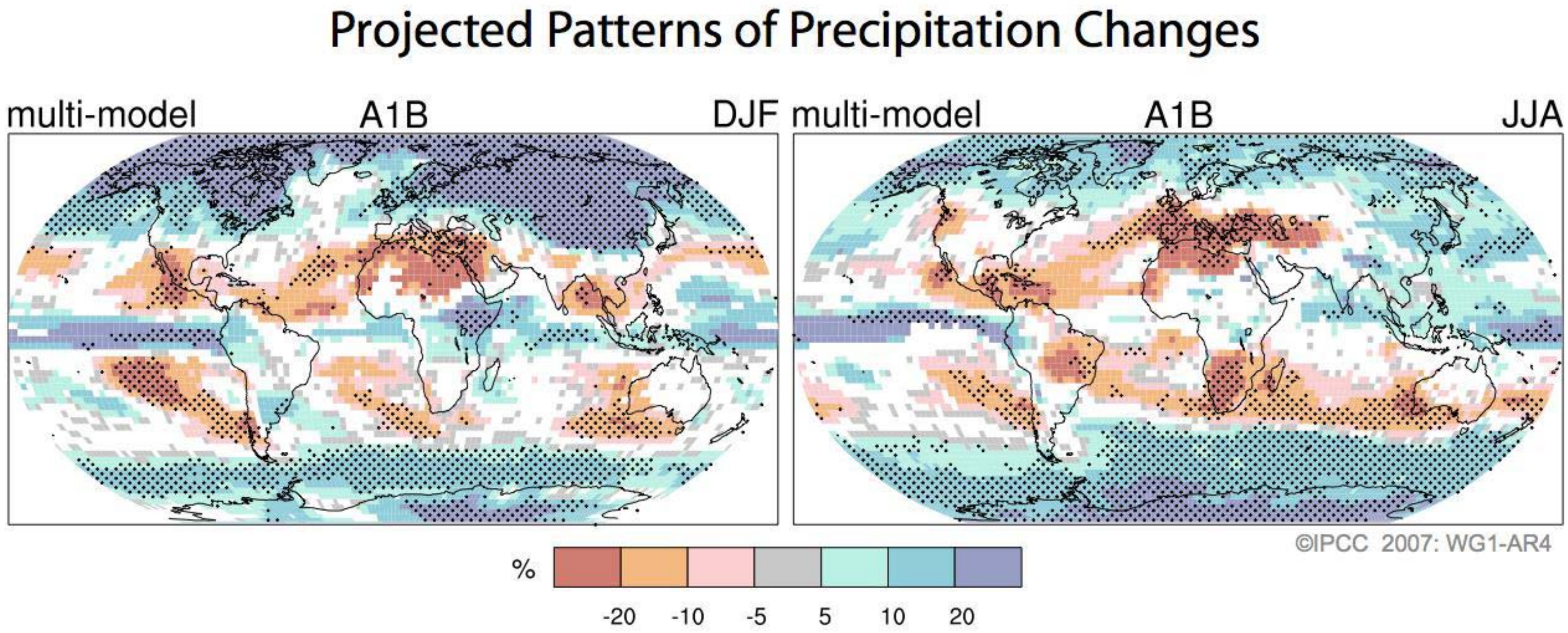
Note: Domestic water withdrawals are downscaled by applying the per capita domestic water use to population of each pixel. Industrial water withdrawals were downscaled by using the industrial water use per unit GDP and applying downscaled information on GDP. Water consumption is assumed to be 30% of domestic use and 10% of industrial use. Agricultural water consumption is assumed to be the sum of crop water deficits in irrigated areas generated in the AEZ analysis and the water used for livestock consumption, applied to a global spatial data set of livestock distribution prepared by FAO.

IMPACTS OF CLIMATE CHANGE ON CROP YIELDS AND WATER DEMAND

Sensitivity of Agro-ecosystems to Global Environmental Change

- Global warming — +/-
  - \+ Removal of cold temperature limitations
  - \+ Longer growing season
  - – Faster growing period
  - – Exceedance of temperature thresholds
  - – Increased crop water requirements
  - – Increased incidence of pests and diseases
- Changes in composition of atmosphere — +
  - \+ Yield increases due to CO2 fertilization
  - \+ Increased water-use-efficiency
  - – Pollution (e.g. tropospheric ozone)
- Alterations in precipitation patterns, soil moisture conditions, surface runoff — +/-
- Increased occurrence of extreme weather events — -
- Increased climate variability — -

Projections of Future Changes in Climate

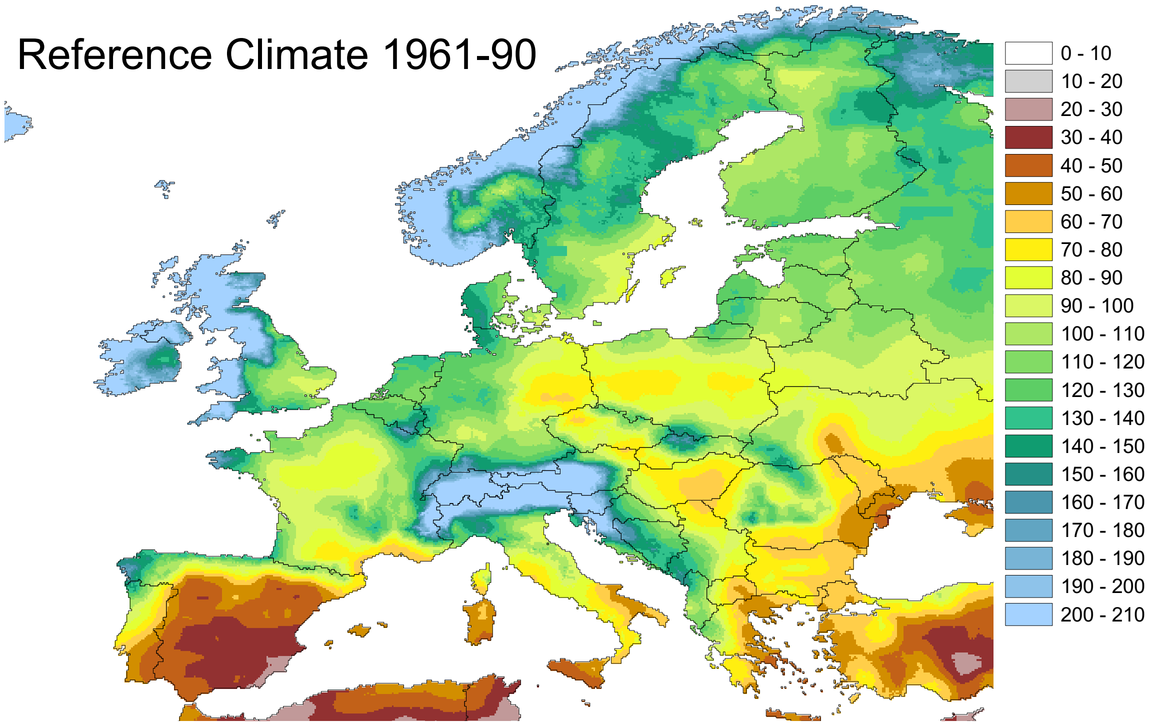


Precipitation increases *very likely* in high latitudes.

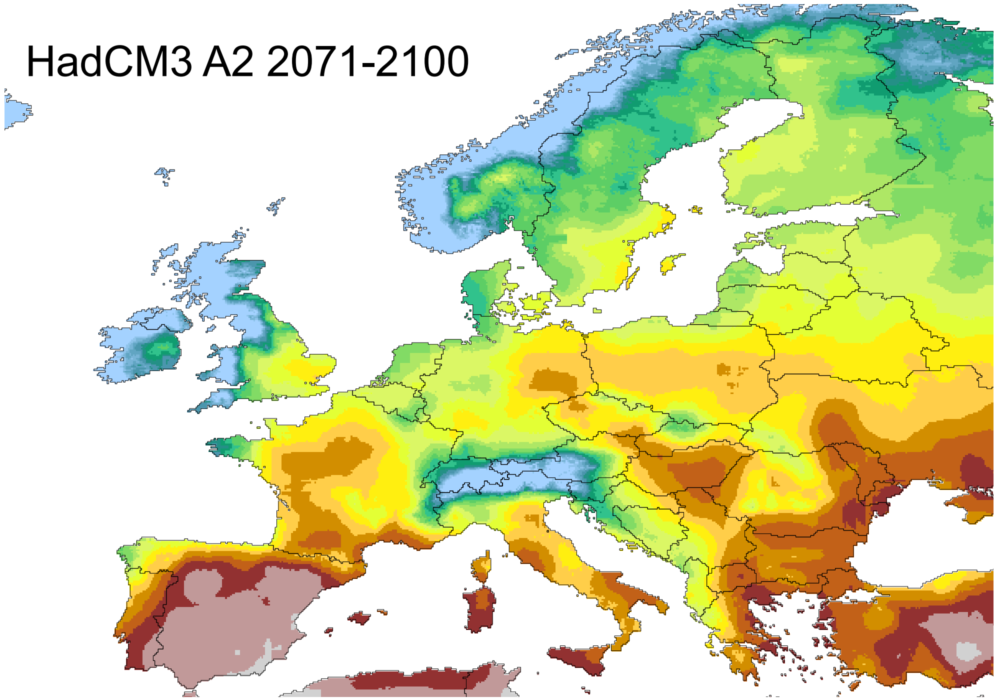
Decreases *likely* in most subtropical land regions.

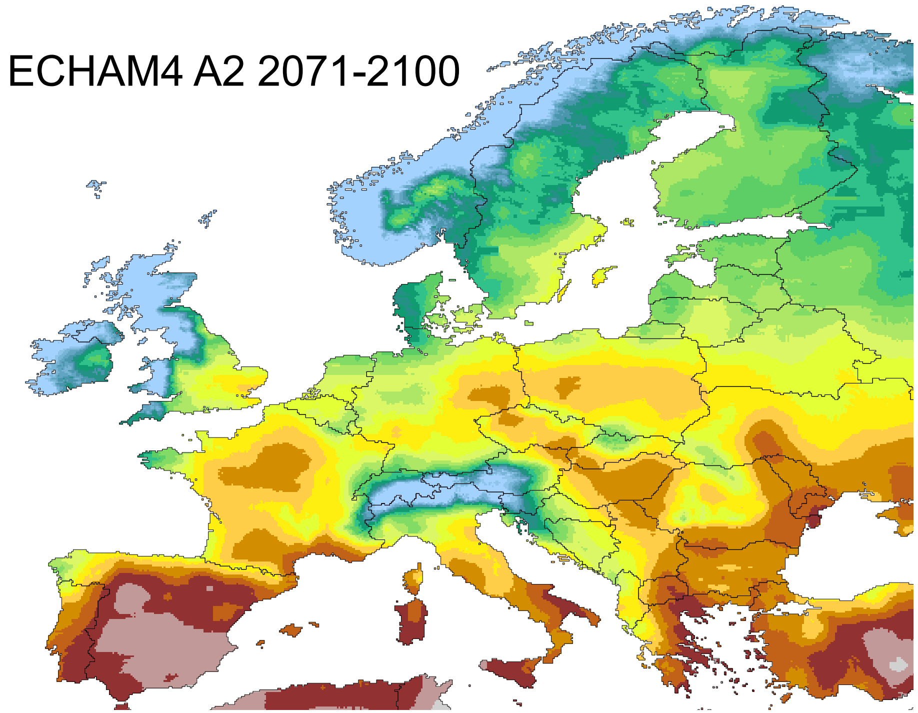
Source: IPCC Fourth Assessment Report, Working Group I

Moisture Index – Present and 2080s

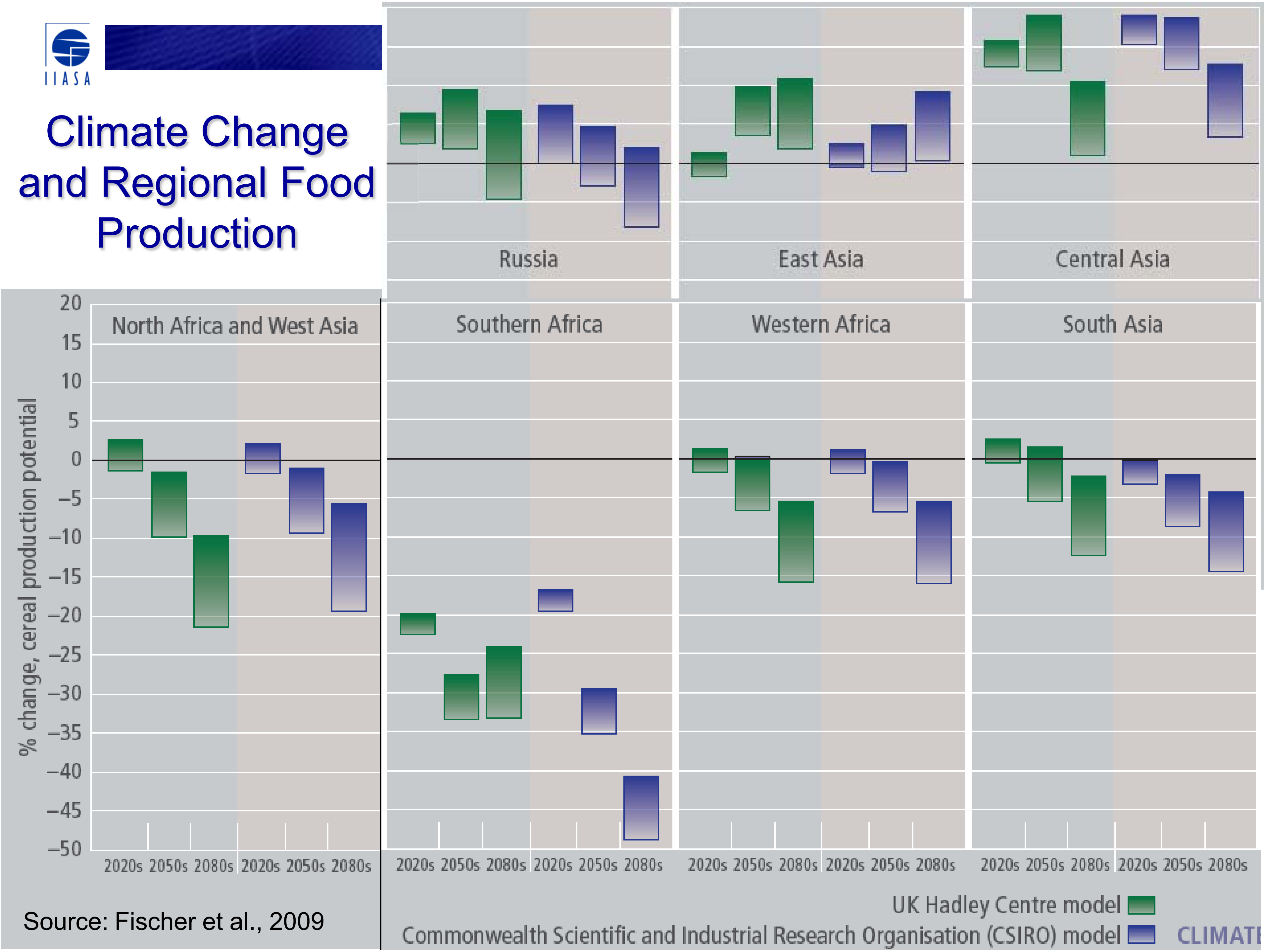


Moisture Index =
100 * Precipitation / Potential Evapotranspiration





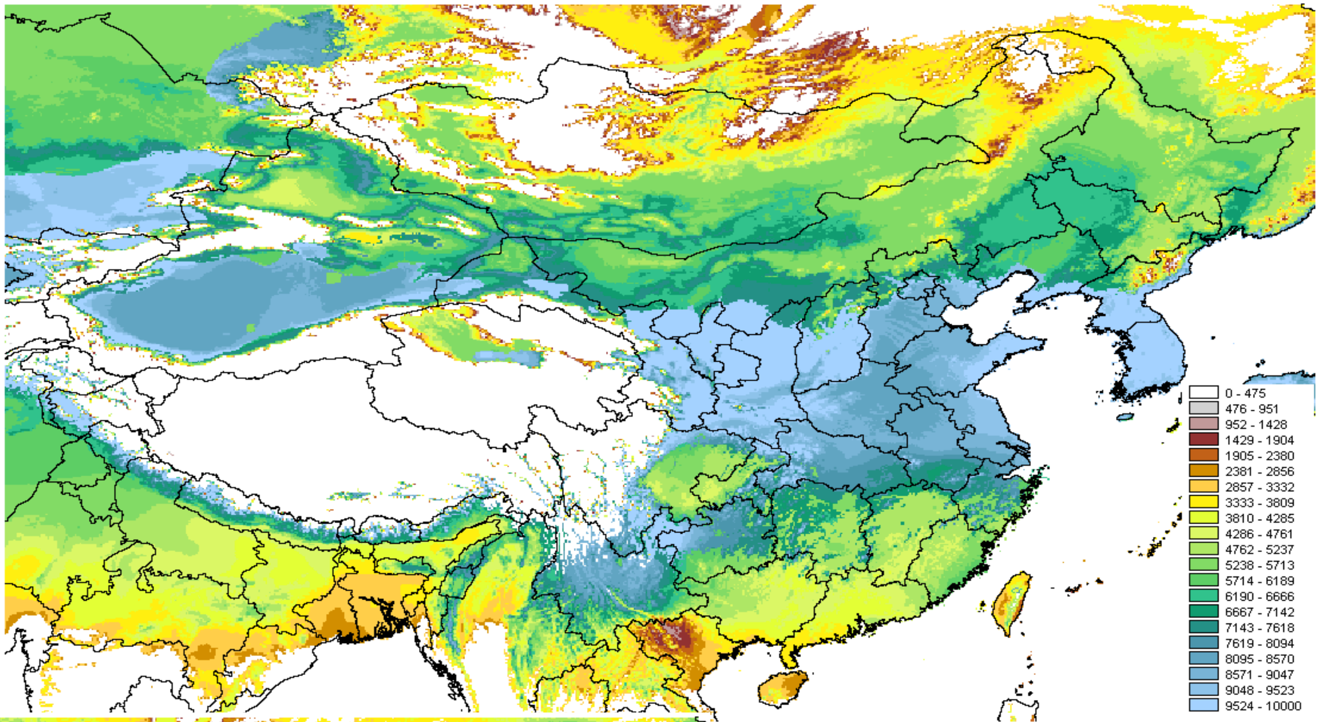
Climate Change and Regional Food Production



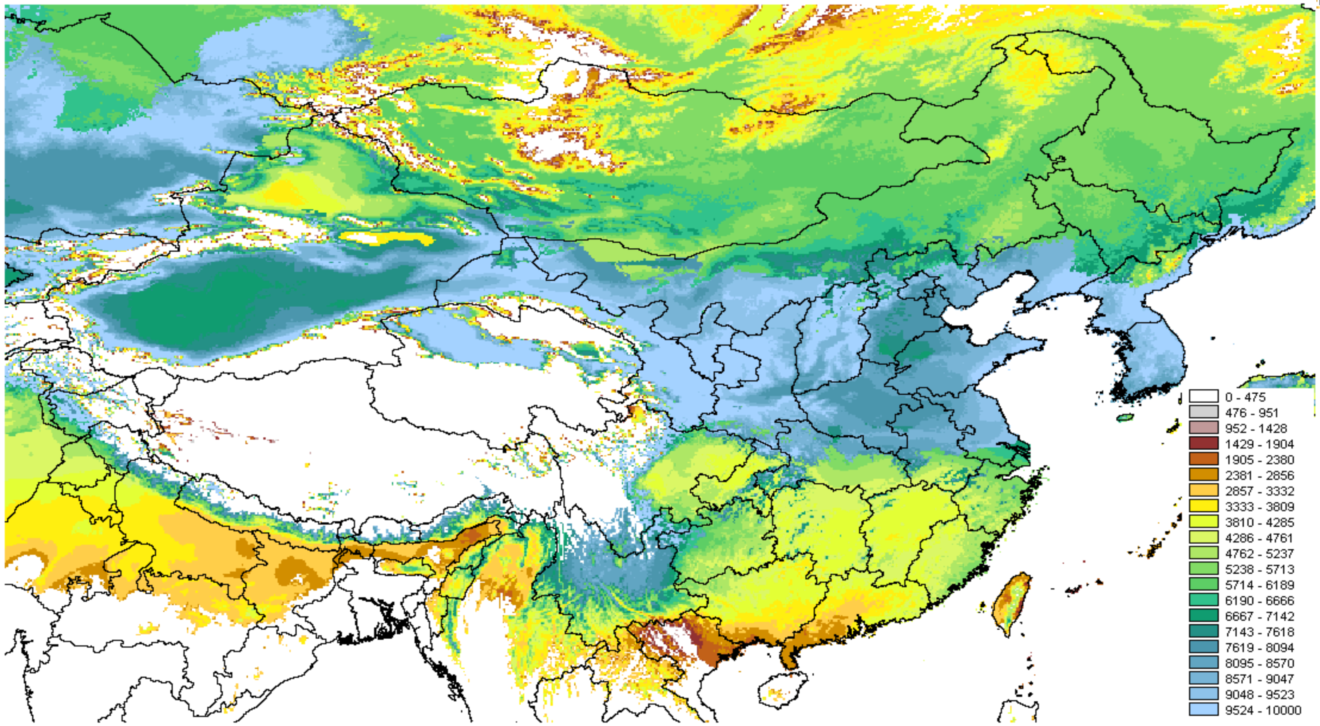
Source: Fischer et al., 2009

Irrigated Wheat

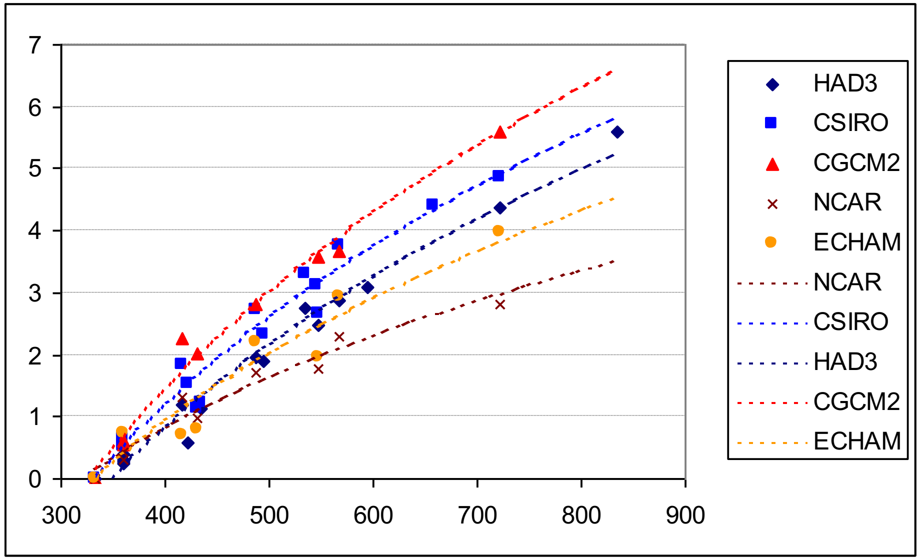
HadCM3, IPCC A2, 2050s

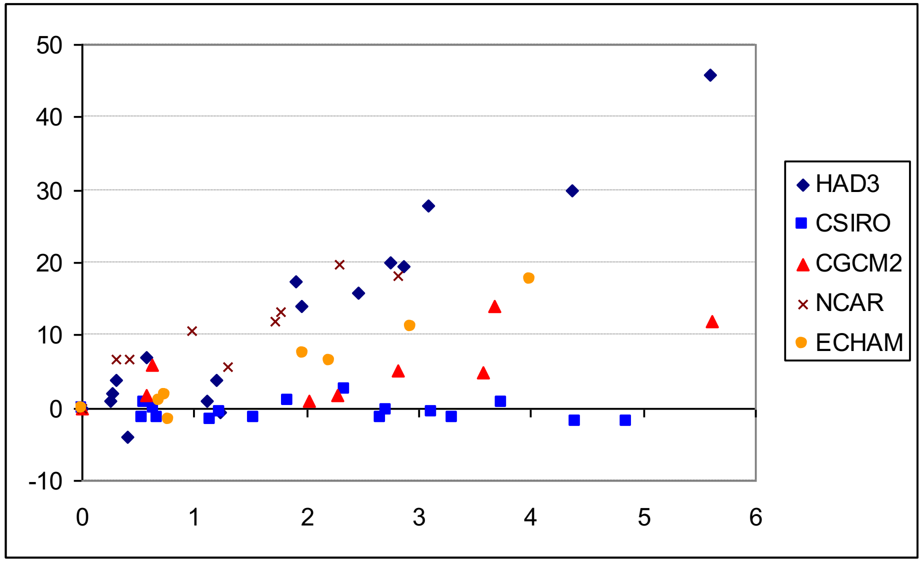


Reference, 1961-1990



Agro-climatically Attainable Yield

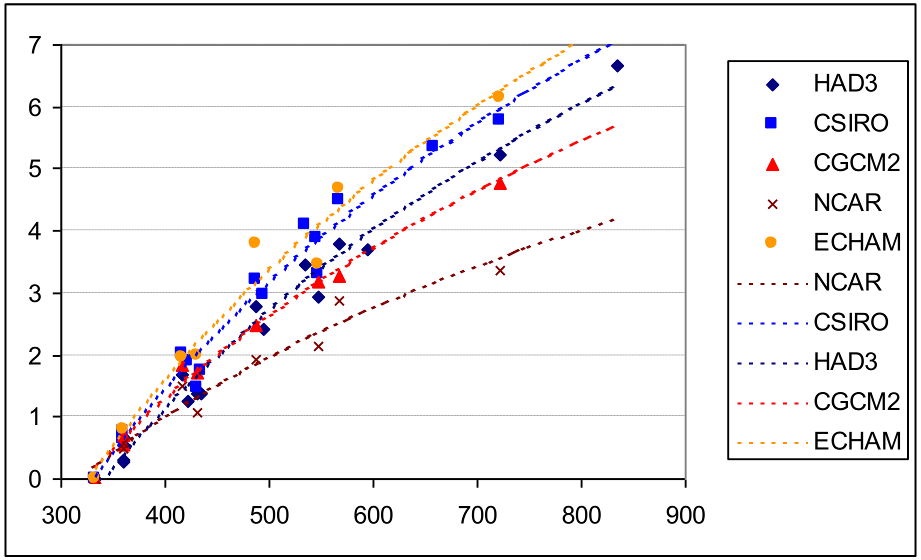


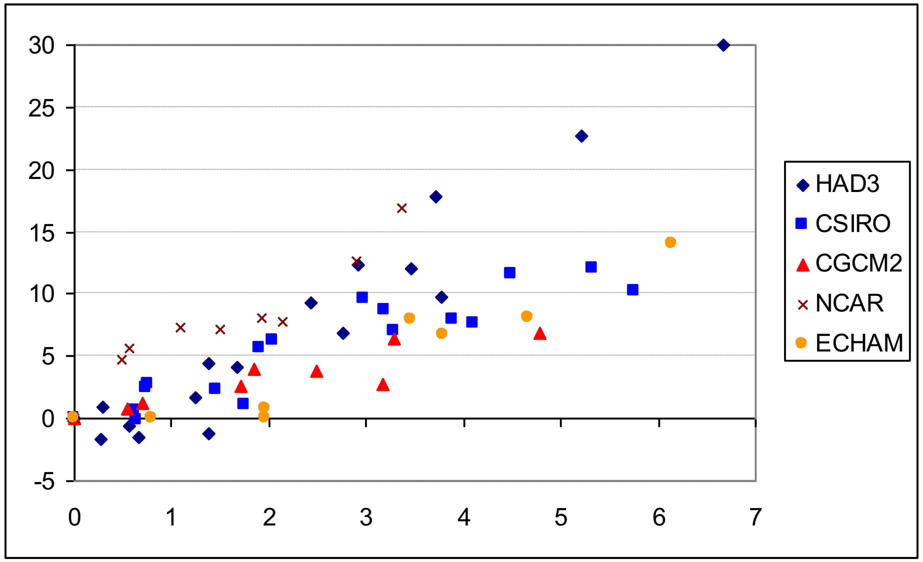


Temperature change vs CO2 concentration

China North Region

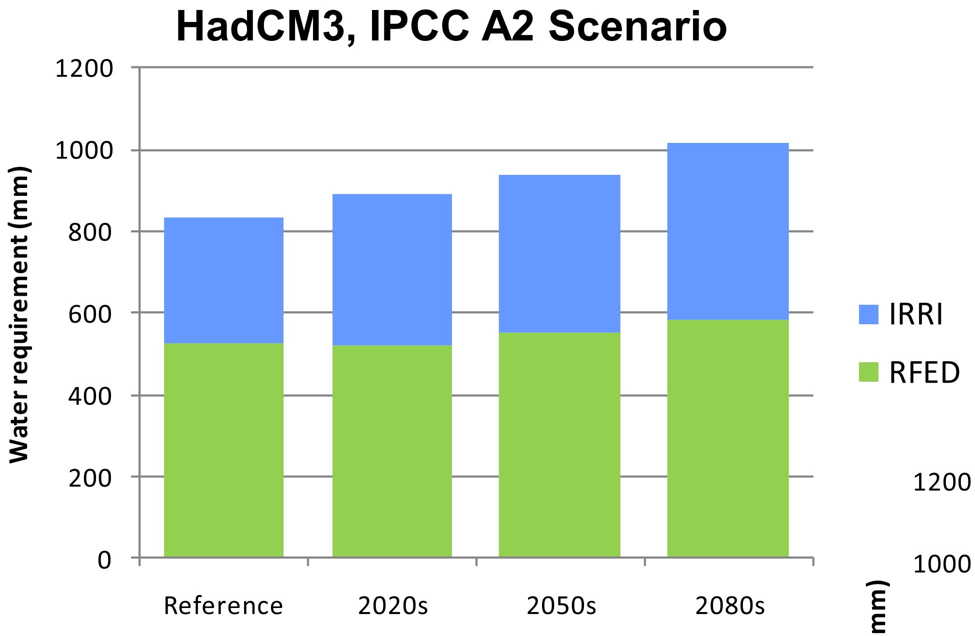
Precipitation change (%) vs Temperature change





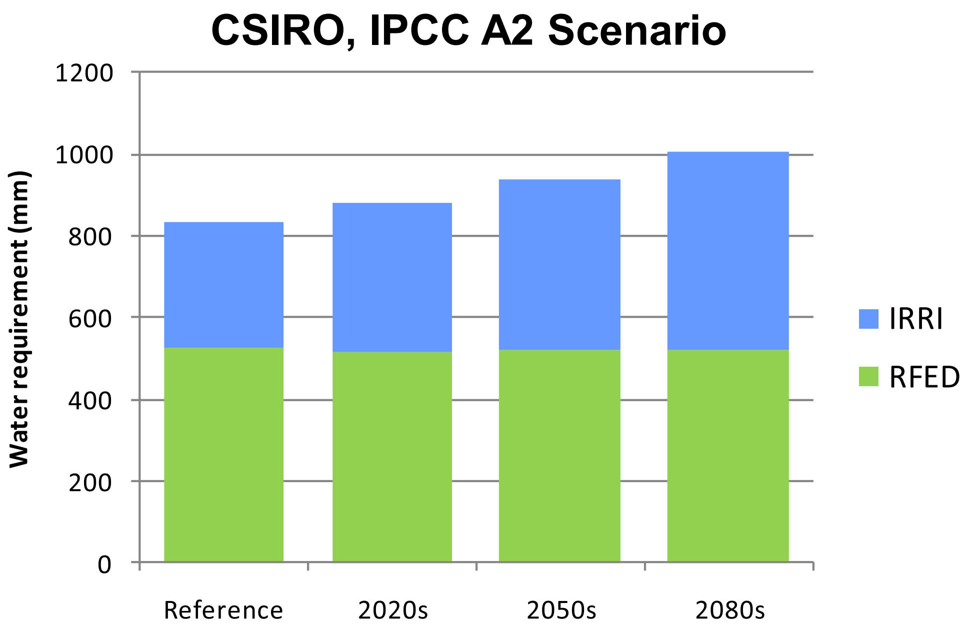
China Northeast Region

China: Climate Change Impacts on average Crop Water Requirements in Irrigated Areas



Calculation based on (i) spatial grid of climate and irrigated land areas and (ii) FAO/IIASA AEZ crop soil water balance method.

With climate change the share of irrigation in total water requirements as well as the total amount of water to be supplemented by irrigation increases; magnitude dependent on scenario and climate model.



China: Climate Change Impacts (% change) on Indicators of Agricultural Water System

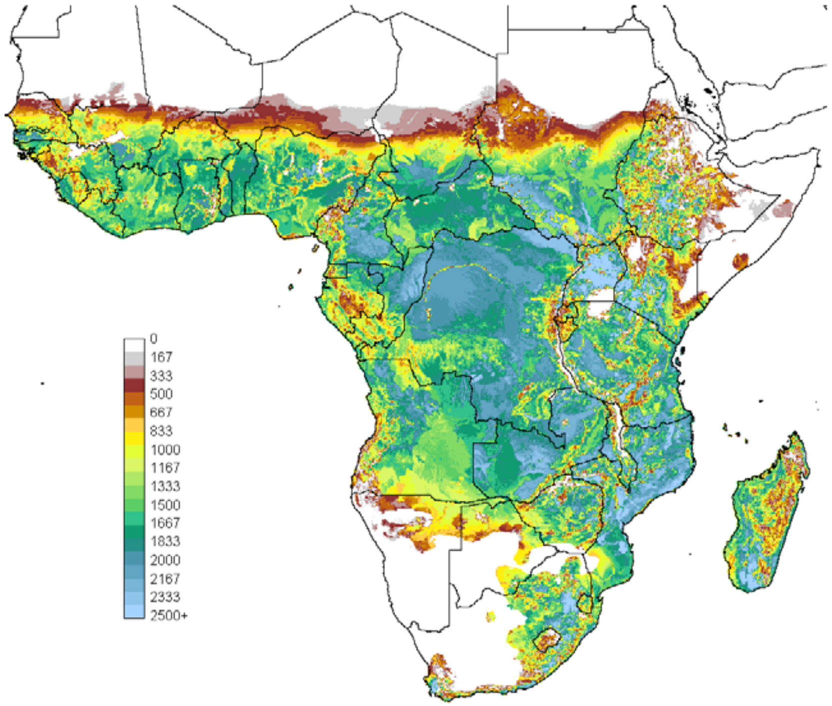
Climate	Percent change in 2020s			Percent change in 2050s		
Scenario	PREC	CWR	WRI	PREC	CWR	WRI
HadCM3A2	1.1	6.7	-3.0	10.0	12.3	8.3
CSIRO A2	3.0	5.7	0.2	6.7	12.1	0.6
CGCM2 A2	0.2	11.0	-6.8	1.5	17.6	-9.3
ECHAM A2	-0.2	7.1	-6.0	5.3	10.4	-0.5
HadCM3 B1	4.0	2.2	3.9	9.5	8.8	9.3
CSIRO B1	4.2	6.5	0.4	7.4	9.7	2.6

Note: percent change relative to respective reference projection without climate change. Crop water requirements (CWR) calculated as crop-specific potential evapotranspiration (plus special allowance for paddy). Almost all of China's water is from internal renewable water resources (WRI).

In year 2000:

- 54 million ha irrigated out of total 128 million ha cultivated land (~ 42%)
- Agriculture uses 427 billion m^3 out of 630 billion m^3 annual water withdrawals (~ 68%)

THE GLOBAL LAND RUSH: LARGE-SCALE ACQUISITION OF LAND



Methodology for estimating ‘fair’ land values

(1) Assemble global/regional land resources database; in this study we use GAEZ v3 (FAO-IIASA, 2011).

(2) Assess suitability for major crops and estimate attainable agro-ecological yield and production (in this study: maize, sorghum, wheat, soybean, groundnut, oil palm, sugar cane, cassava, cotton).

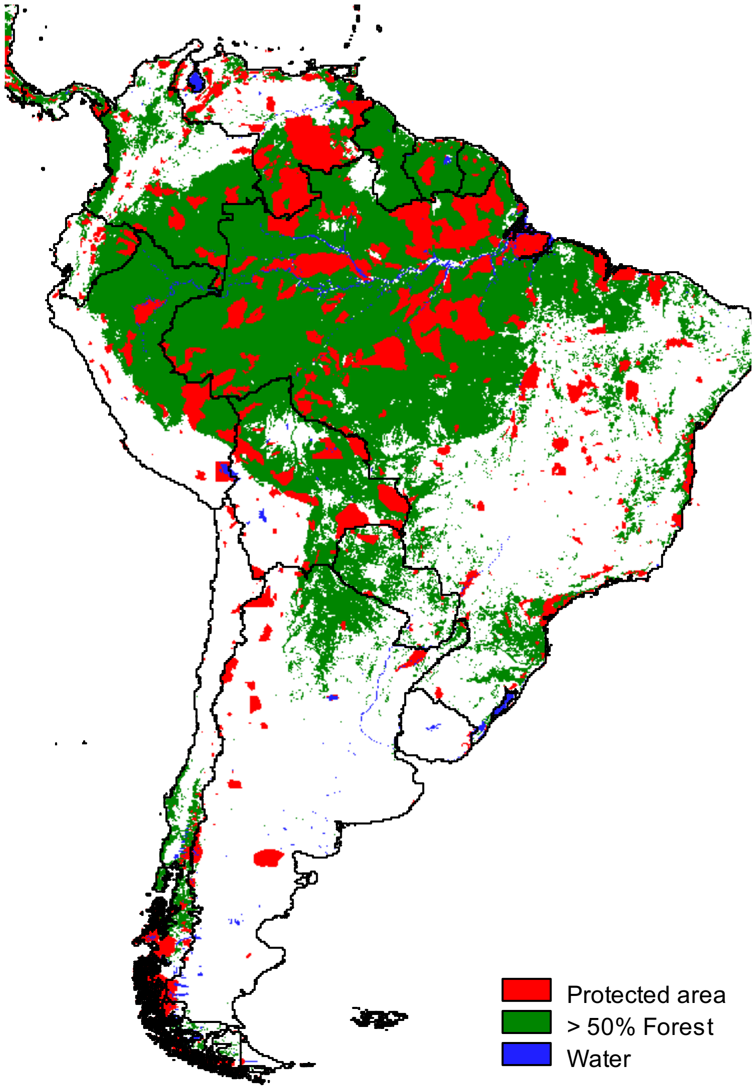
(3) Estimate for each crop and location the required inputs (seed, fertilizers, labor, machinery, and other costs) using a generic set of production technologies.

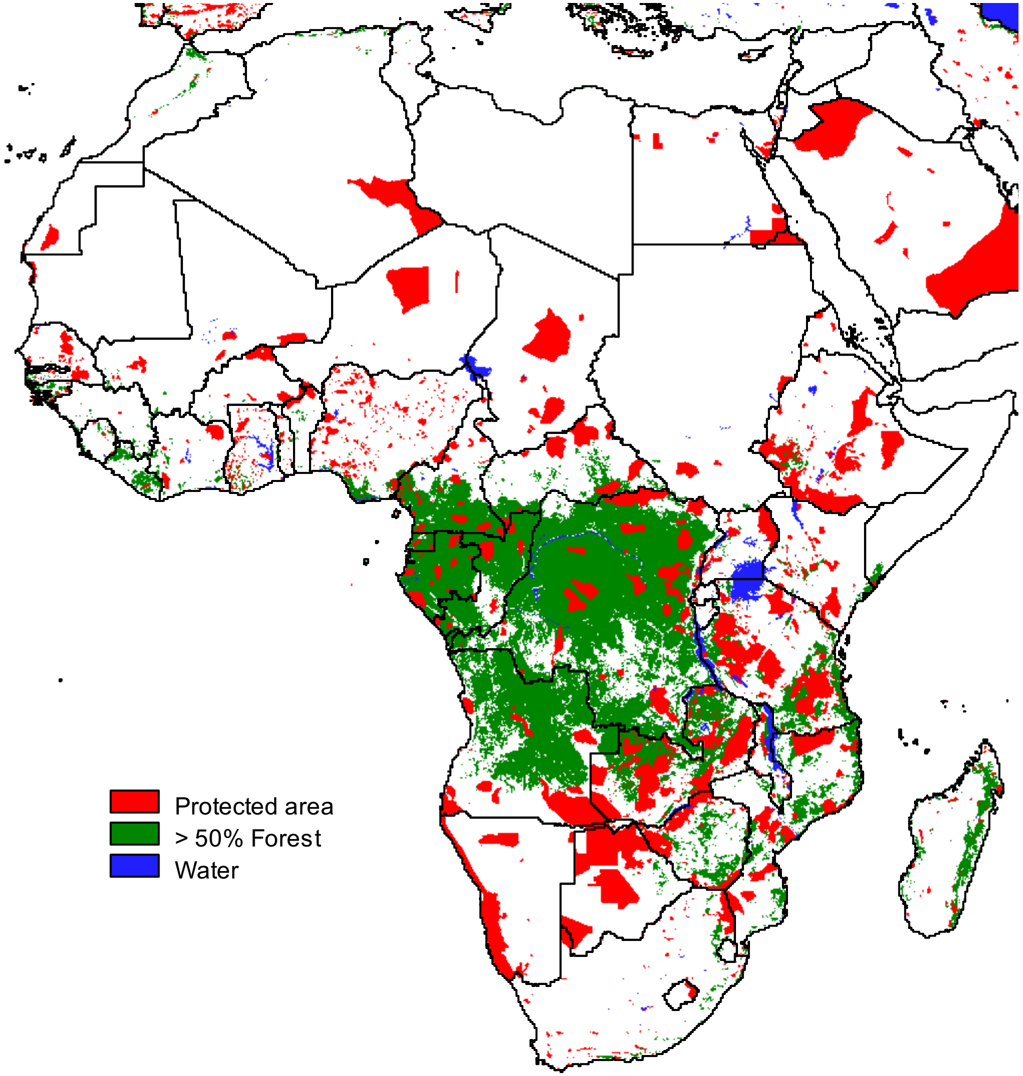
(4) Construct ‘umbrella’ crop based on assessed major crops, selecting in each grid cell the one maximizing estimated net output value.

(5) Calculate ‘fair’ land values on the basis of estimated attainable output value minus location-specific reference production costs and transportation costs.

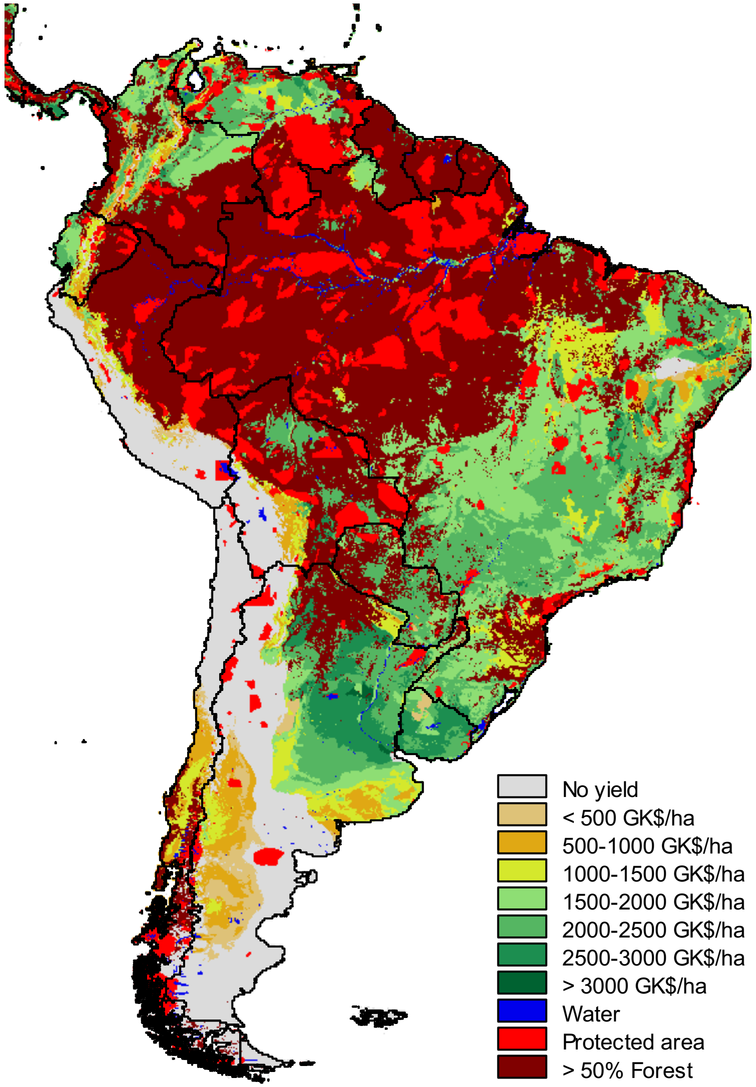
(6) Summarize grid-cell outcomes and tabulate by current land cover/use category, protection status and land value class.

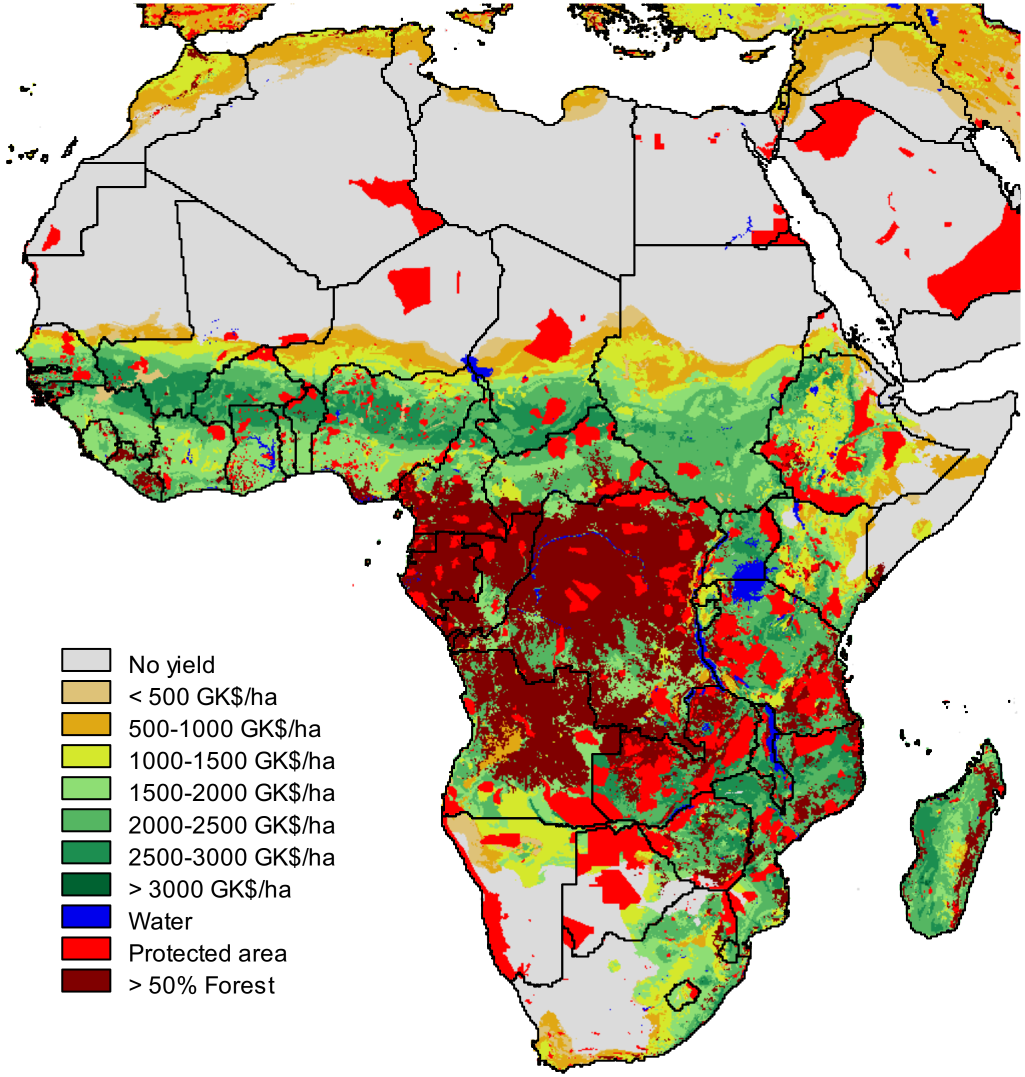
Spatial Distribution of 'No Go' Areas: Closed Forest and Protected Areas



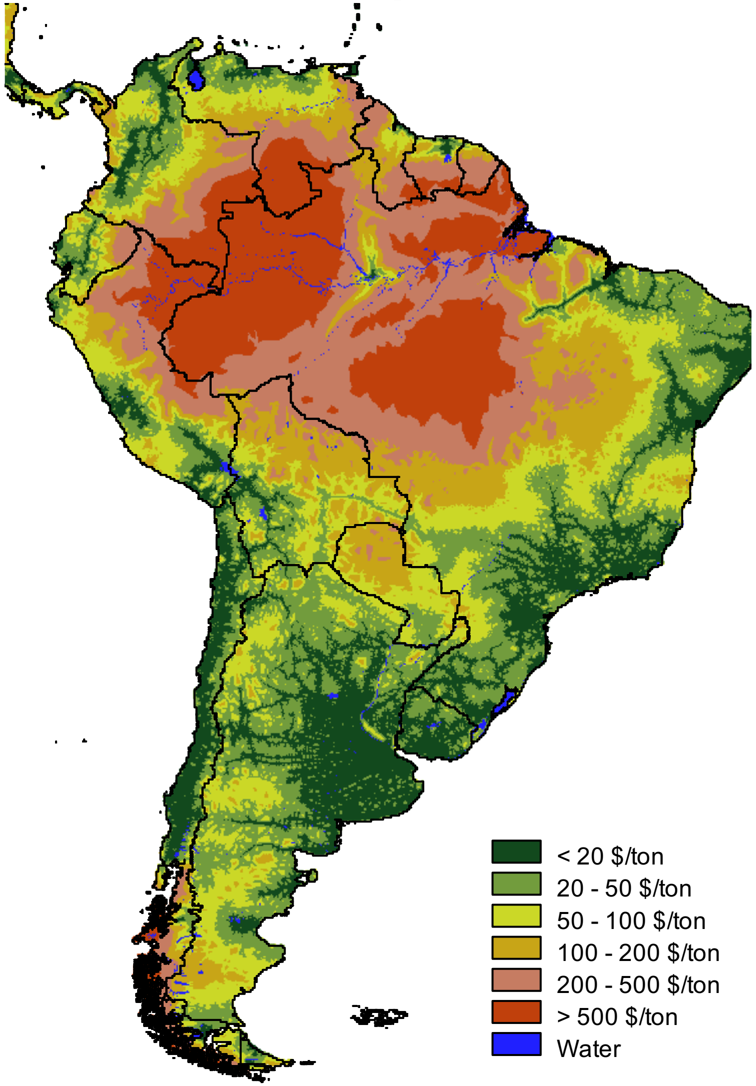


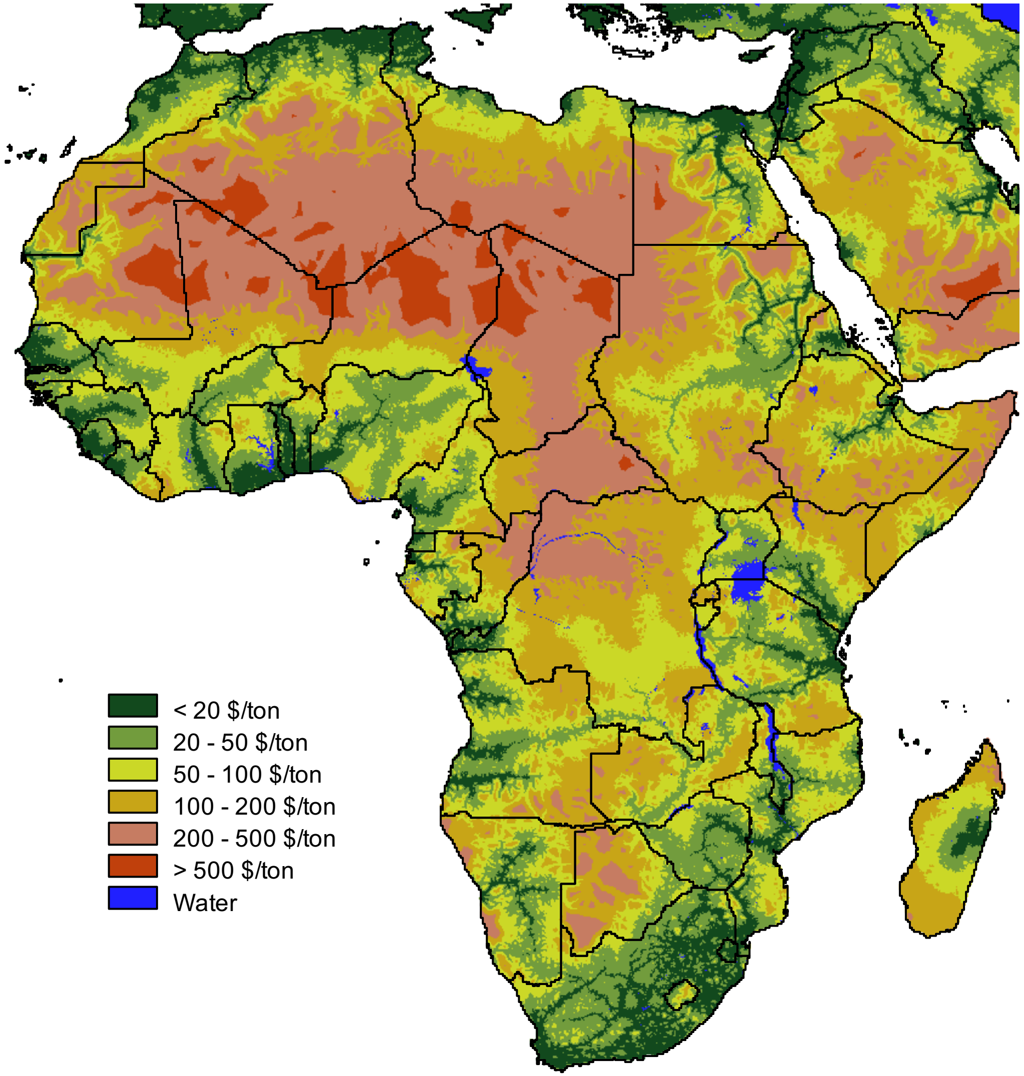
Potenial Productivity of 'umbrella' crop outside 'No-Go' Areas (GK$/ha)





Transport cost to nearest port (US$/ton)





Source: World Bank (2011, unpublished).

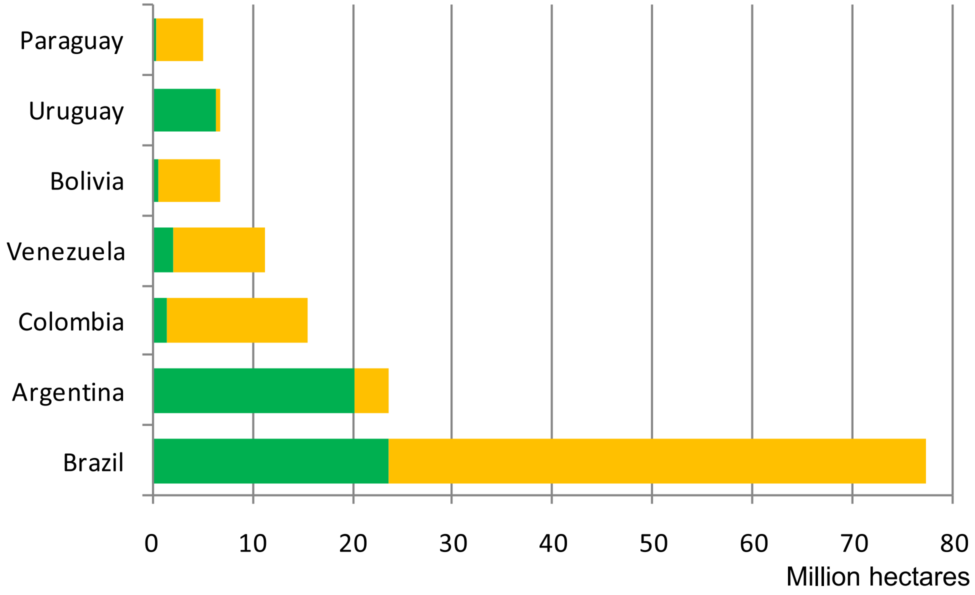
Grass/Wood Land outside 'No-go' areas suitable for 'umbrella' crop (mill. ha)

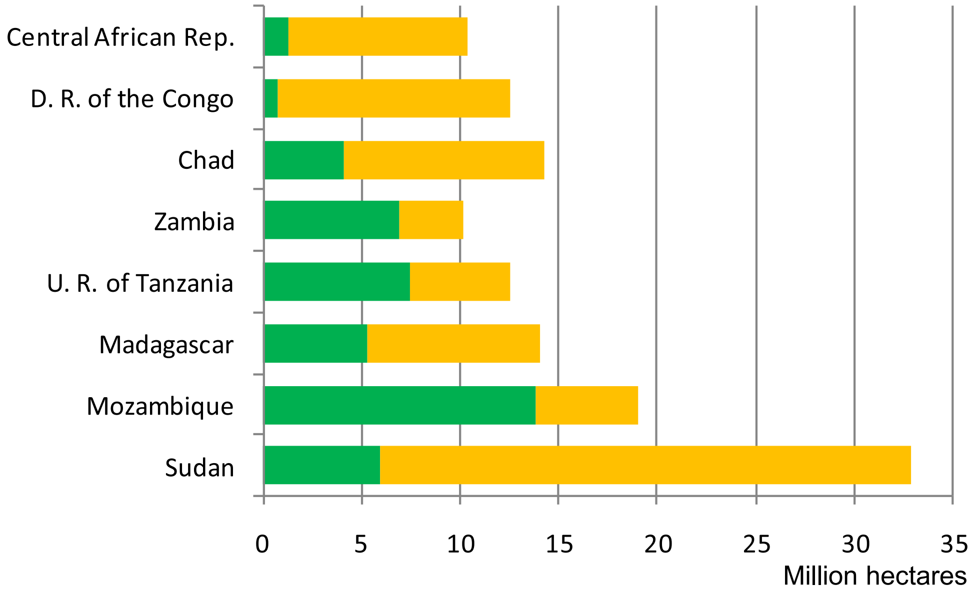
Region	Total Grass/ Wood Land excl. 'No-Go'	VS+S+MS Grass/Wood Land	NVP > 1000 Grass/Wood Land	NVPT>1000 Grass/Wood Land
Northern America	502	77	5	2
Europe & Russia	512	106	4	1
Australia & N.Zealand	457	69	5	3
Latin America	606	282	152	57
Sub-saharan Africa	855	403	194	85
North Africa & West Asia	87	12	0.0	0
Asia (excl. W.Asia)	563	101	17	8
World Total	3587	1052	378	156

Source: Calculations by authors based on FAO-IIASA GAEZ v3 database, 2011

Note: Extents of land currently classified as grass/wood land outside 'No-Go' areas. The table shows (i) total extents, (ii) land very suitable, suitable and moderately suitable for rain-fed cultivation of at least one of nine major agricultural crops (maize, sorghum, wheat, soybean, groundnut, oil palm, sugar cane, cassava, cotton), (iiI) of which with NVP (excl. transport) > 1000 $/ha, and (iv) NVP (incl. transport) > 1000 $/ha.

Countries with large extents of potential highly productive land





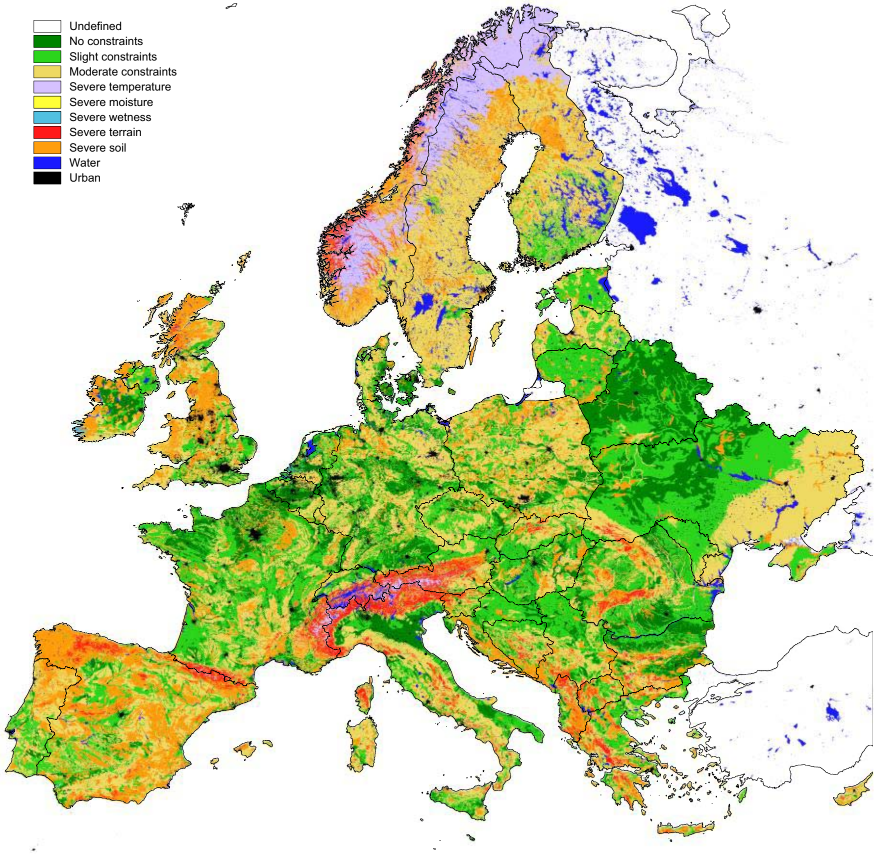
Including transport cost to port

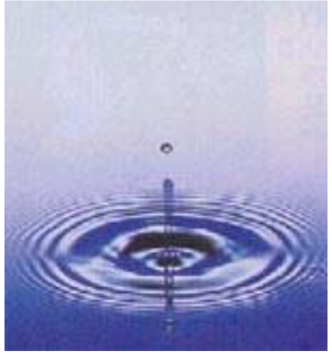
Without transport cost to port

Note: The diagrams show extents of land currently classified as grass/woodland outside 'No-Go' areas and with an estimated NVP exceeding 1000 US$/ha, based on assessment of nine major agricultural crops (maize, sorghum, wheat, soybean, groundnut, oil palm, sugar cane, cassava, cotton).

Source: Calculations by authors based on FAO-IIASA GAEZ v3 database, 2011

BIOENERGY DEVELOPMENT





REFUEL, Main Objectives

To develop an ambitious, yet realistic road map for an effective deployment of biofuels until 2030 in the EU27+

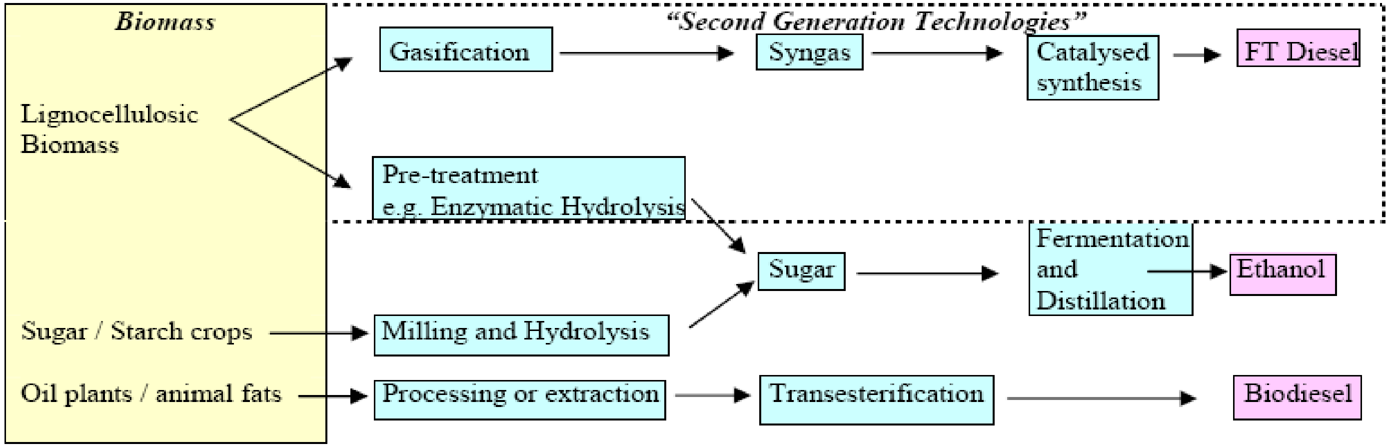
- Land availability
- Feedstock potentials
- (relative) costs of biofuels
- Impacts
- Strategy and policy issues
- Implementation issues

Bio-fuel Feedstocks

Feedstock groups:

- Oil crops
  Rapeseed; Sunflower; Soybean; Oilpalm; Jatropha
- Sugar crops
  Sugarcane; Sugar beet; Sweet sorghum
- Starch crops
  Wheat; Rye; Triticale; Maize; Sorghum; Cassava
- Herbaceous lignocellulosic plants
  Miscanthus; Switchgrass; Reed canary grass
- Woody lignocellulosic plants
  Poplar; Willow; Eucalyptus

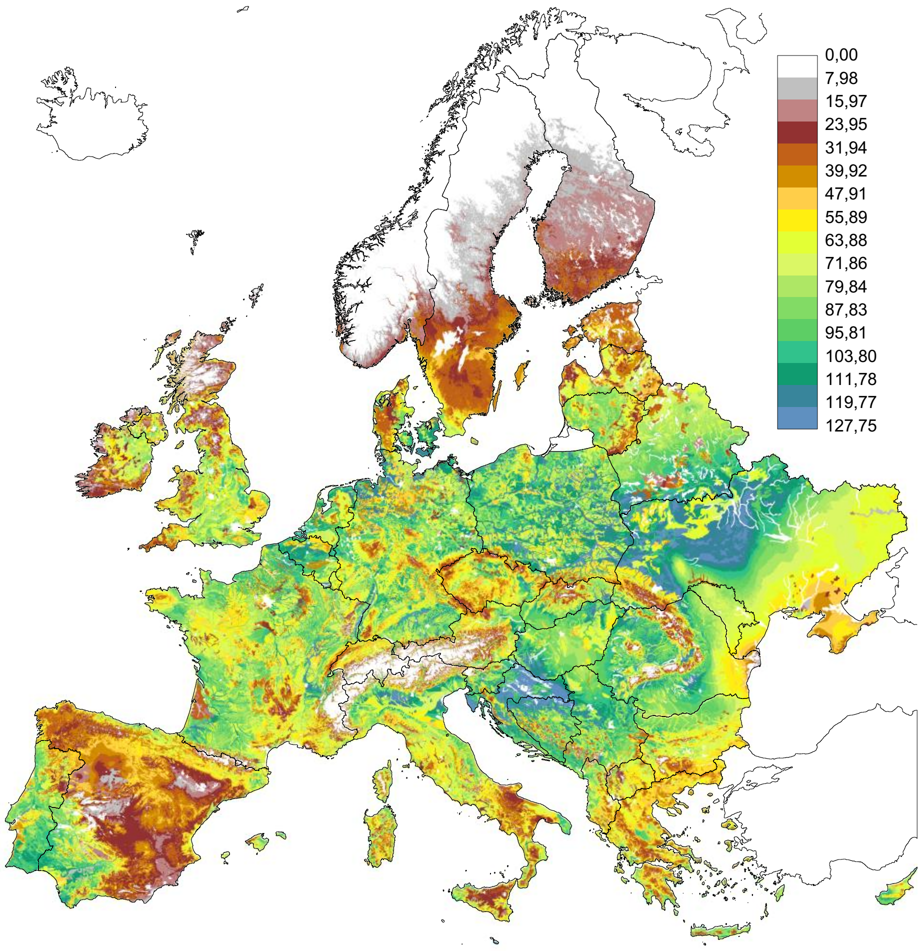
Figure 1. Fuel production pathways



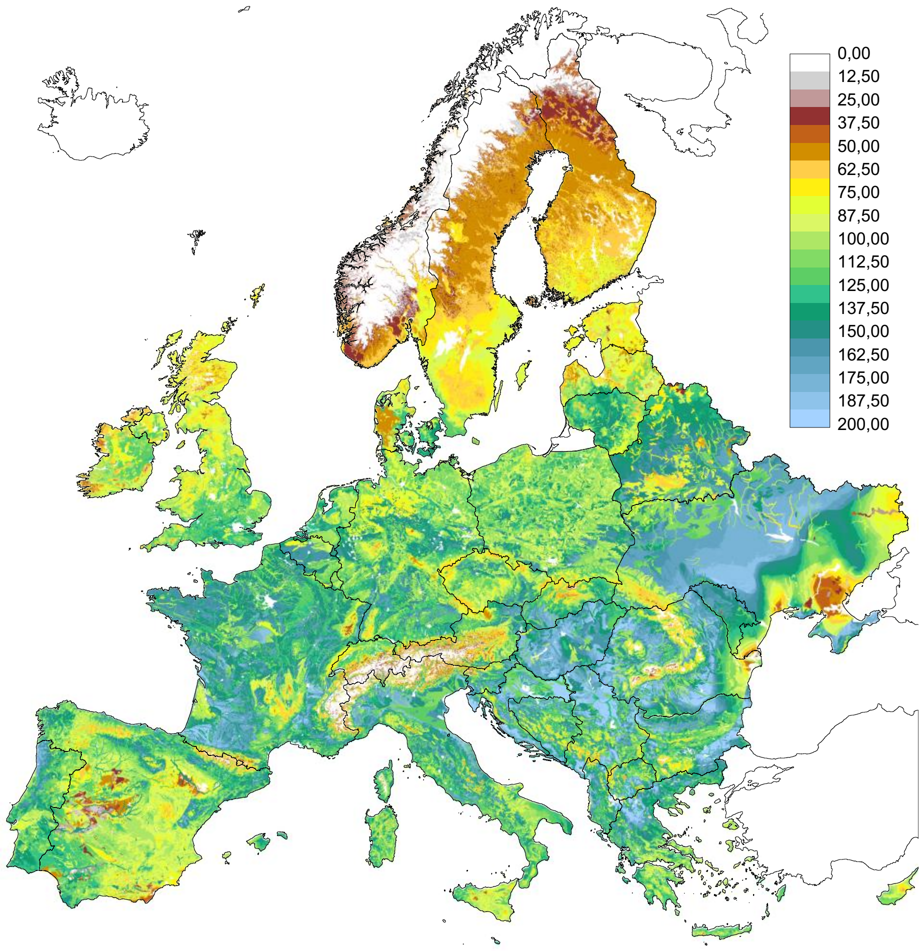
Source: adapted from BMU (2006) and Hamelinck and Faaij (2006)

Biofuel Feedstock Yield Potential

(a) Attainable energy yields of (1st generation) starch crops, sugar crops and oil crops (GJ/ha, biofuel equiv.)



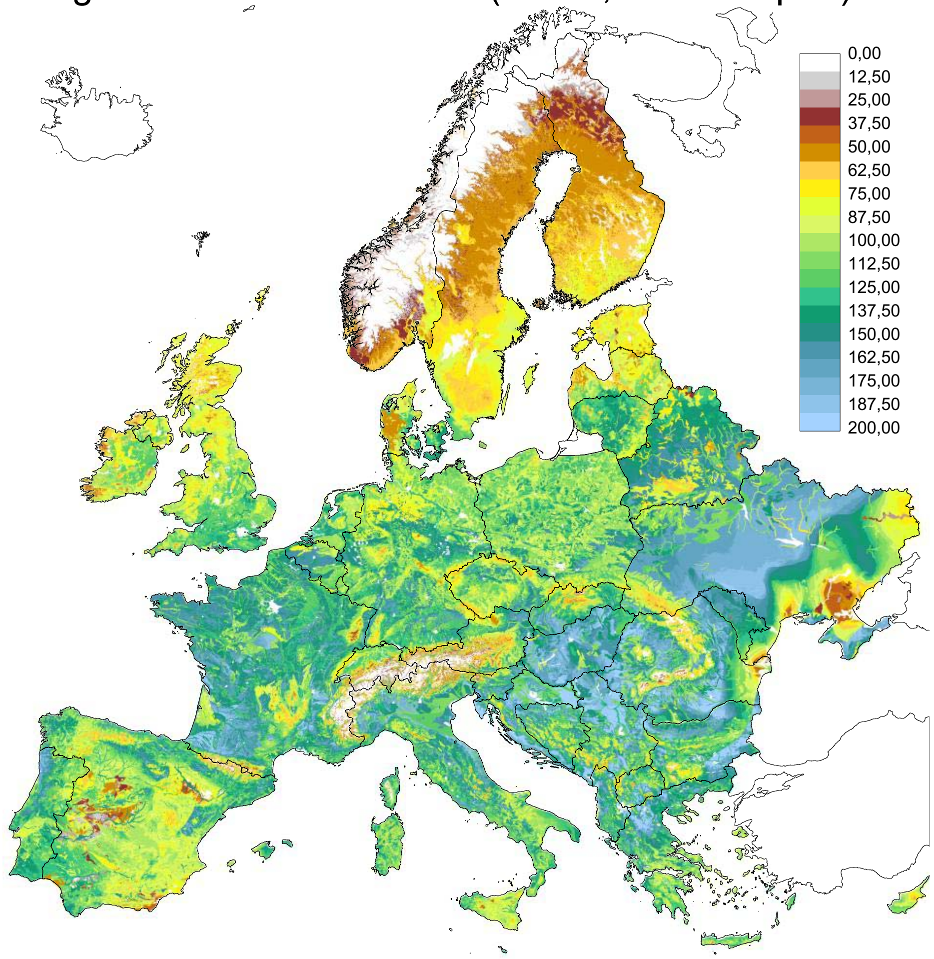
(b) Attainable energy yields of (2nd generation) woody and herbaceous ligno-cellulosic feedstocks (GJ/ha, biofuel equiv.)

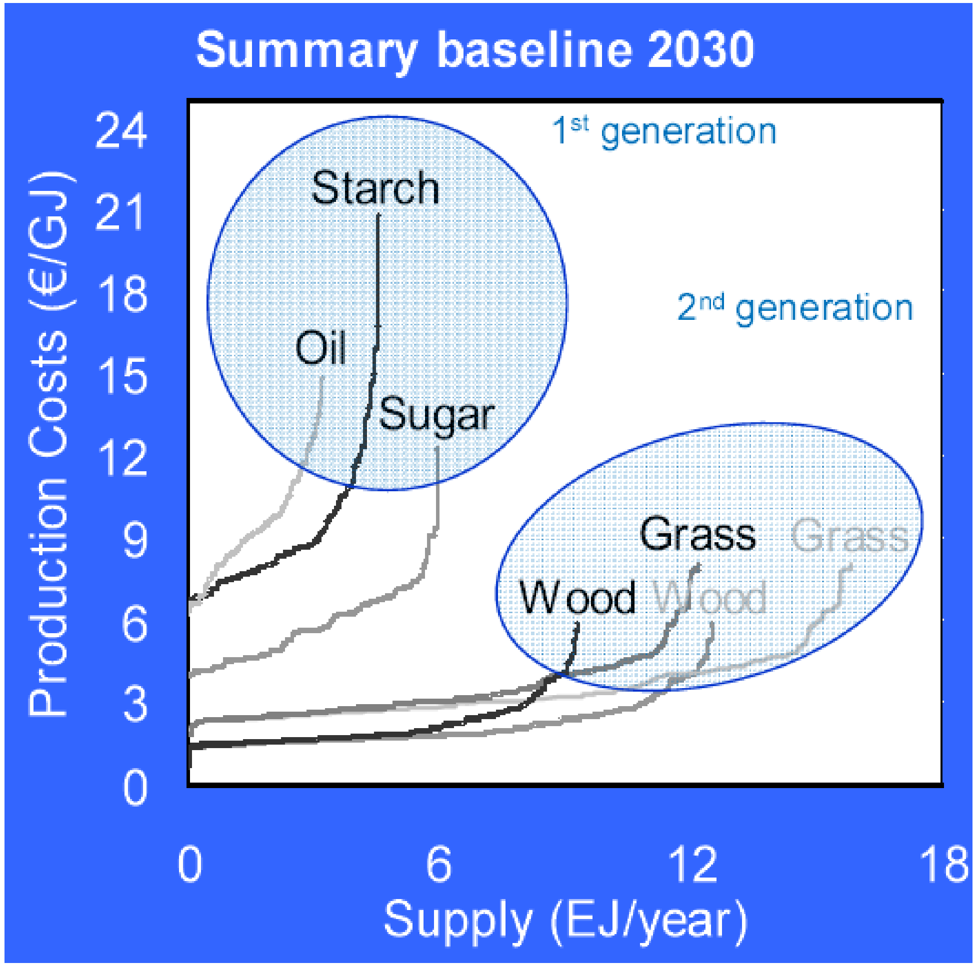


Source: Land Use Change and Agriculture Program, IIASA, 2007

Detailed feedstock supply and cost assessment

Attainable energy yields of 2nd generation lignocellulosic feedstocks (GJ/ha, biofuel equiv.)



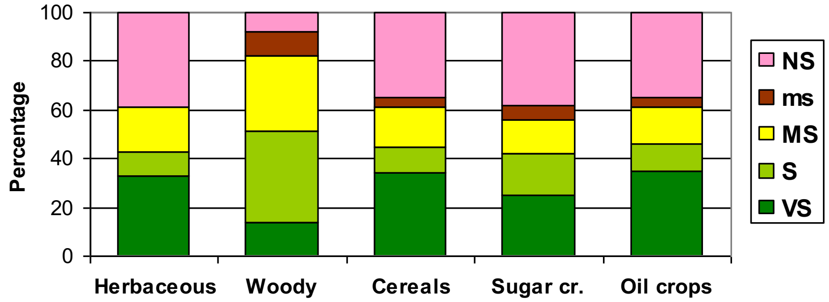


1 EJ (ExaJoule) = 24 Mtoe

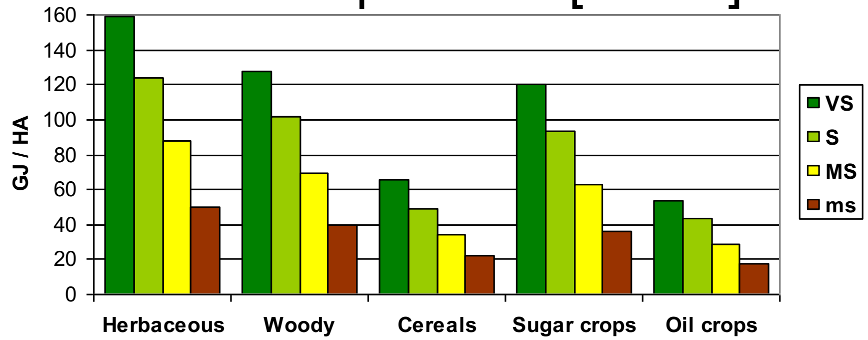
POLAND – Suitability for biofuel feedstock

Feedstocks

Suitability index	SUITABILITY distribution on agricultural area (%)					Average **YIELD** (rainfed) in suitability class				
	VS	**S**	**MS**	**ms**	**NS**	**VS**	**S**	**MS**	**Ms**	Unit of Yield
Herbaceous	33	10	18	0	39	17.1	13.3	9.4	5.4	ton d.w./ha
Woody	14	37	31	10	7	13.3	10.6	7.2	4.1	ton d.w./ha
Cereals	34	11	16	4	35	8.6	6.5	4.5	2.9	ton d.w./ha
Sugar crops	25	17	14	6	38	8.6	6.7	4.5	2.6	ton sugar/ ha
Oil crops	35	11	15	4	34	1.5	1.2	0.8	0.5	ton oil / ha



Biofuel equivalent [GJ/ha]



GAEZ
Global Agro-ecological Zones

GAEZ v3.0 Global Agro-ecological Zones

Data access

User's Guide

Research Report

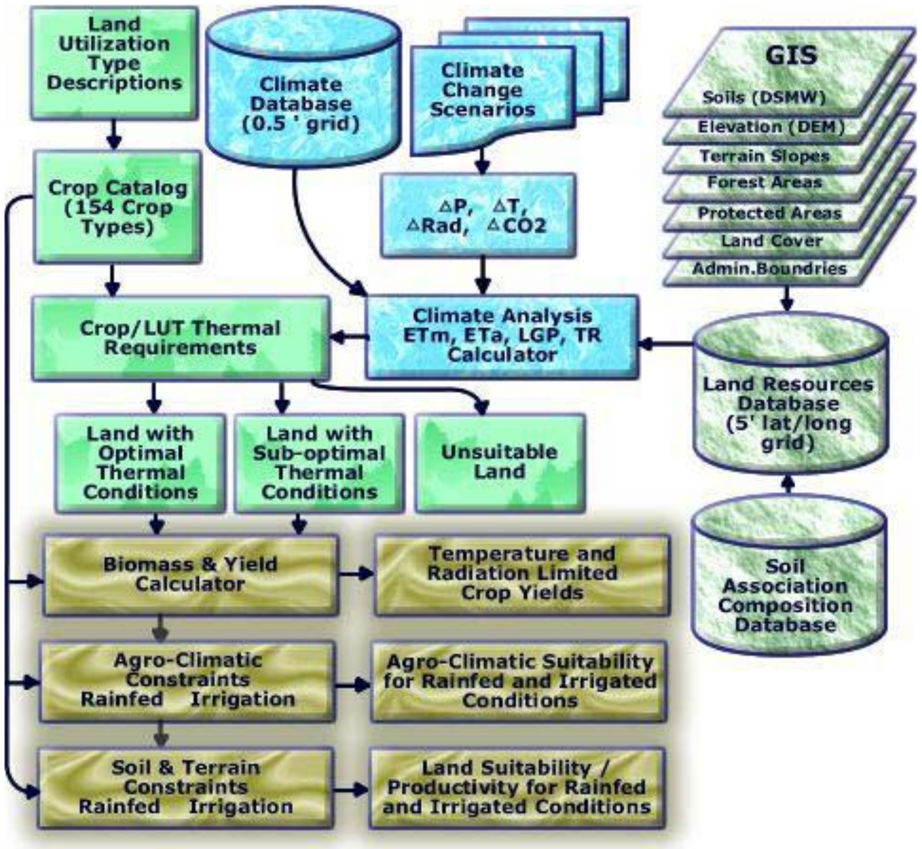
Model Documentation

News and updates

Food and Agriculture Organization of the United Nations

International Institute for Applied Systems Analysis

The GAEZ Viewer



GAEZ Model

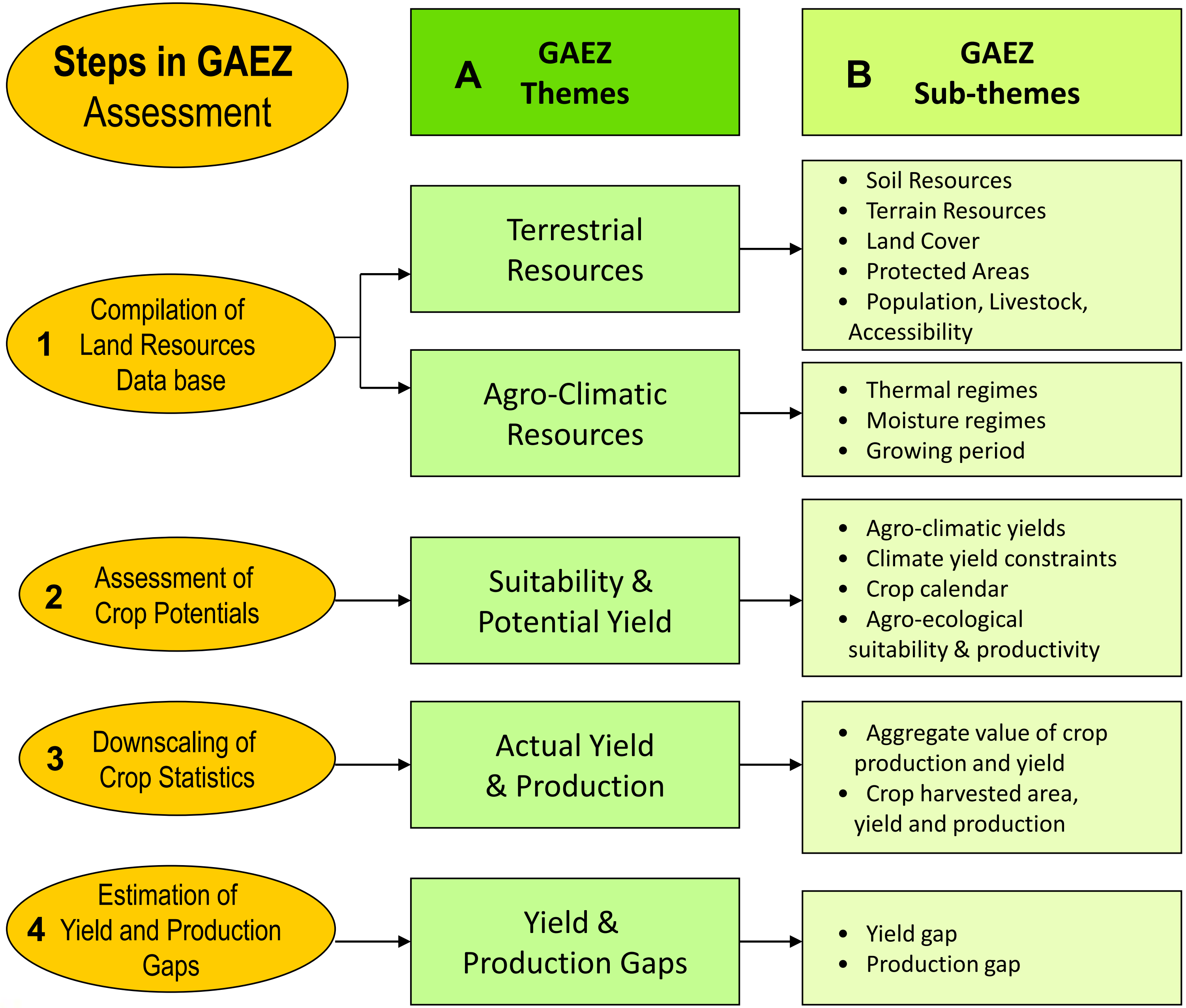
GAEZ
Global Agro-ecological Zones

Complete set of Results

GAEZ Viewer Database ~19 TB

User tailored Results

Web access



GAEZ
Global Agro-ecological Zones

GAEZ features:

- 49 crop species (food, feed, fiber and fuel)
- ~300 crop sub-types (land utilization types)
- Management systems (e.g. irrigated/rainfed, input level)
- Current climate (average, time series)
- Climate change scenarios (2020’s, 50’s, 80’s)
- Outputs from four GCMs
- 5 arc-minute resolution (~10 km at equator)

GAEZ
Global Agro-ecological Zones

Some GAEZ Outputs in Viewer

1. Agro-climatic indicators, e.g. length of growing period, annual and seasonal P/PET ratio, etc.
2. Crop suitability, by six classes
3. Attainable potential yields for each crop type and management level
4. Water deficit and water-stress indicators
5. Quantified crop production constraints (thermal, moisture, soil, terrain); in maps and tabulated results
6. Downscaled statistical crop production
7. Yield gaps (downscaled statistical vs potential production)
8. Additional datasets (e.g. land cover types, irrigated areas, population density, …).

GAEZ
Global Agro-ecological Zones

GAEZ 2009

Land Resources

Soil Resources / Dominant soil

Help

Land Resources

Agro-climatic Resources

Suitability and Potential Yield

Actual Yield and Production

Yield and Production Gaps

- Geographic Areas
- Geographic Filters

- Map
- Map Statistics
- Crop Summary Tables
- Visualization and Download

Geographic Filters specification

Oper.	Filter	Oper.	Value	+	Del.
	Cultivated land (share) [percent]	≥	40	+	—
AND	Median altitude [m]	≥	500	+	—
AND	Population density [persons/km2]	≤	200	+	—
AND				+	—

Clear

About Geographic Filters...

Provides options for custom made filters of land cover, protected areas, climatic zones and soil and terrain slope conditions.

Selection: Dominant soil / Canada / Cultivated land (share) >= 40 ANDMedian altitude >= 500 ANDPopulation density <= 200 AND

GAEZ 2009

Land Resources
Agro-climatic Resources
Suitability and Potential Yield
Actual Yield and Production
Yield and Production Gaps

- Geographic Areas
- Geographic Filters

Land Resources

Land Cover / Cultivated land (share)

Help

Visualization and Download

Show interactive map
Use map in Google Earth (KML)

Show statistics table

Download data in ZIPped ASCII Grid format

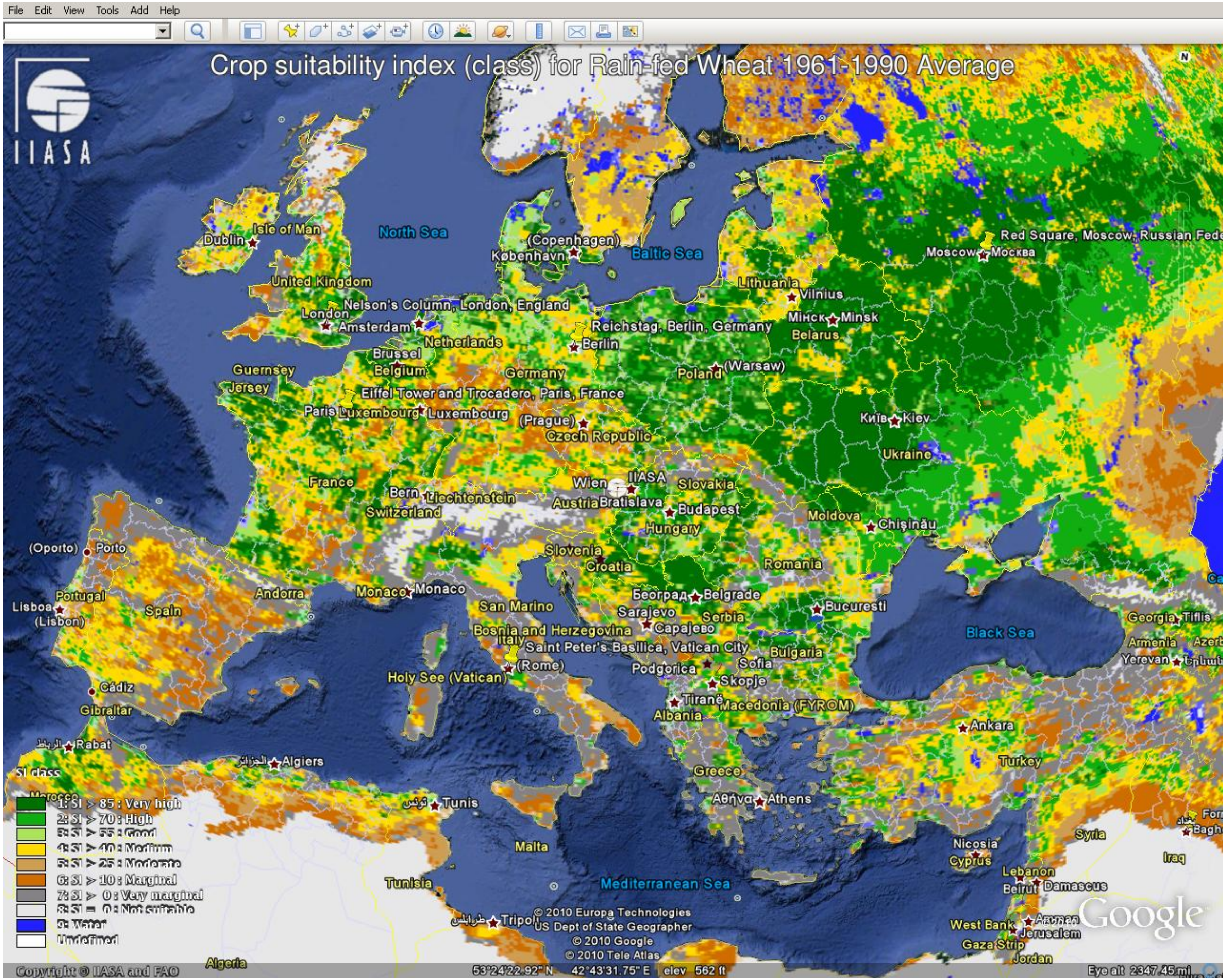
Other downloadables

- Trimmed map as PNG image
- Legend as PNG image
- Selection summary as tab separated values file
- Standard bundle archive as ZIP file
- Map as PNG image
- Map as PDF document
- Trimmed map as PDF document
- Map statistics as tab separated values file

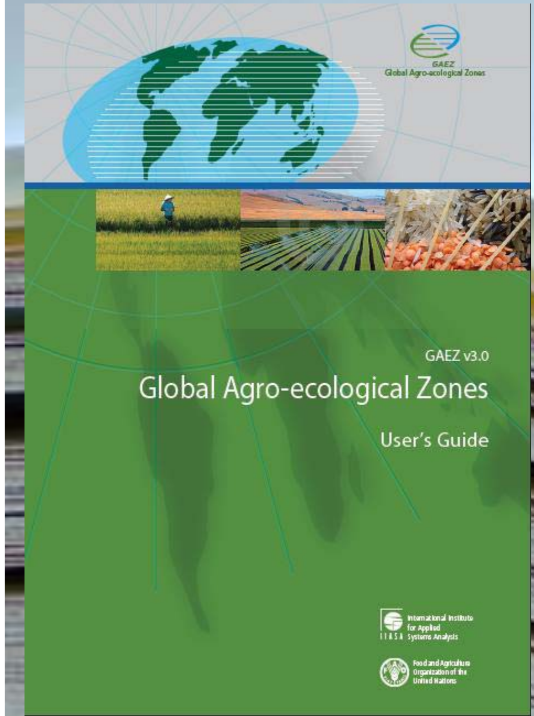
About Visualization and Download...
Results include maps, map statistics, crop summary tables, and other results which provide varying display and download options.

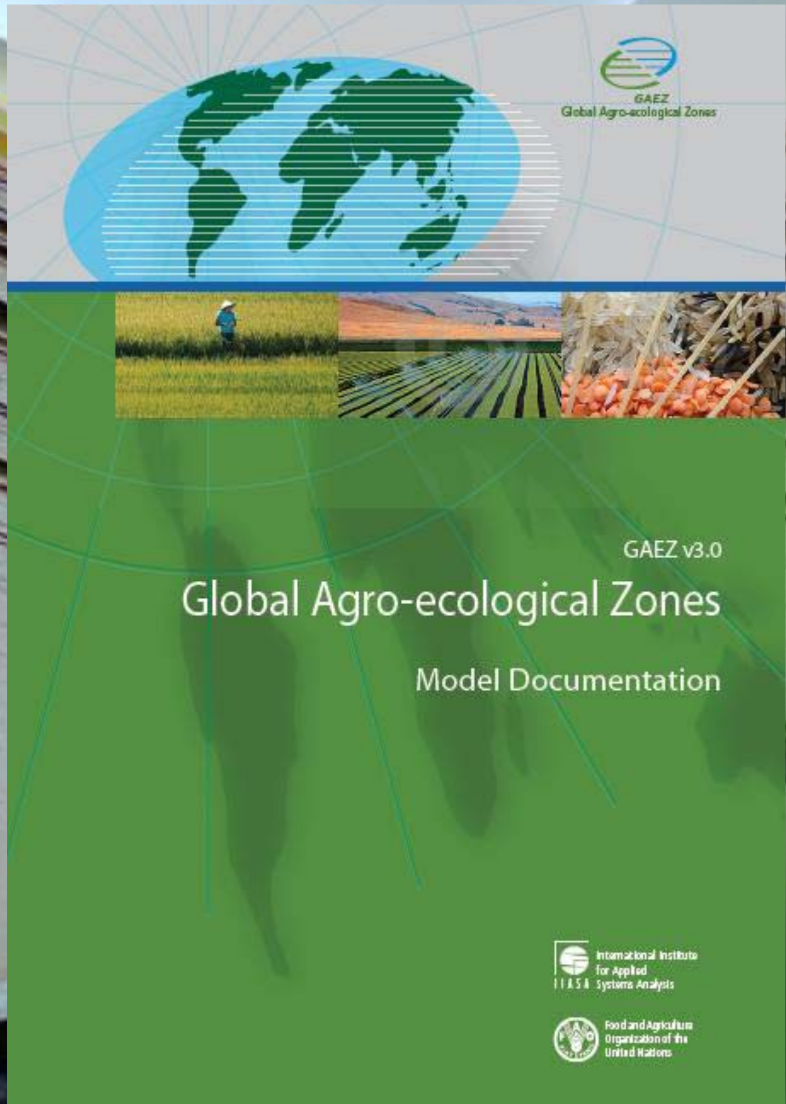
Your results have been prepared.

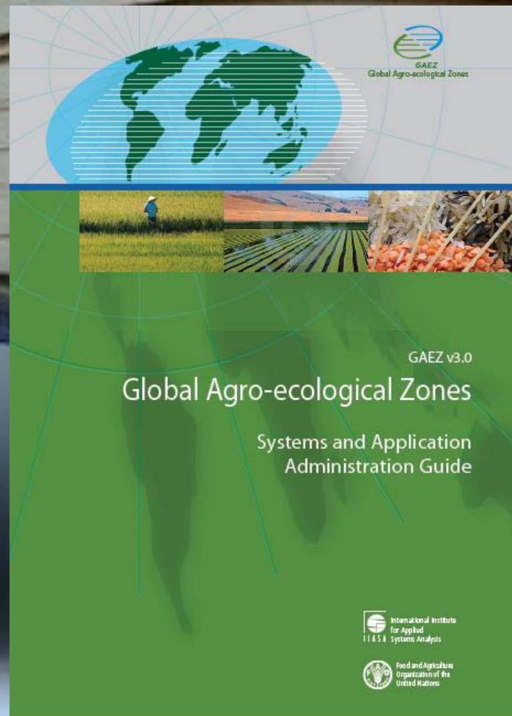
Selection: Cultivated land (share) / World / No filters


File Edit View Tools Add Help
Crop suitability index (class) for Rain-fed Wheat 1961-1990 Average
IIASA
North Sea
Baltic Sea
Black Sea
Mediterranean Sea
Isle of Man
Dublin
United Kingdom
Nelson's Column, London, England
London
Amsterdam
Netherlands
Brussel
Belgium
Guernsey
Jersey
(Copenhagen)
København
Reichstag, Berlin, Germany
Berlin
Germany
Lithuania
Vilnius
Минск Minsk
Belarus
Red Square, Moscow, Russian Fede
Moscow Москва
Poland (Warsaw)
Eiffel Tower and Trocadero, Paris, France
Paris
Luxembourg Luxembourg
(Prague)
Czech Republic
Київ Kiev
Ukraine
France
Wien
IIASA
Slovakia
Bern
Liechtenstein
Switzerland
Austria
Bratislava
Budapest
Hungary
Moldova
Chişinău
(Oporto) Porto
Slovenia
Croatia
Romania
Portugal
Lisboa
(Lisbon)
Spain
Andorra
Monaco Monaco
San Marino
Београд Belgrade
Bucuresti
Sarajevo
Serbia
Capajeвo
Bosnia and Herzegovina
Italy
Saint Peter's Basilica, Vatican City
Bulgaria
(Rome)
Podgorica
Sofia
Holy See (Vatican)
Skopje
Cádiz
Gibraltar
Tiranë
Macedonia (FYROM)
Albania
Georgia Tiflis
Armenia
Yerevan
Ankara
Turkey
Rabat
Algiers
Greece
Αθήνα Athens
Tunis
Malta
Nicosia
Cyprus
Syria
Iraq
Lebanon
Beirut
Damascus
Tunisia
Tripoli
West Bank
Jerusalem
Gaza Strip
Jordan
Algeria
Morocco
SI class
1: SI > 85 : Very high
2: SI > 70 : High
3: SI > 55 : Good
4: SI > 40 : Medium
5: SI > 25 : Moderate
6: SI > 10 : Marginal
7: SI > 0 : Very marginal
8: SI = 0 : Not suitable
9: Water
Undefined
© 2010 Europa Technologies
US Dept of State Geographer
© 2010 Google
© 2010 Tele Atlas
Google
Copyright © IIASA and FAO
53°24'22.92" N 42°43'31.75" E elev 562 ft
Eye alt 2347.45 mi

GAEZ Documentation







- User's Guide
-Administrator Guide
- Model documentation
- Research report
-API Documentation

Summary:

- Agro-ecological zoning is a flexible spatial analysis tool which follows a systematic environmental approach. Provides standardized framework for land resources appraisal and for analyzing alternatives of agro-resources use.
- Includes a variety of agro-climatic and agro-edaphic indicators suitable for across-site analysis and up-scaling. Can assess historical variability and can factor in future climate change.
- Estimates the suitability and productivity of a large number of crops across a wide range of environmental settings. It calculates reference values for major production cost components.
- Contains an automatic crop calendar search enabling analysis along climatic gradients and simulating 'smart farmer' behavior and adaptation to climate change.
- AEZ can be applied in current agricultural areas (e.g. yield gap) and potential suitable areas; identify and exclude 'No-Go' areas.

http://www.iiasa.ac.at/Research/LUC