www.neespi.org

Northern Eurasia Earth Science Partnership Initiative

Инициатива партнерства в области наук о Земле в Северной Евразии

M. Zalogin, Ph.D.

Current NEESPI Activity in Ukraine

NEESPI/NASA Project to be implemented in Ukraine since 2005:

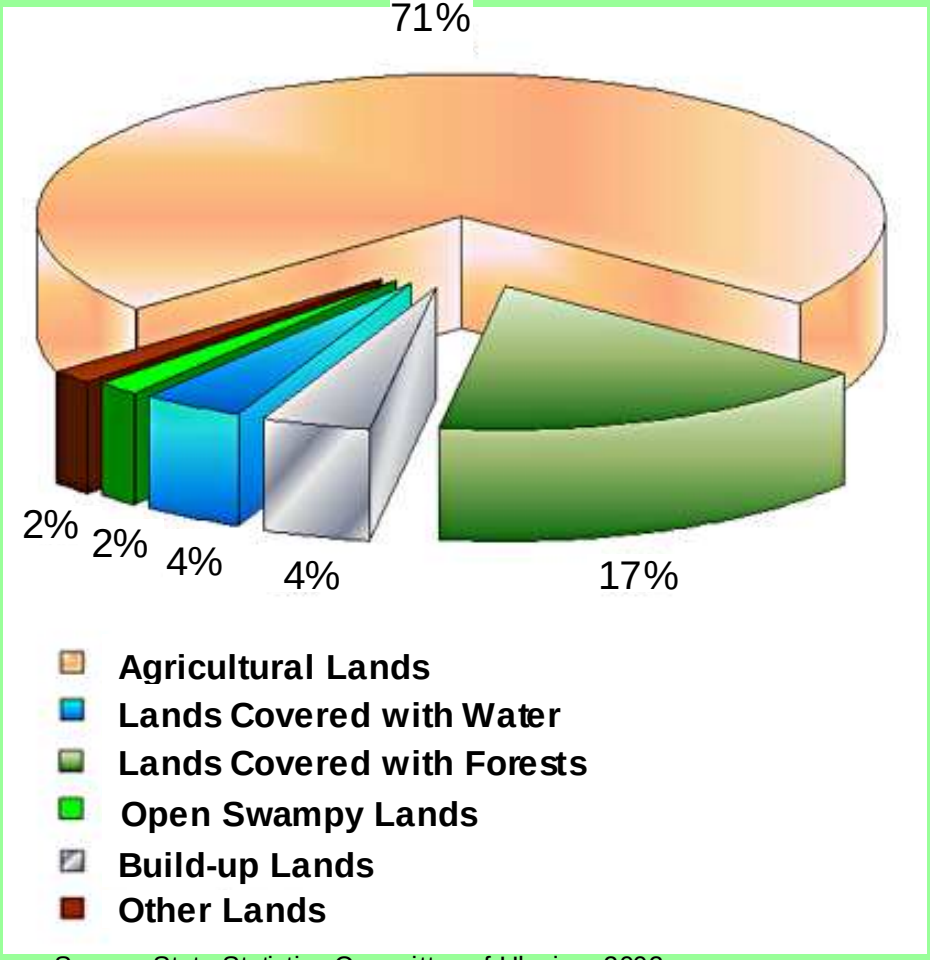
"Carbon, Climate and Managed Land in the Ukraine: Integrating Data and Models of Land Use for NEESPI." - Columbia University

"Study of Land Use/Land Cover Dynamics and the Carbon Cycle in the Temperate Zone of NEESPI: The Black Sea Region and China Department of Geography & Center for Remote Sensing." - Boston University

"Exacerbation of Carpathian and Appalachian Flooding Response Due to Land Cove/Land Use Change: A Comparative Study." - Appalachian Laboratory, Center for Environmental Science, University of Maryland (proposal is under development

Map on Agricultural Lands Based from Remote Sensing Data (1:200,000 scale)

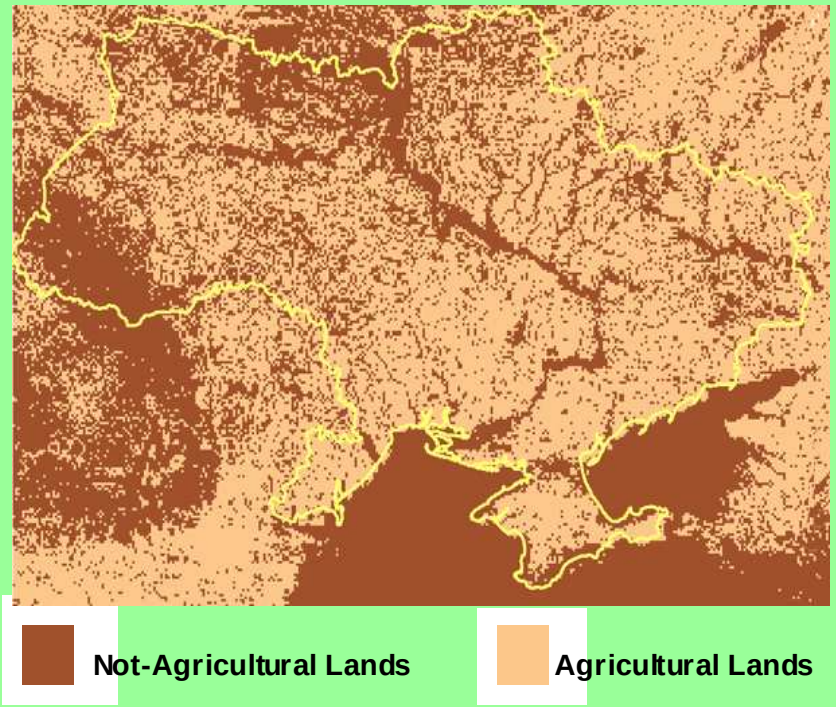
Land Use in Ukraine



Source: State Statistics Committee of Ukraine, 2002

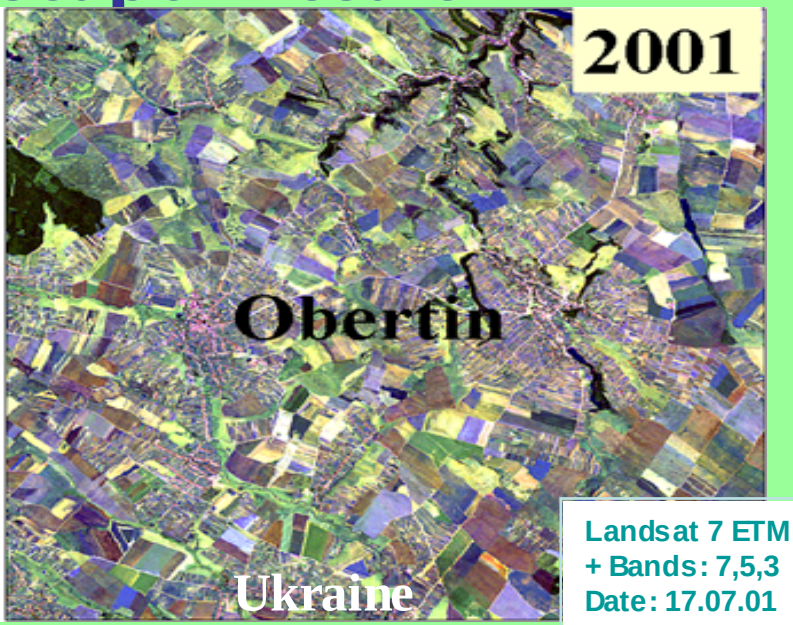
Agricultural Lands (=Agro-Ecosystems) of Ukraine Based on Six MODIS Images (2002).

Source: UNEP-GEF BINU Project, ULRMC

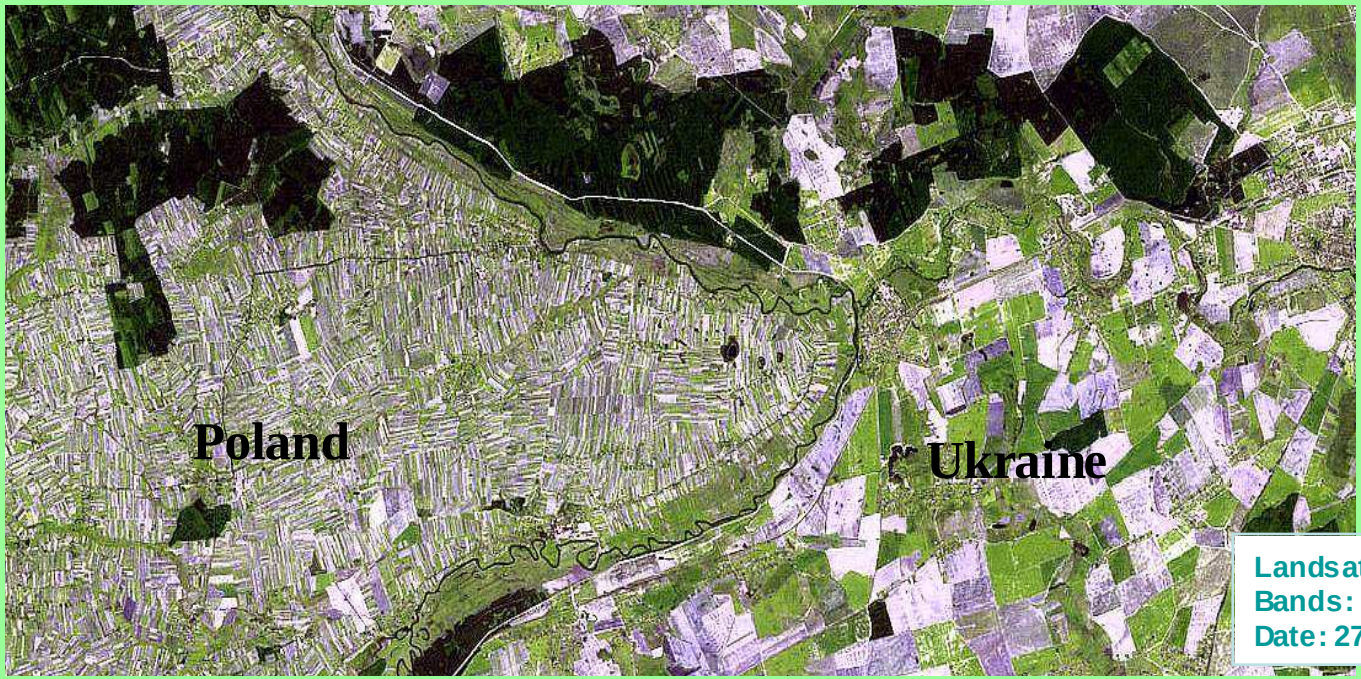


Identification of Land Cover Changes and New Agro-landscape Mosaic

Landsat 4
Bands: 7,5,3
Date: 29.07.88



Landsat 7 ETM
+ Bands: 7,5,3
Date: 17.07.01



Landsat 4
Bands: 7,5,3
Date: 27.07.88

Carbon, Climate and Managed Land in Ukraine

Integrating Land Use Data and Models for NEESPI

Francesco N. Tubiello, Cynthia Rosenzweig
Climate Impacts Group, NASA-GISS and Columbia University
Gunther Fischer, Anatoly Shvidenko
International Institute for Applied Systems Analysis
Mykola Zalogin, Katerina Gumenyuk
Ministry of the Environment and Academy of Sciences, Ukraine

Introduction:

Research Goal: Quantify carbon dynamics over managed land in Ukraine, for the current period and up to 2030, as a function of agricultural land use.

Methods and Tools: Analysis of observed and simulated data of agricultural systems focusing on crop and management factors relevant to carbon cycling:

1) Dynamic Crop models; 2) agro-ecological zoning; 3) experimental, statistical and remote sensing data sets.

Introduction:

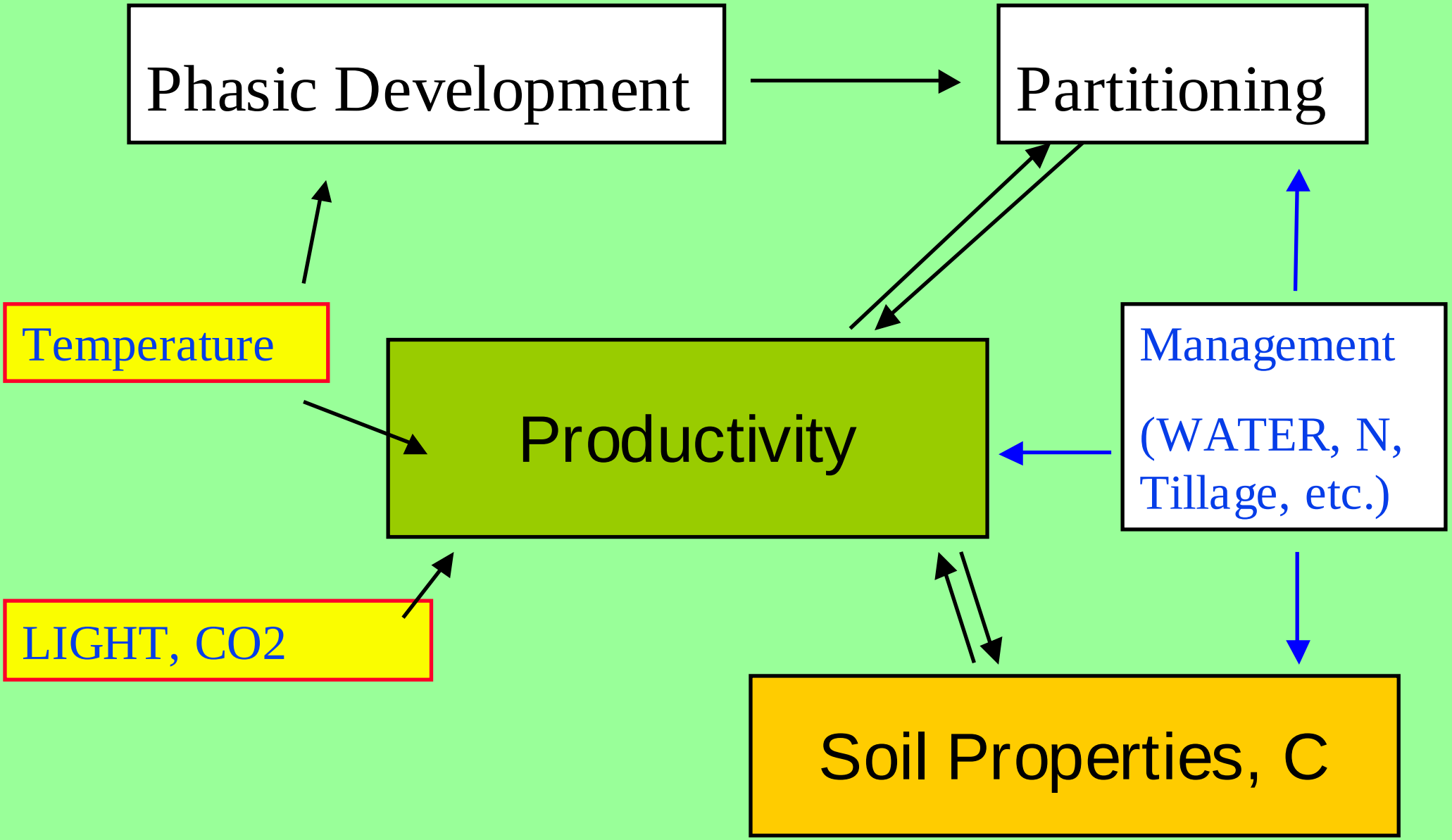
Research Activity: Land use for agriculture, climate variability and change in Ukraine.

Research Timelines: current, 1990-present; future, to 2030, 2050, 2080.

Technical Goal: Model agricultural systems focusing on crop and management factors relevant to carbon cycling.

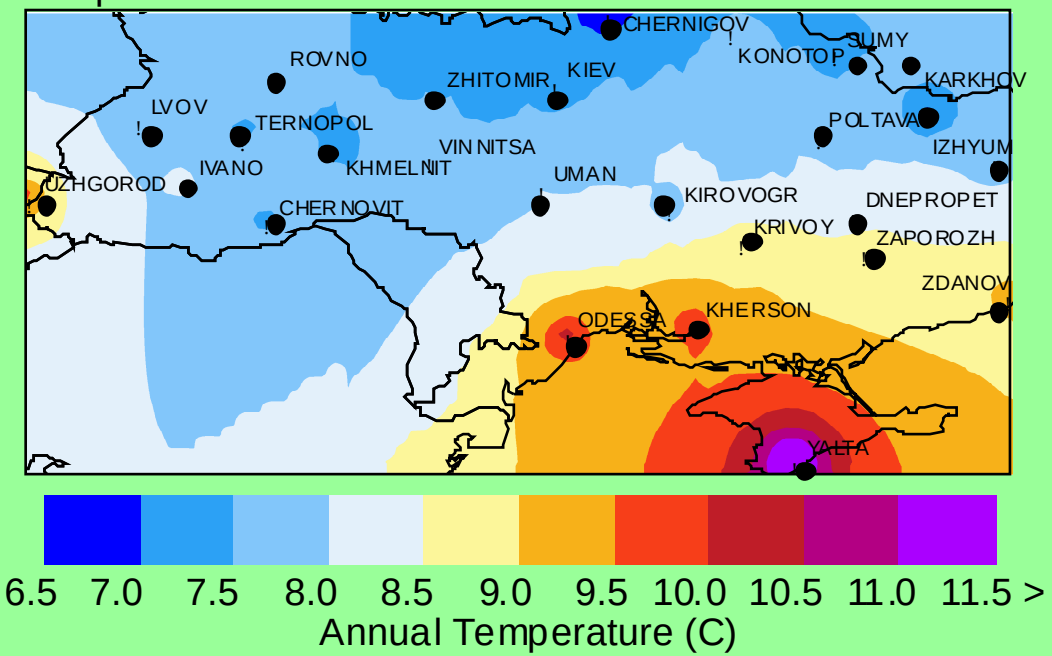
Modeling Tools, From Site to Region:

Dynamic Crop Models



Dynamic Crop Models: 25 Sites

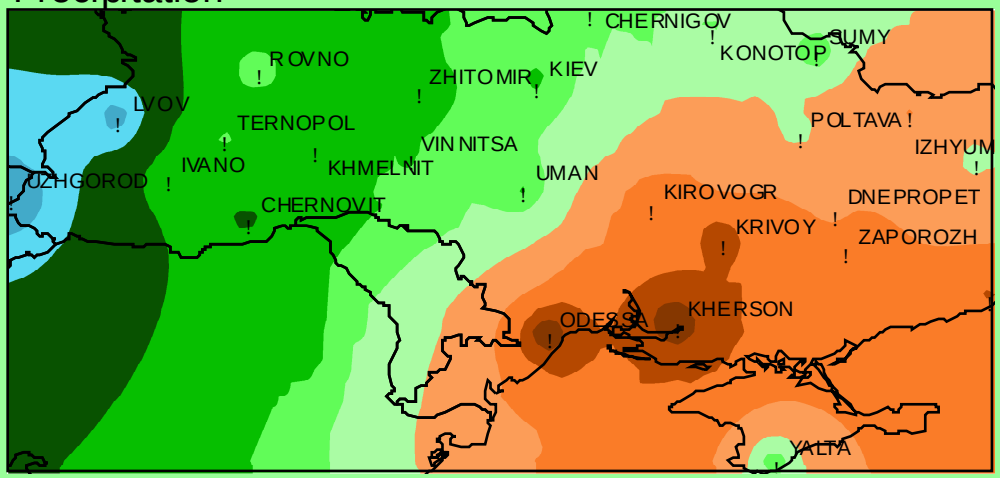
Temperature



6.5 7.0 7.5 8.0 8.5 9.0 9.5 10.0 10.5 11.0 11.5 >

Annual Temperature (C)

Precipitation



450 475 500 525 550 575 600 625 650 675 700 >

Annual Precipitation (mm)

At each site:

-- Soil and climate data;

-- Crop management data;

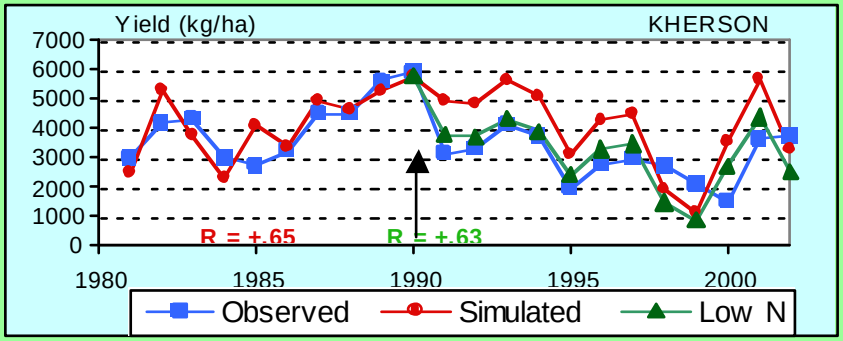
Winter Wheat, Maize, Potato, Sunflower,

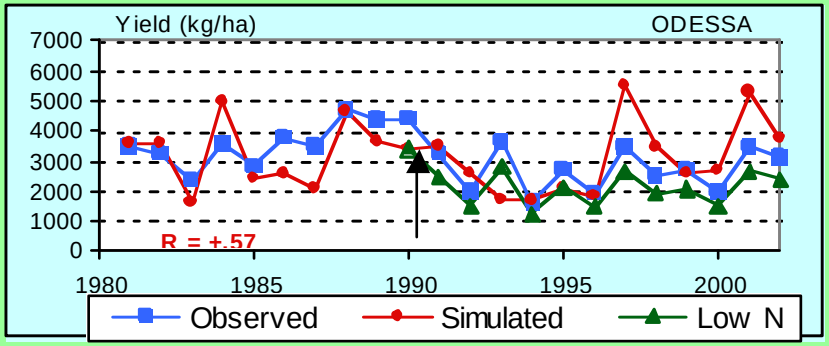
Rapeseed (for bio-energy)

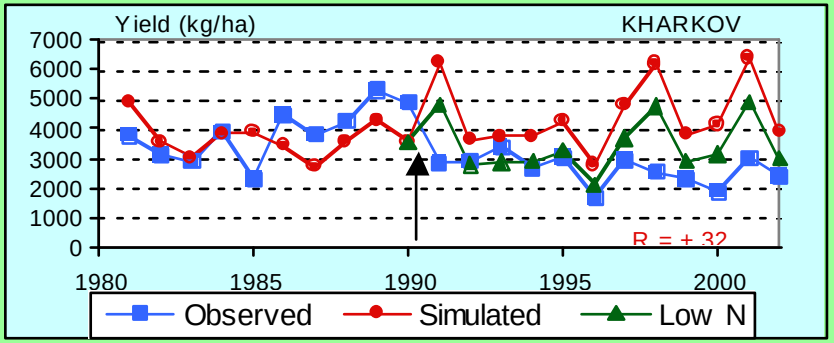
(planting dates, N and water, cultivar types, etc.)

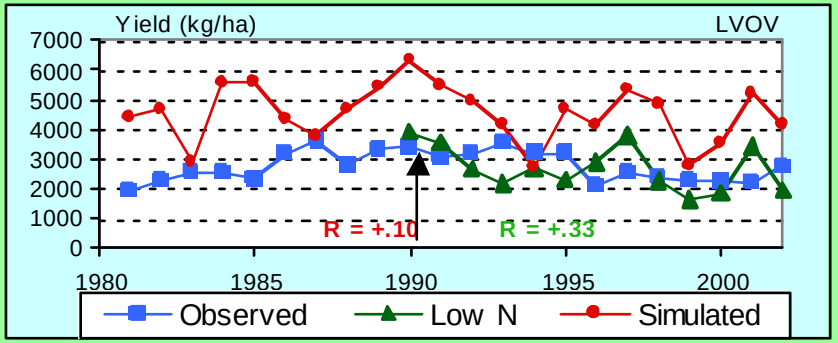
-- Site or rayon-level statistics

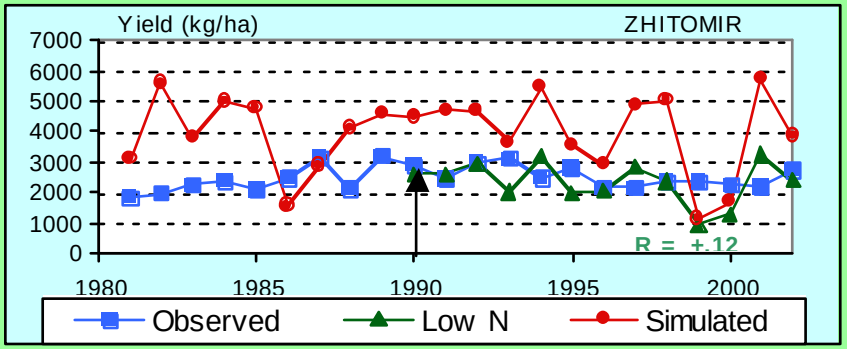
Dynamic Crop Models: Evaluation, Winter Wheat Effects of 70% Reduction in N Fertilizer after 1990 From 100 to 30 kg N/ha



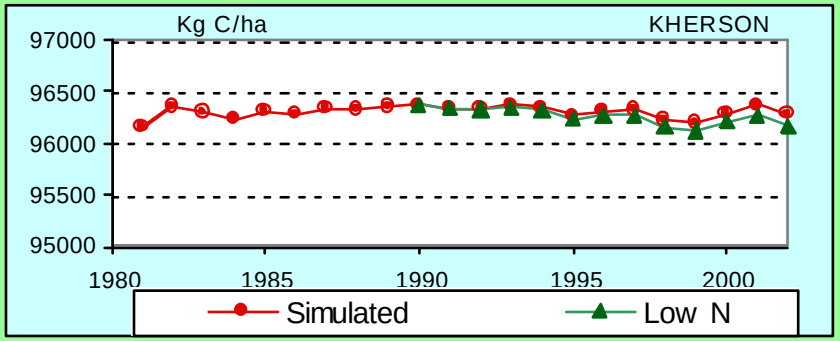




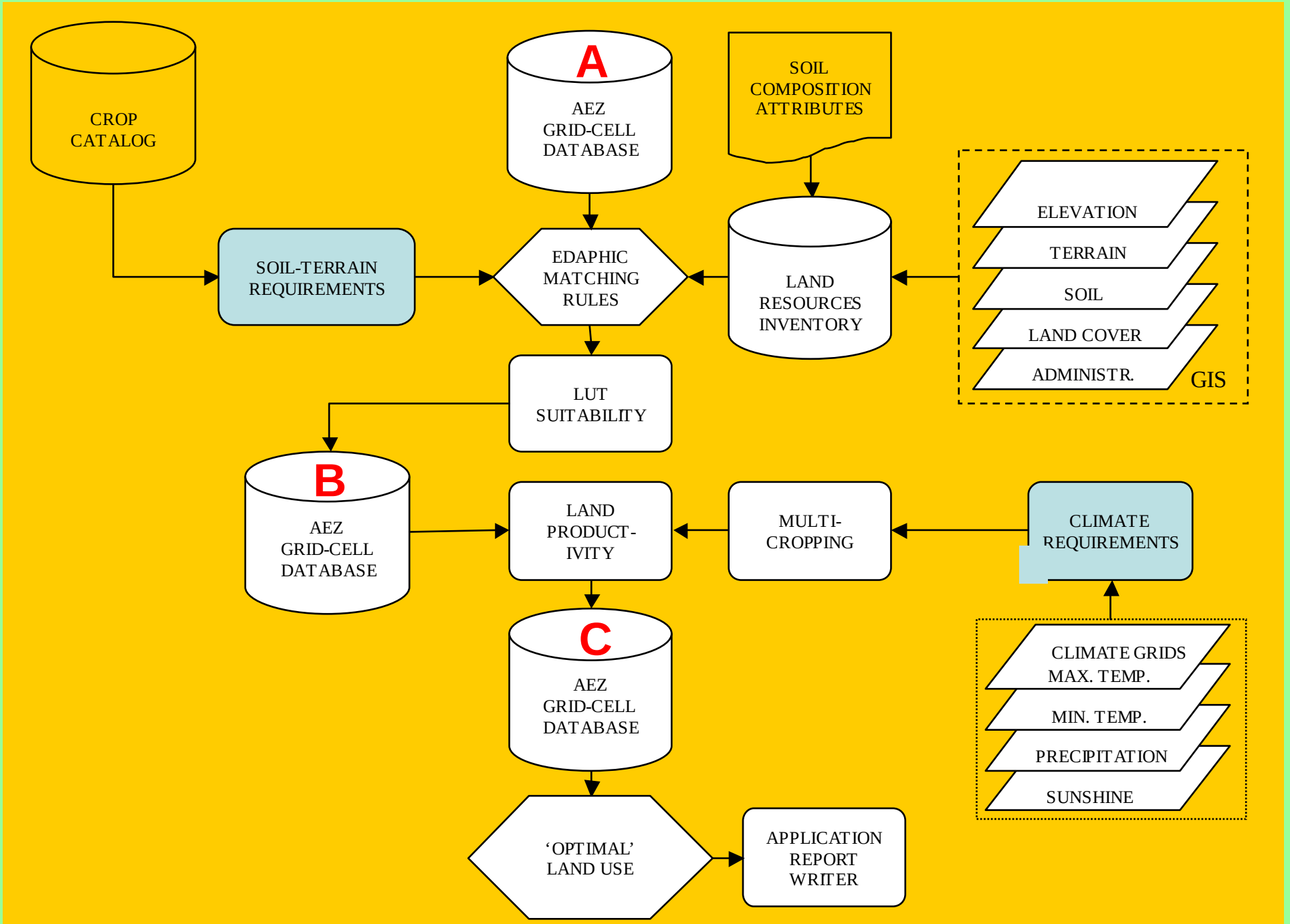




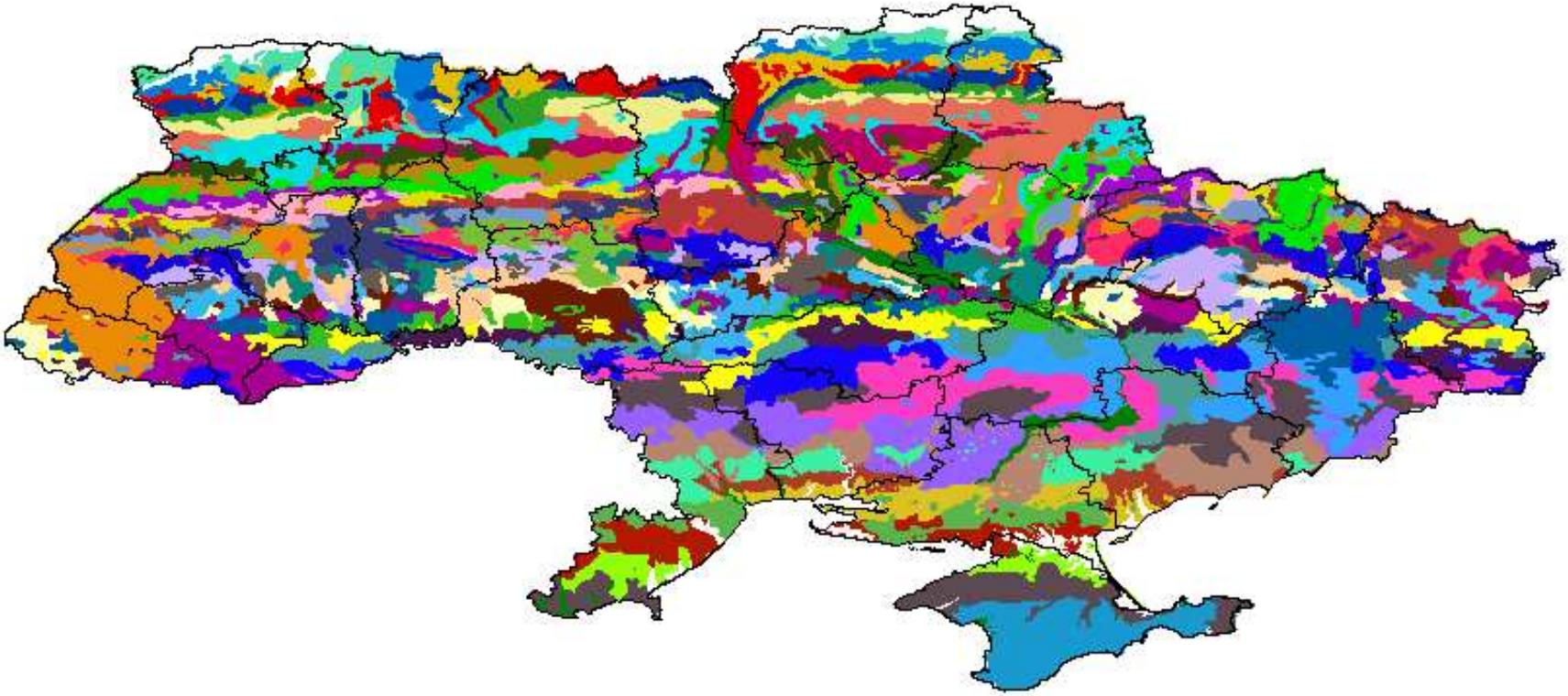
Potential Effect on Soil C



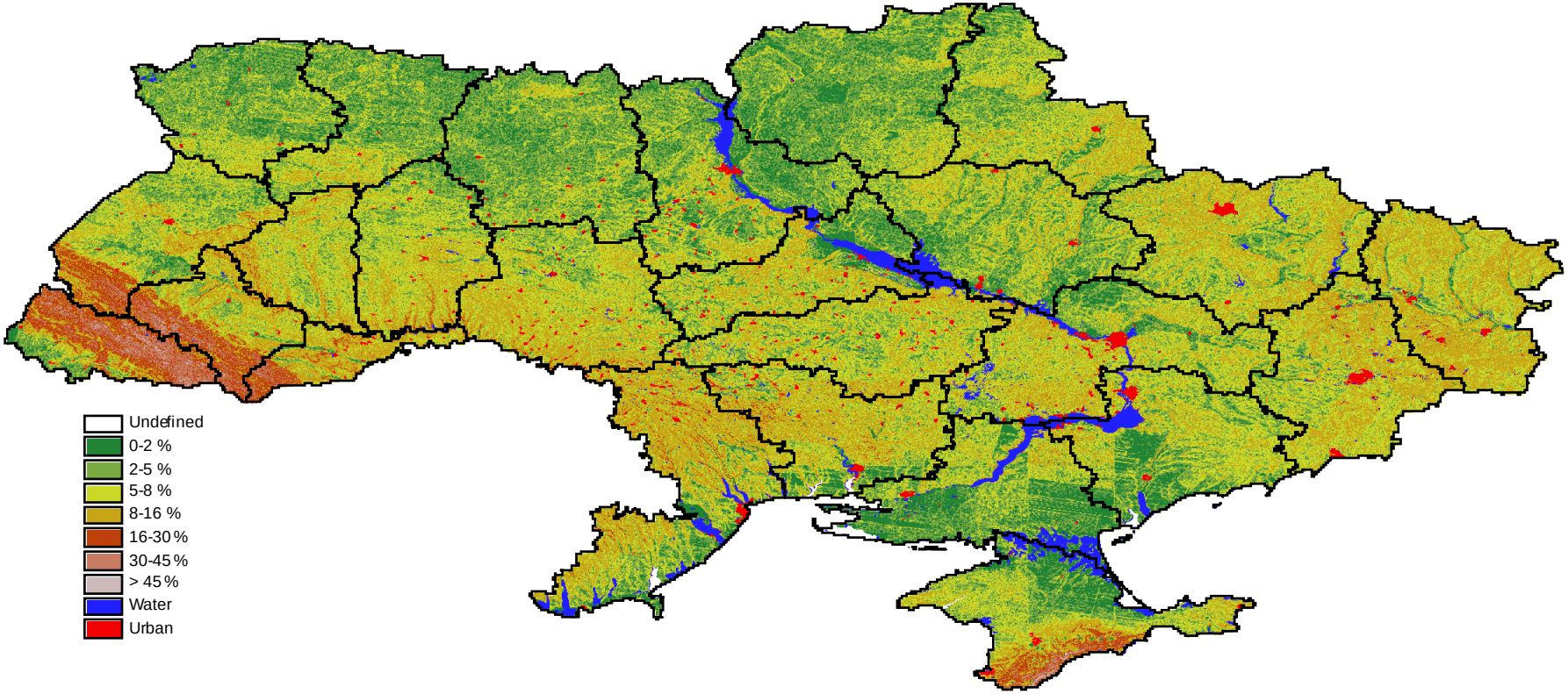
From site to Region: Steps in AEZ Methodology



Soil Map



Terrain Slopes



Crop types in the study: Ukraine

The selection of crops for the present Ukrainian AEZ study is based on the considerations listed below:

a) **the most significant crops in terms of sown (harvested) areas;**

b) **importance of the crops for food security;**

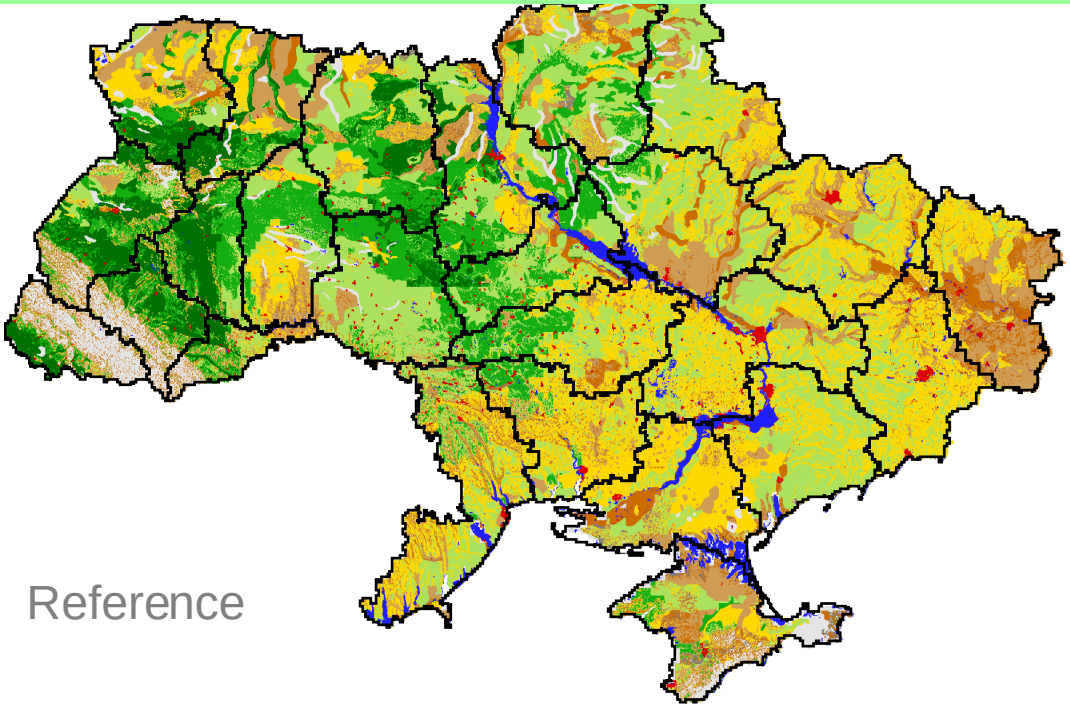
c) **economic effect (profitability) of the production of the crops;**

d) **the world's and domestic trends of the economic development;**

e) **National Programme of the Development of the Ukrainian Agricultural Sector**

Crops types for AEZ study			
Cereals		*Industrial crops*	
Winter wheat	2	Sugar beet	4
Spring wheat	3	Sunflower	4
Rice	2	Soya	3
Winter rye	2	Rapeseed	4
Millet	4	*Vegetables*	
Winter barley	2	Cabbage	4
Spring barley	2	Tomato	4
Oats	3	Onion	4
Maize for grain	4	*Potato*	4
Buckwheat	2	*Fodder crops*	
Pea	3	Maize for silage	4
Bean	3	Alfalfa	1
Total	79	Grass	3

Application: Climate Change Impacts

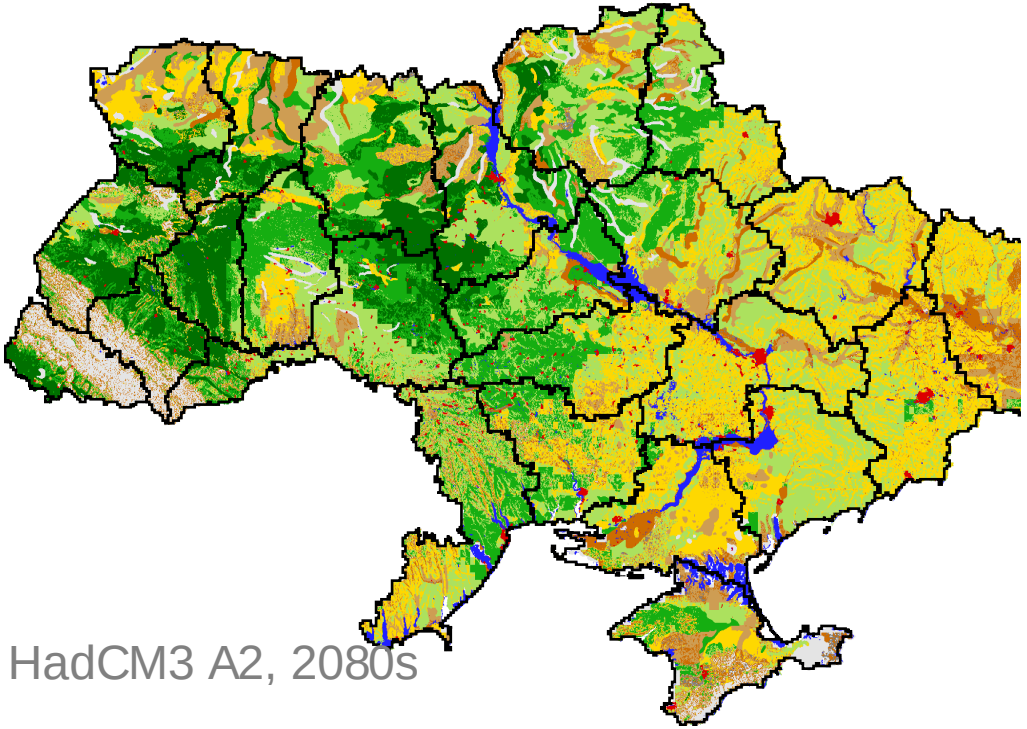


Reference

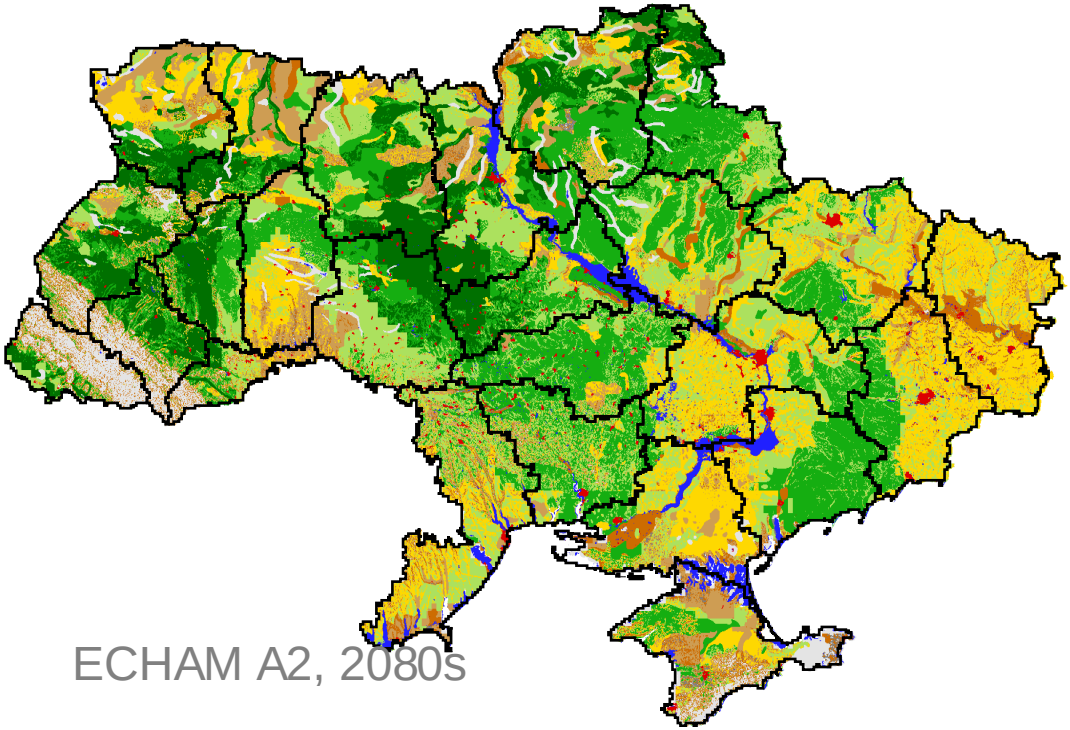
Suitability of wheat under current and 2080 projected climate

- Undefined
- SI > 75 : Very high
- SI > 63 : High
- SI > 50 : Good
- SI > 35 : Medium
- SI > 20 : Moderate
- SI > 10 : Marginal
- SI > 0 : Very marginal
- Not suitable
- Water
- Built-up

SI == suitability index; it is a non-unit scale of potential productivity, with the maximum happening where the crop grows best.

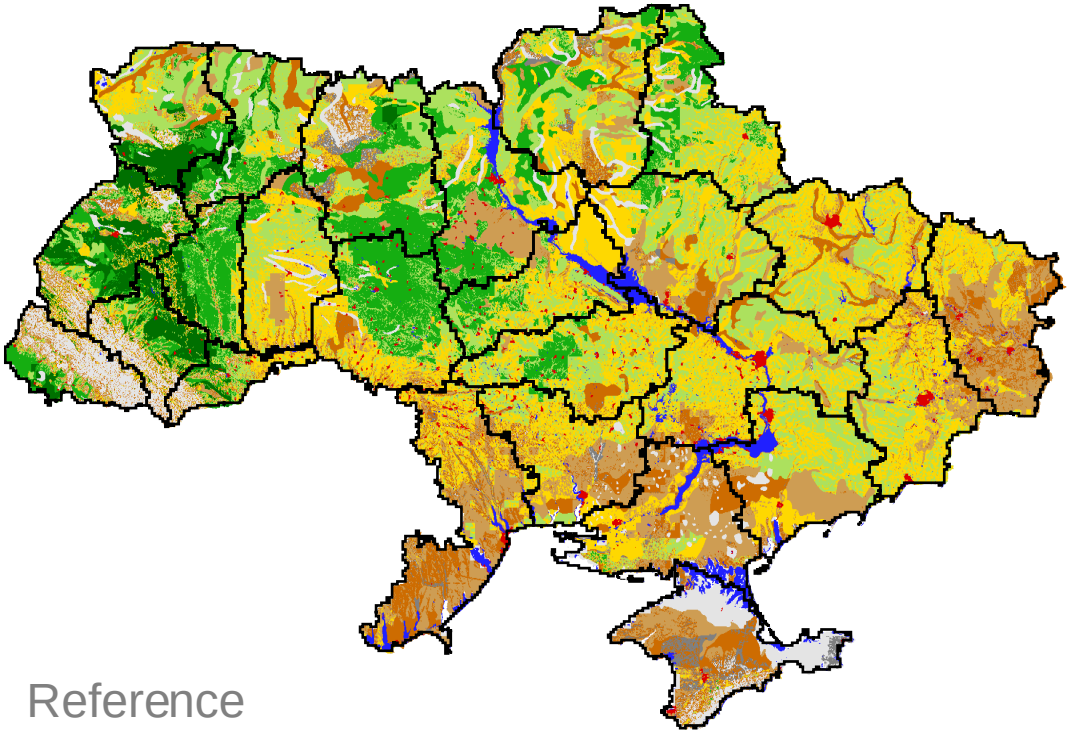


HadCM3 A2, 2080s

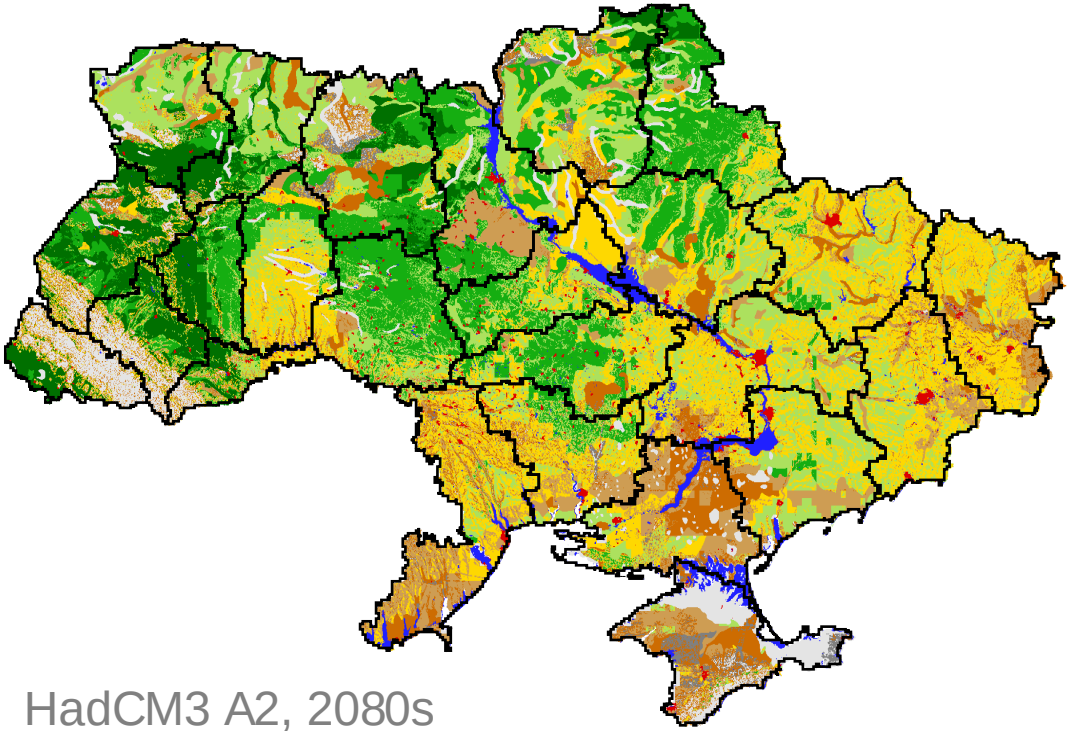


ECHAM A2, 2080s

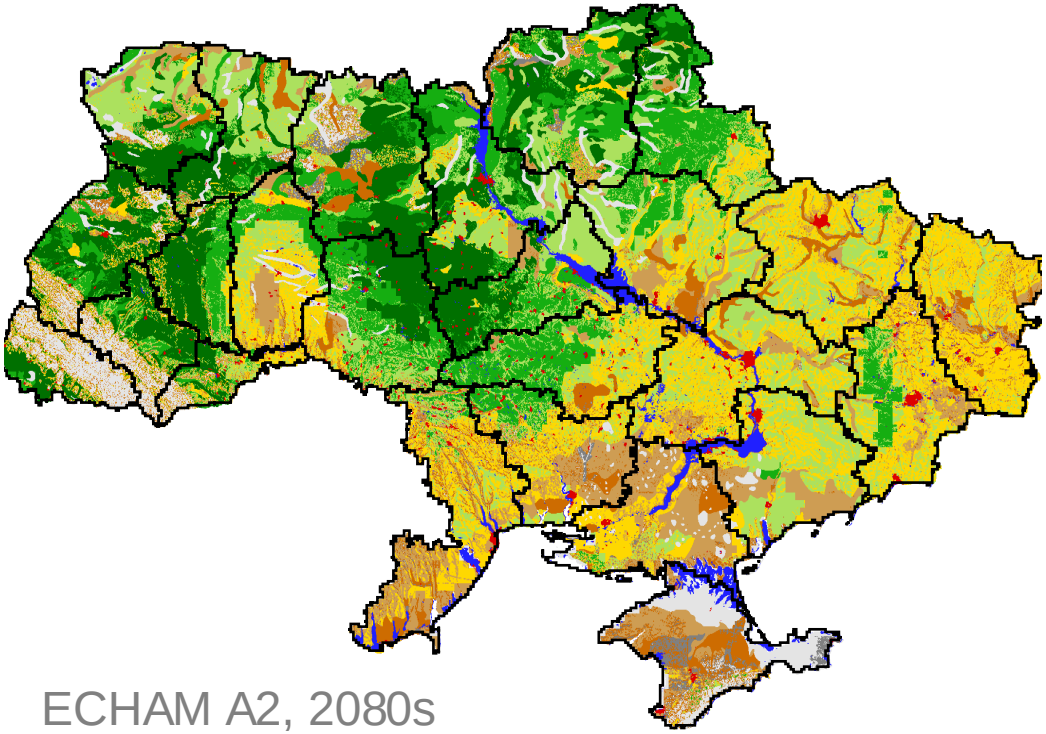
Suitability of Rainfed Rapeseed under current and projected climate



Reference



HadCM3 A2, 2080s



ECHAM A2, 2080s

- Undefined
- SI > 75 : Very high
- SI > 63 : High
- SI > 50 : Good
- SI > 35 : Medium
- SI > 20 : Moderate
- SI > 10 : Marginal
- SI > 0 : Very marginal
- Not suitable
- Water
- Built-up

Conclusions:

Good Applicability of site crop models to Ukraine case studies

- Simulations can capture interannual variability and fertilizer-N shock signal after 1990 for productivity, maybe for soil C;

Agro-ecological zone model implemented for Ukraine: current, and future climates (2030, 2050, 2080).

Poor additional data for sites, although collection ongoing;

Remote sensing utilization main focus of next two years

THANK YOU !