Socio-economic scenarios of food availability and land use change as a response to global change in the mediterranean basin

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SOCIO-ECONOMIC SCENARIOS OF FOOD AVAILABILITY AND LAND USE CHANGE AS A RESPONSE TO GLOBAL CHANGE IN THE MEDITERRANEAN BASIN

(A component of the LaSeR-Med project)

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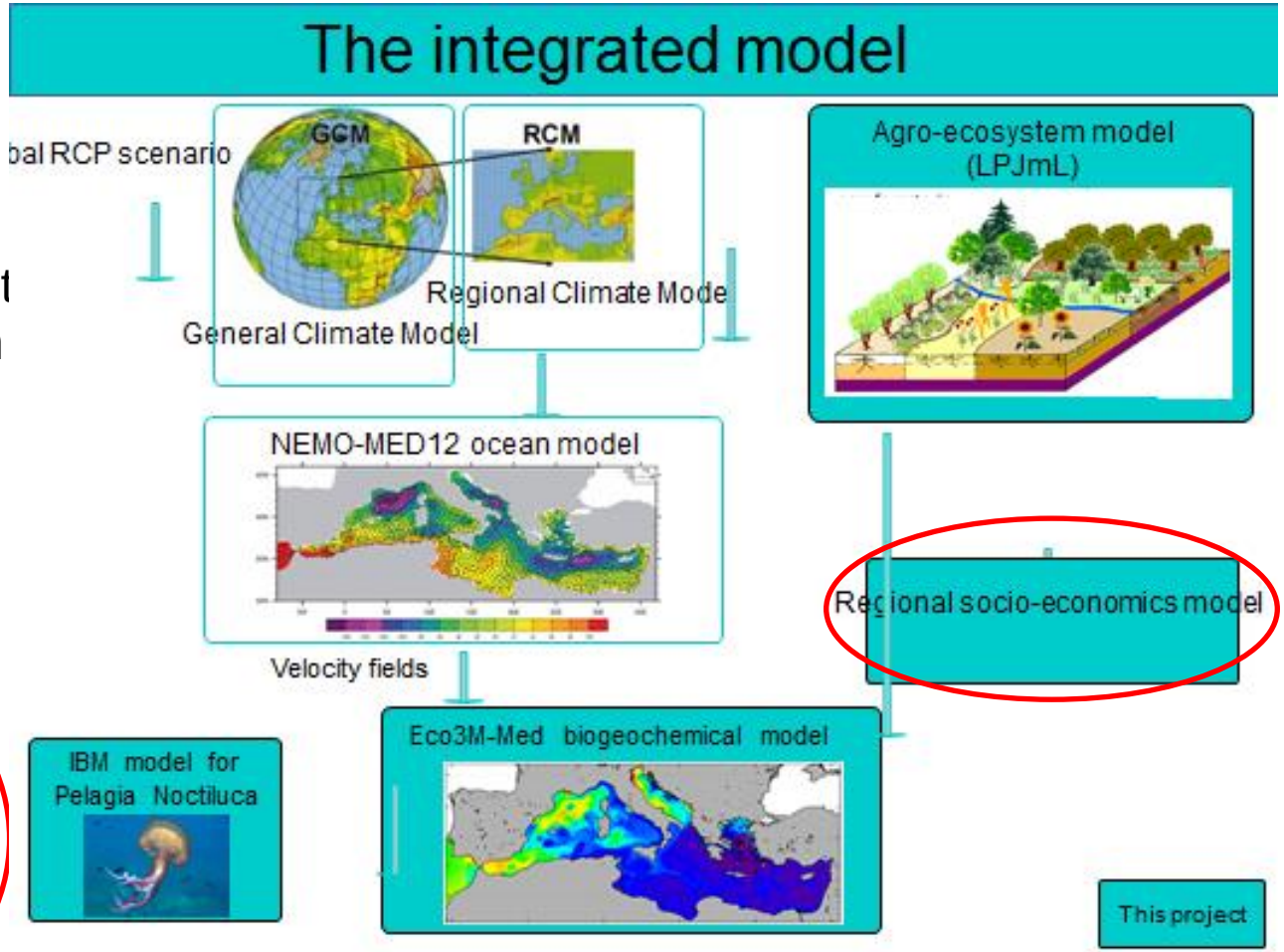
SE scenarios within the Laser-Med project

Objectives:

1. To predict and analyse through relevant environmental indicators, the impact of climate change on key ecosystem services provided by the terrestrial and marine ecosystems.

2. To investigate the impact of **combined climate and socio-economic (SE) scenarios** on terrestrial and marine ecosystems.



SES scenarios (SES)

- SES focus on system dynamics that generate consistent future pathways, which include trends and nonlinear interactions, that can ensure some level of **food availability** for the Mediterranean populations while also **minimizing the ecological impact**.

- *Research questions:*

  How can land-use and land management change if food availability and some level of food sufficiency become policy goals in the Mediterranean Region?

  - How to respond to the food demand at 2050?
  - How to transform the food agricultural sector in order to supply in a sustainable way the food needed for a growing population?

- *Objectives:*

  → Inform policy-making processes on **agricultural land use change and land management**

  → Force the agro-ecosystem model and indirectly impact the oceanic model through rivers discharge and water runoffs

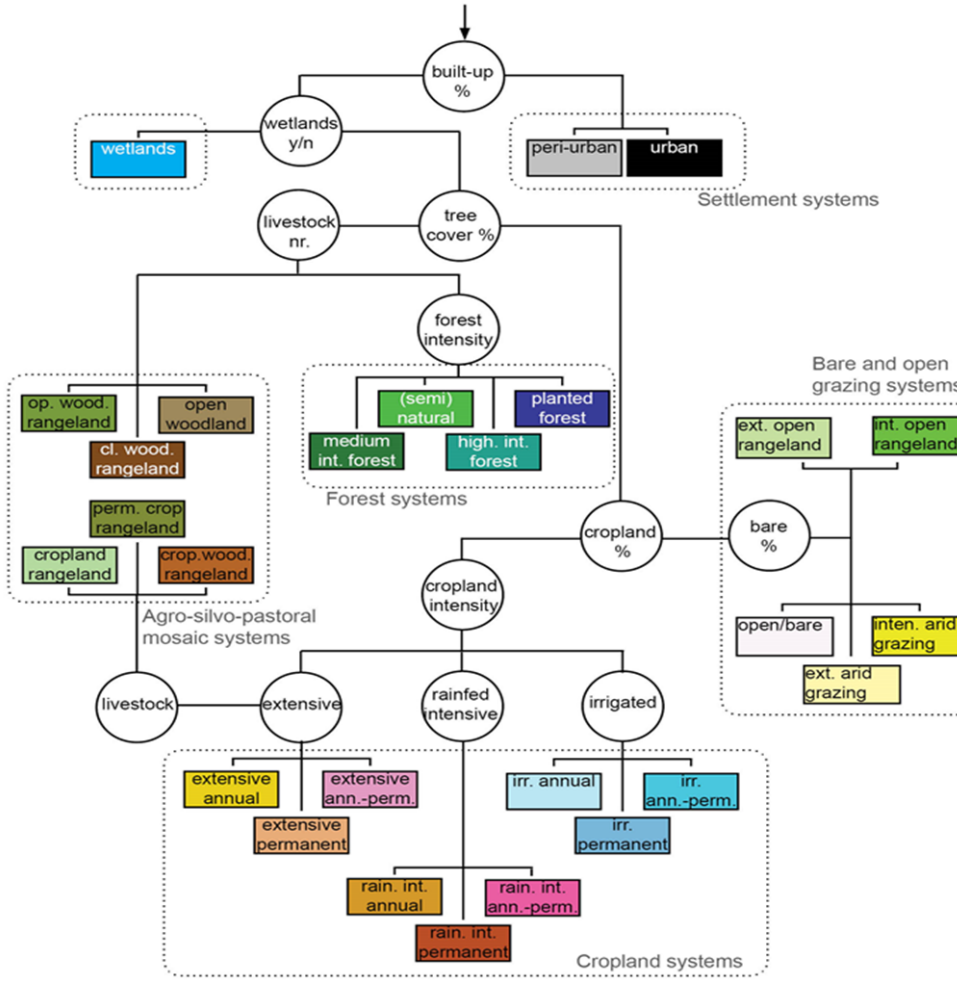
  → Develop a multi-scale approach to connect the impact of global change (climate, economic and environmental) with food security

Food security & Land system

FAO indicators of food security

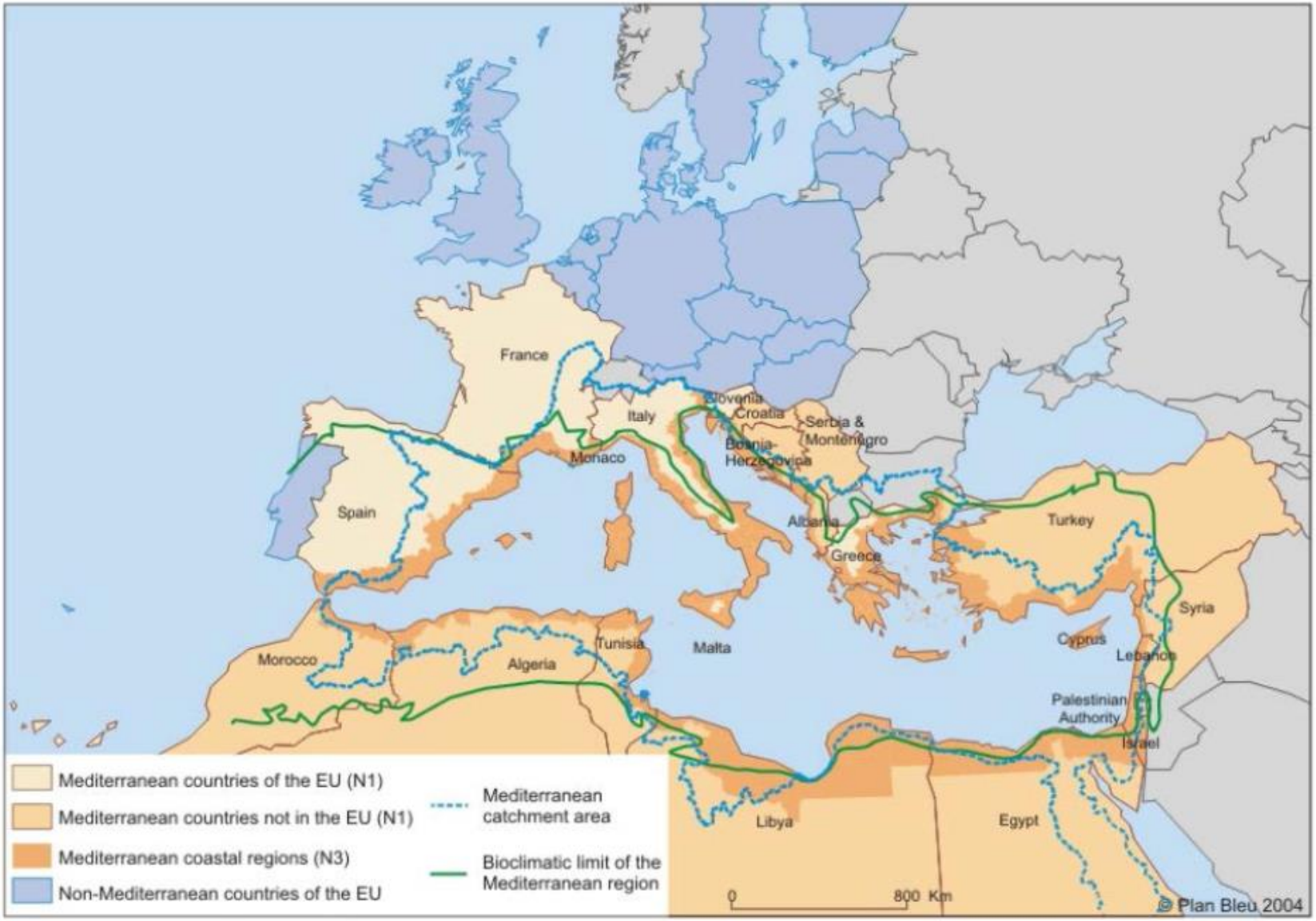
DIMENSIONS	FOOD SECURITY INDICATORS
AVAILABILITY	Average Dietary Energy Supply Adequacy Average Value of Food Production Share of dietary energy supply derived from cereals, roots and tubers Average protein supply Average supply of protein of animal origin
ACCESS	Percent of paved roads over total roads Road density Rail-lines density Domestic Food Price Level Index Prevalence of undernourishment
UTILIZATION	Access to improved water sources Access to improved sanitation facilities Percentage of children under 5 years of age affected by wasting Percentage of children under 5 years of age who are stunted Percentage of children under 5 years of age who are underweight
STABILITY	Cereal import dependency ratio Percent of arable land equipped for irrigation Value of food imports over total merchandise exports Political stability and absence of violence/terrorism Domestic food price level index volatility Per Capita food production variability

Food Security Index



Malek-Verburg (unpublished)

Study area Laser-Med



SES with and without climate change at 2050

Political objective: given demographic & economic change at 2050, to at least ensure the current level of food availability and food sufficiency.

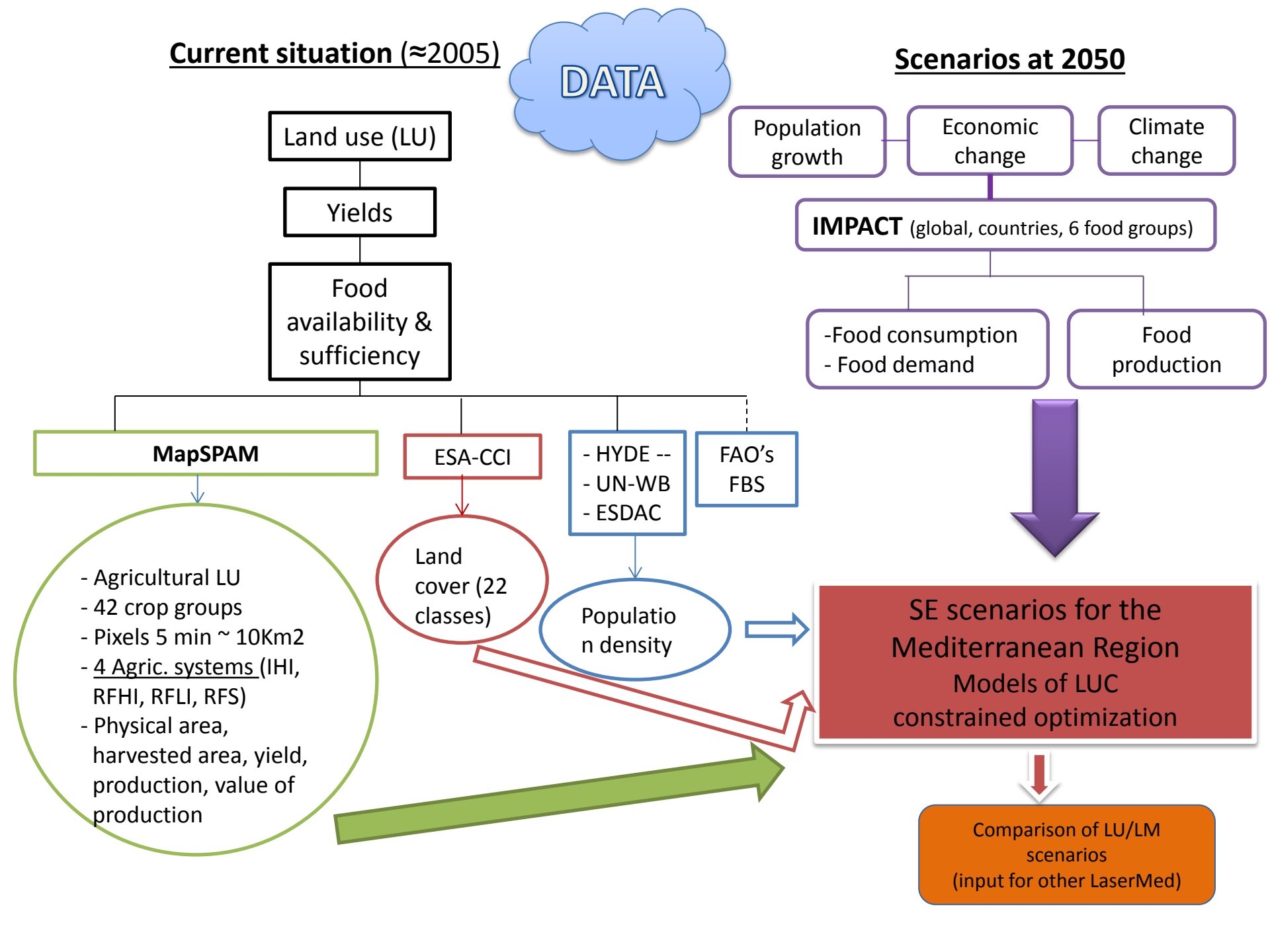
Scenario 1 (baseline scenario):
Increase of agricultural production maintaining the same agricultural LU structure
→ increase of utilised agricultural area (UAA) through reduction of non-food agricultural and/or expansion of UAA taking over other areas with agricultural potential like forests
→ all other things equal (yields, technology, etc.)

Scenario 2
Change in land management: decisions based on yield optimisation so as to maintain the current agricultural LU or to reduce the UAA. Increase of yields so as to maintain the current LU of agricultural LU or to reduce the UAA
→ Attainment of potential yields that maximize the production level of each group of crops (i.e. redistribution of crop zones)
→ Attainment of maximal yield of each crop (i.e. R&D)

Scenario 3: Given demographic growth and ensuring the current level of FA a political decision of reducing agricultural effluents/emissions.

Scenario 4: Given demographic growth and ensuring the current level of FA, introduction of a political decision of reducing the level of agricultural water consumption (i.e. a climate change stress).

Scenario 5: Given demographic growth and ensuring the current level of FA, introduction of a budgetary restriction (a level of GPV or another proxy).


Current situation (≈2005)
DATA
Scenarios at 2050
Land use (LU)
Yields
Food availability & sufficiency
Population growth
Economic change
Climate change
IMPACT (global, countries, 6 food groups)
-Food consumption
- Food demand
Food production
MapSPAM
ESA-CCI
- HYDE --
- UN-WB
- ESDAC
FAO's FBS
- Agricultural LU
- 42 crop groups
- Pixels 5 min ~ 10Km2
- 4 Agric. systems (IHI, RFHI, RFLI, RFS)
- Physical area, harvested area, yield, production, value of production
Land cover (22 classes)
Populatio n density
SE scenarios for the Mediterranean Region
Models of LUC constrained optimization
Comparison of LU/LM scenarios
(input for other LaserMed)