The role of field margins in enhancing biodiversity and the importance of the management of multifunctional landscapes

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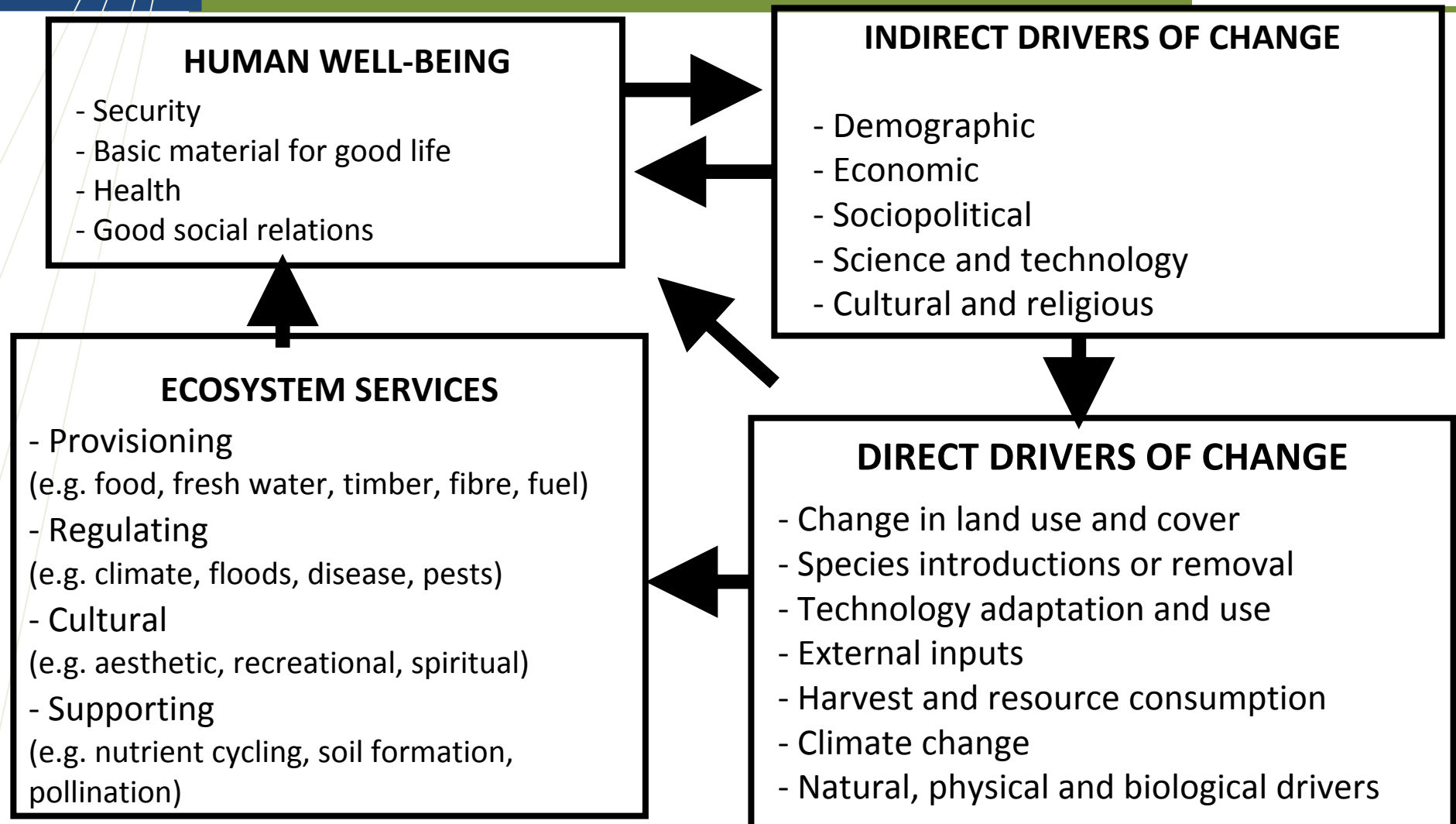*European Biodiversity Conference – Bruxelles 7 December 2010*

Outline

- Why is biodiversity important to agriculture?

- Is there cause for concern ?

- What are the drivers of biodiversity change ?

- What does the sustainable agriculture say about biodiversity ?

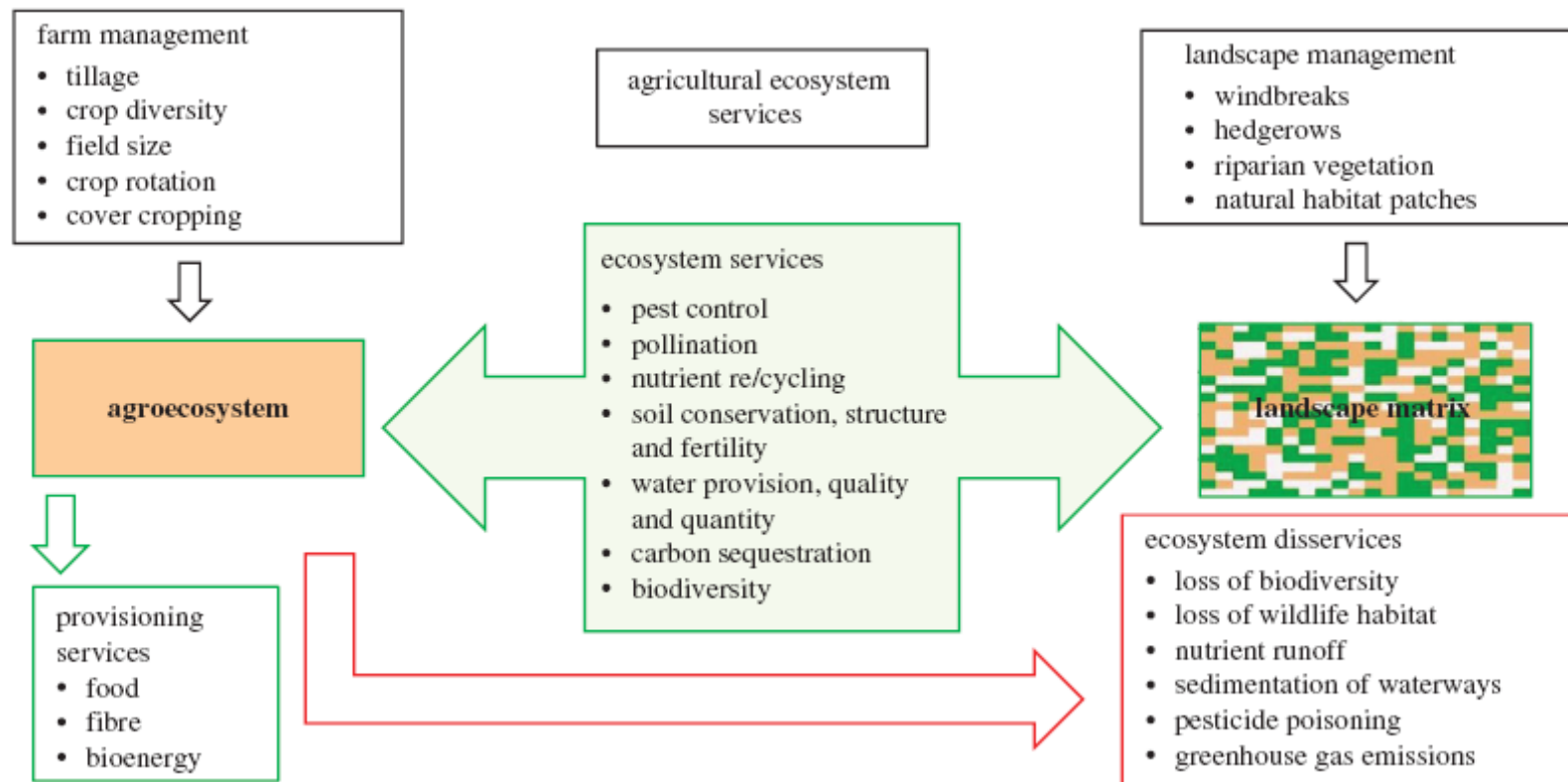- What could change with some specific agro-ecological measure ?

Biodiversity and Ecosystem service

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HUMAN WELL-BEING

- Security
- Basic material for good life
- Health
- Good social relations

INDIRECT DRIVERS OF CHANGE

- Demographic
- Economic
- Sociopolitical
- Science and technology
- Cultural and religious

ECOSYSTEM SERVICES

- Provisioning
(e.g. food, fresh water, timber, fibre, fuel)
- Regulating
(e.g. climate, floods, disease, pests)
- Cultural
(e.g. aesthetic, recreational, spiritual)
- Supporting
(e.g. nutrient cycling, soil formation, pollination)

DIRECT DRIVERS OF CHANGE

- Change in land use and cover
- Species introductions or removal
- Technology adaptation and use
- External inputs
- Harvest and resource consumption
- Climate change
- Natural, physical and biological drivers

Millenium Ecosystem Assessment (2005). Ecosystem and Human Well-Being.

Agroecosystem disservices

farm management
- tillage
- crop diversity
- field size
- crop rotation
- cover cropping

agricultural ecosystem services

landscape management
- windbreaks
- hedgerows
- riparian vegetation
- natural habitat patches

agroecosystem

ecosystem services
- pest control
- pollination
- nutrient re/cycling
- soil conservation, structure and fertility
- water provision, quality and quantity
- carbon sequestration
- biodiversity

landscape matrix

provisioning services
- food
- fibre
- bioenergy

ecosystem disservices
- loss of biodiversity
- loss of wildlife habitat
- nutrient runoff
- sedimentation of waterways
- pesticide poisoning
- greenhouse gas emissions

Power (2010) . Phil. Trans. R. Soc. B 365, 2959–2971

Trends in the status of agro-ecosystem services

* 'Mixed' represents mixed trend across Europe
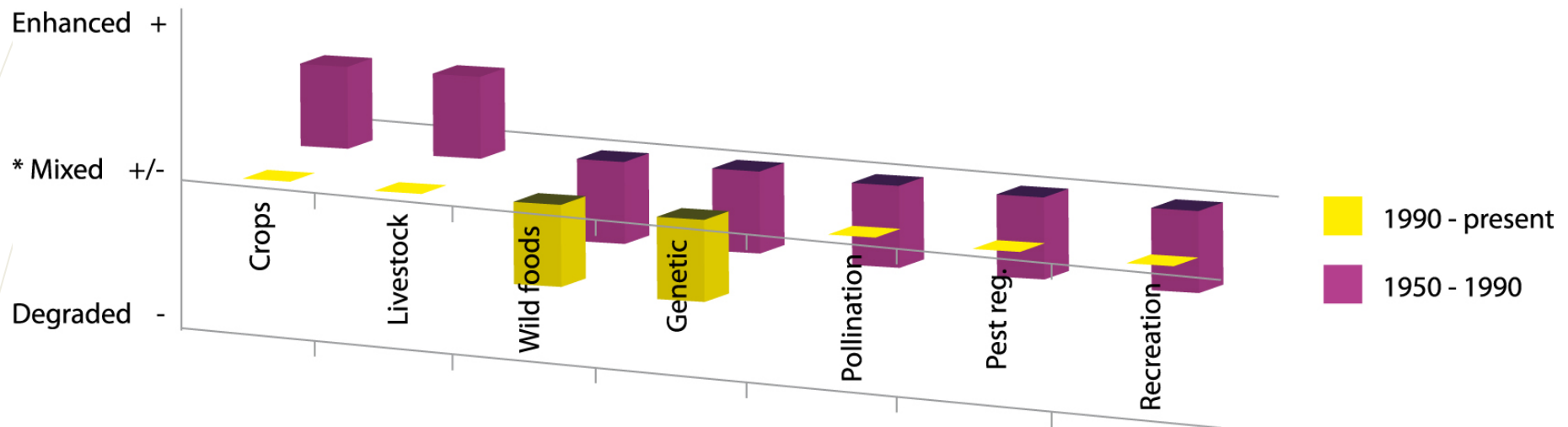
Enhanced +

* Mixed +/-

Degraded -

Crops | Livestock | Wild foods | Genetic | Pollination | Pest reg. | Recreation

1990 - present
1950 - 1990

Trends in the status of agro-ecosystem services

The Rubicode project (2010). Special Issue 19. Biodiversity and Ecology Conservation.

What are the drivers of biodiversity change?

RICE LANDSCAPE

- Over-exploitation of the agricultural land, monoculture, intense input system, sealing

GREENHOUSE LANDSCAPE

EFSA journal (2010), 2010; 8(4):1567 -1580.

Capri & Karpouzas (2009). Pesticide risk assessment in paddy rice. Elsevier, 174 pp.

What are the drivers of biodiversity change?

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- Habitat fragmentation, degradation and destruction (land use change).

1881

1960

1976

2003

Dall'Olio N.(2008). PhD Thesis, Parma University.
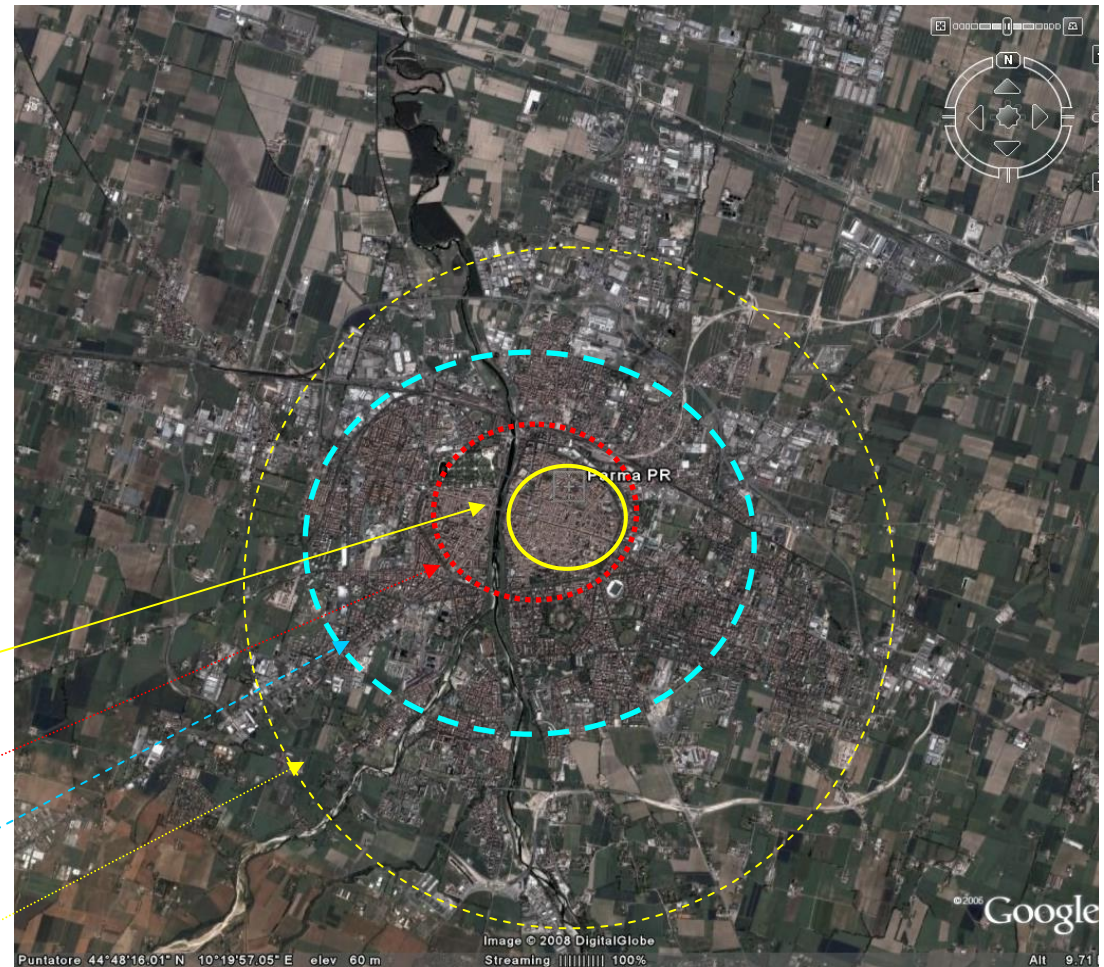
What are the drivers of biodiversity change?

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- Alien species

  (example > 7000 km of coast destroyed in 10 years by *Red Palm Weevil)*

http://www.palms.org/palmsjournal/2002/redweevil.htm

Monitoring data 2010 at www.aeiforia.it

What are the drivers of biodiversity change?

- Pollution

  (example industrial and urban pollution is cause of serious disaster and potential bombing effects in > 20 % of the intensive EU agricultural area)

EU Intereg project (2010) at http://projectfoks.eu/about/

- Underlying drivers: population growth and increased per capita consumption
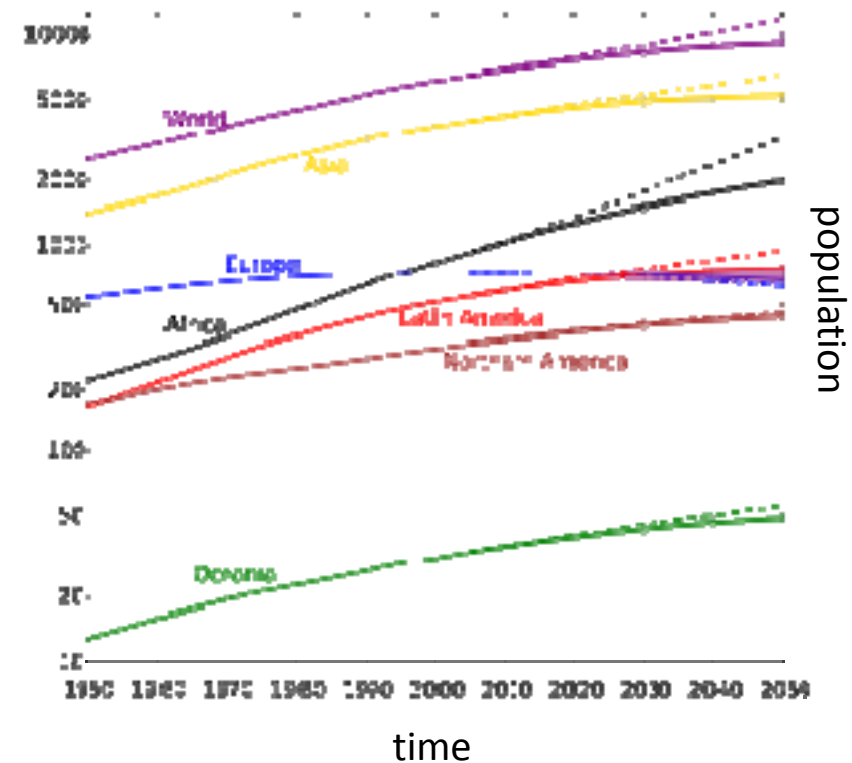
Feeding the world (2010). Nature, 466,7366: 531-532.

OPERA and Humboldt University, Berlin (2010) at www.opera-indicators.eu

Future landscape: the multifunctional agriculture

- Joint production of standard commodities and ecological services
- Increased landscape heterogeneity, refuges, metapopulation dinamics

Jordan et al. (2007) – Science, 316, 1570-1571

Future ecological unit: the multiservice agricultural farm

OPERA

- education
- conservation
- landscape
- mitigation
- protection
- tradition
- ricreation
- biodiversity

SOStain project for sustainable viticulture (2010) at www.able2sostain.org

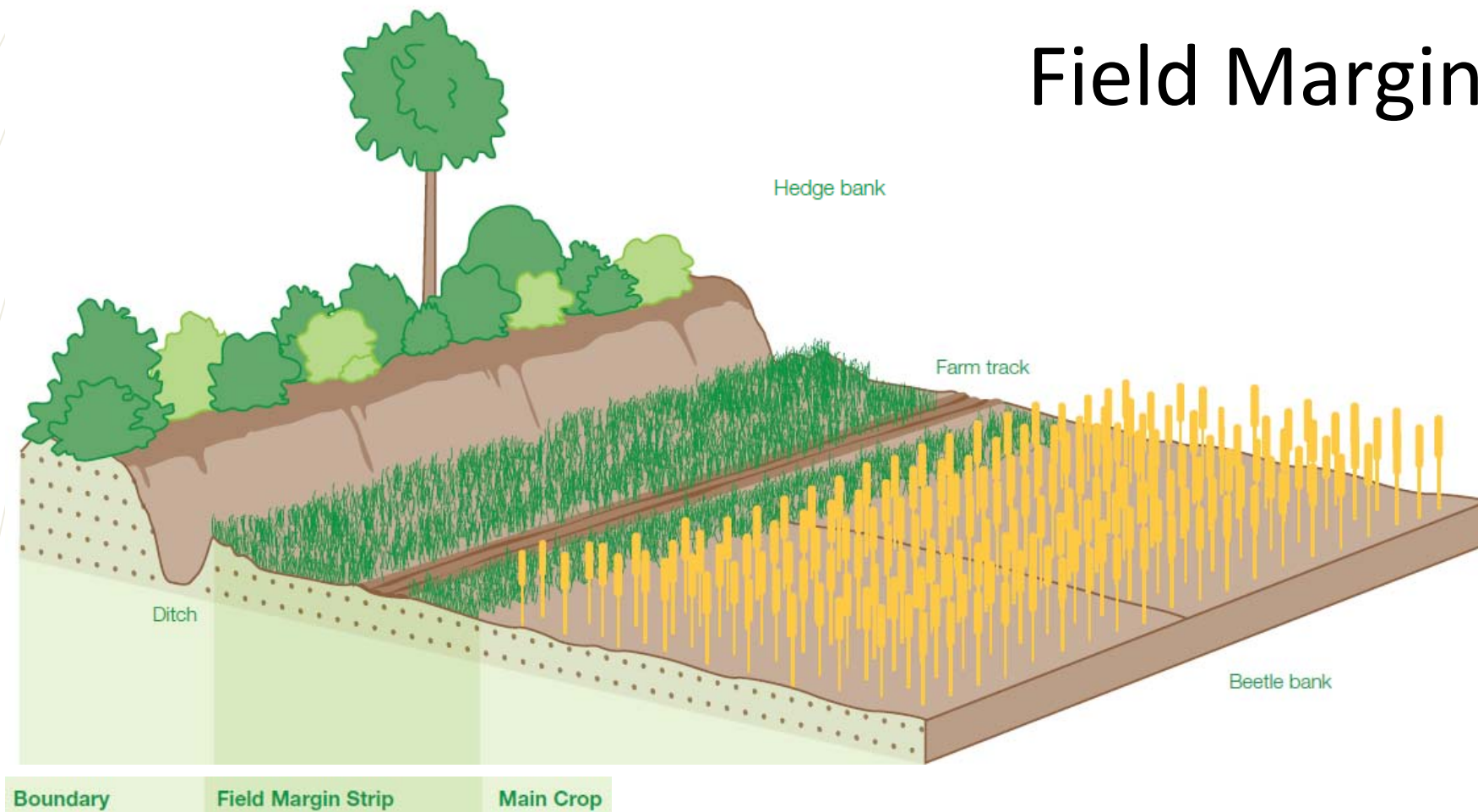# Time and spatial integration

Landscape management

Farm management

Crop management

Soil management

Increasing level of integration and risk mitigation

How can we provide pragmatic solutions?

Field Margins

OPERA – ELO pubblication (2010). Multifunctional landscapes at www.opera-indicators.eu

OPERA (2010). SUD informal meeting, 14 June at www.opera-indicators.eu

Field margins protect
- the aquatic environment , and the drinking water supplies
- the local biodiversity
- the uncovered field from soil erosion
- the village from the spray-drift
- ……..

and ensure a multifunctional use of the land by
- providing controlled access in the countryside
- enhancing the visual appearance of the landscape
- ……..

How can we provide solutions?

Design and features in the landscape

Hydraulic management

Bioremediation and efficiency

Efficiency
Winter (drained catchment)
Summer
Vegetated ditches/Basins
Concentrations and loads
Peaks and average values

Wetlands & field margins

LIFE project ARTWET (www.artwet.fr)

Wetlands: restored pond, vegetated ditches, storm basin, etc

OPERA

- Vast environmental, social and economical benefits (ecoservices)

- Results obtained are highly relevant to the environmental policy (EU legislation framework)

- A green technology easy to replicate, low cost, adapted to the local context (ecological infrastructure)

- Include wetland in the farm and in a basin (integrated approach)

Summary

- Political commitment to halt biodiversity loss.
  – Framework for achieving sustainable agriculture

- Ecosystem service protection is necessary for sustainable agriculture.
  – Assessing the social, environmental and economical impact.

- Multifunctional landscapes, variable protection goals
  – Measures delivered for reducing the risk

- Pragmatic solution with a proactive role of the rural communities
  - Slogan "thinking locally, act globally"