



Laboratorio de Historia
de los Agroecosistemas



AGRO-ECOSYSTEMS
HISTORY LABORATORY



Mediterranean organic farming and climate change. Potential for mitigation and adaptation.

Eduardo Aguilera

**THE ROLE OF ORGANIC AGRICULTURE
IN FIGHTING CLIMATE CHANGE**

AUGUST 24TH, 2015, 2:30 PM

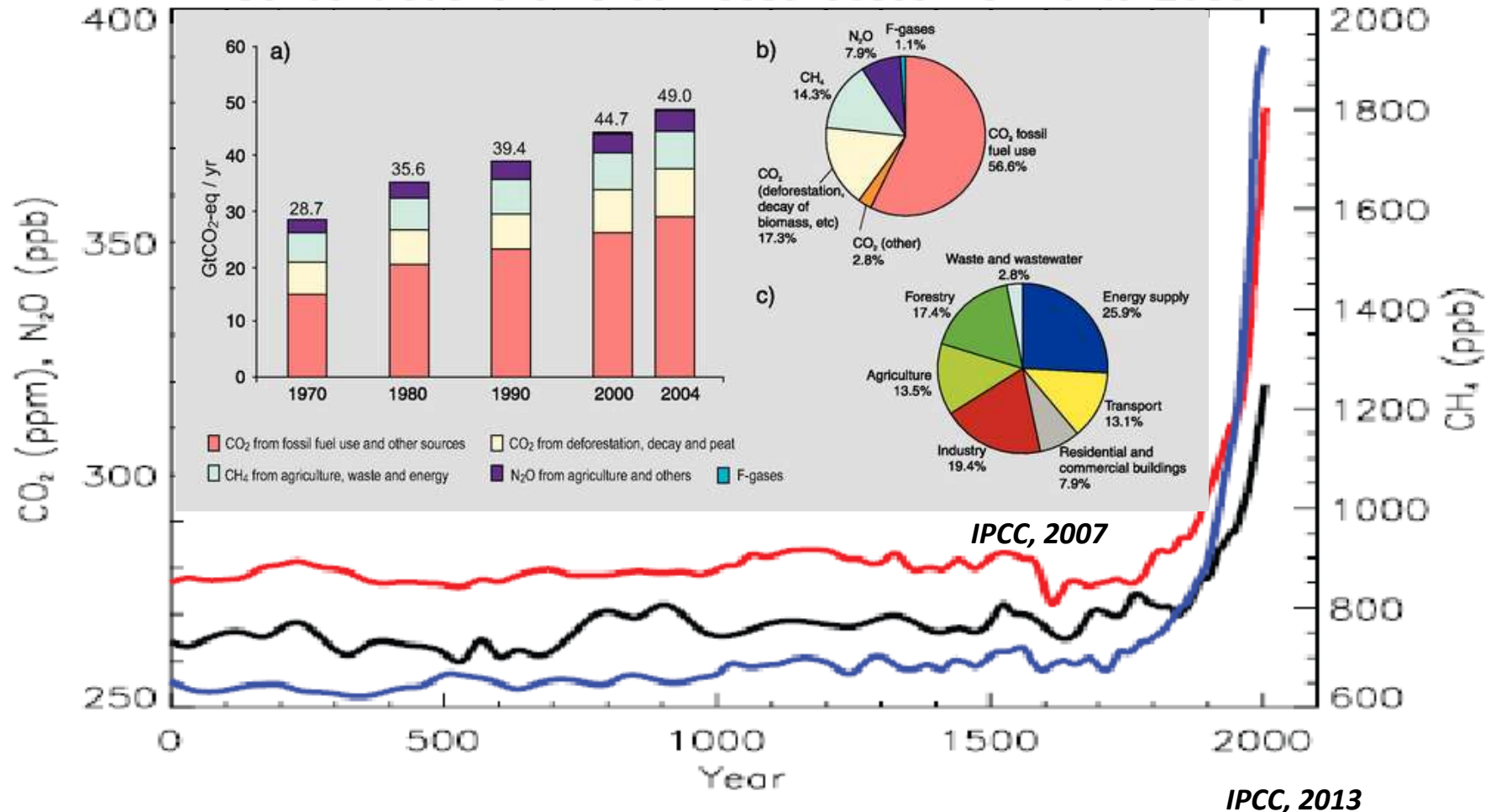
EXPO Milan 2015, Biodiversity Park, Theater of the Earth

The Action Network 'Organic can feed the Planet'

e-mail: organic.action.network@gmail.com

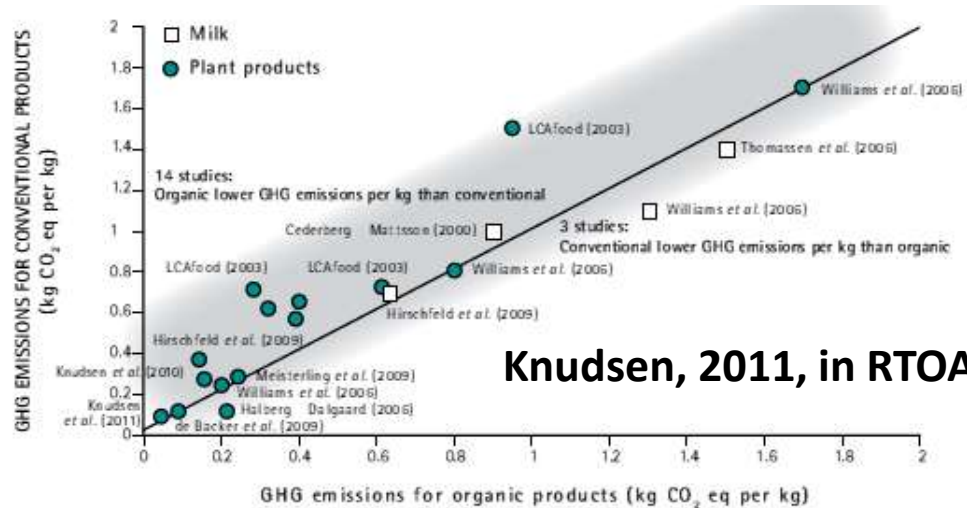
Anthropogenic greenhouse gas emissions

Concentrations of Greenhouse Gases from 0 to 2005



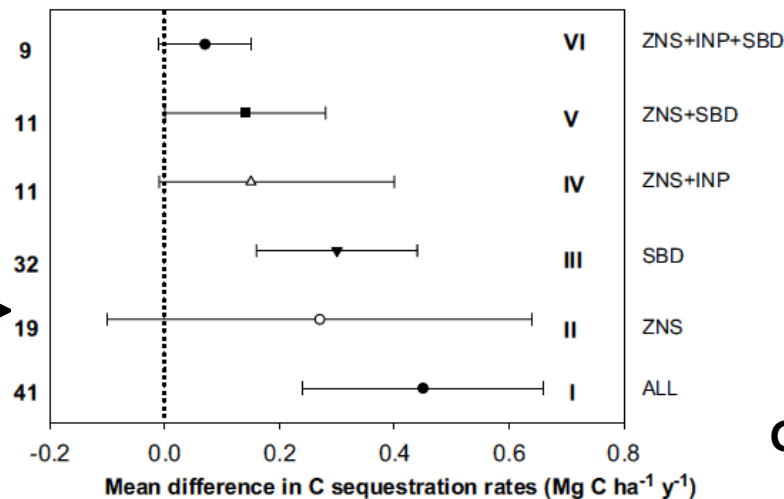
Organic farming and greenhouse gas emissions

- Less fossil inputs
 - Organic fertilization (C sequestration)
 - Usually less N inputs
- ↓
- Less emissions per hectare



- Usually lower yields

- Yield-scaled emissions?
- Carbon sequestration?



Gattinger et al. 2012

Agriculture and climate change in the Mediterranean

High **contribution to GHG emissions**

Mitigation potential?



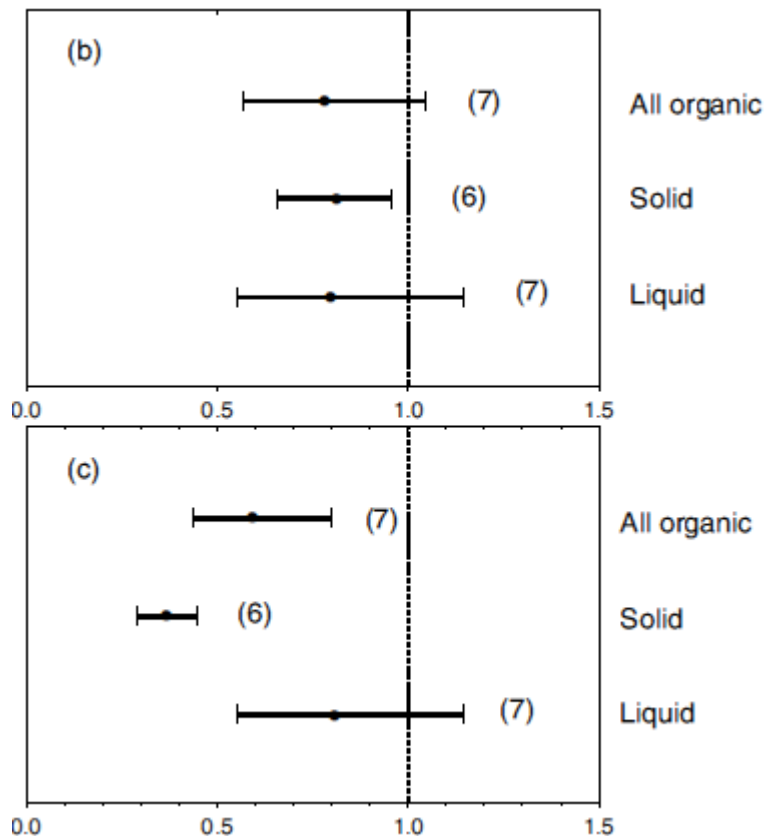
High **vulnerability to climate change**

Adaptation potential?



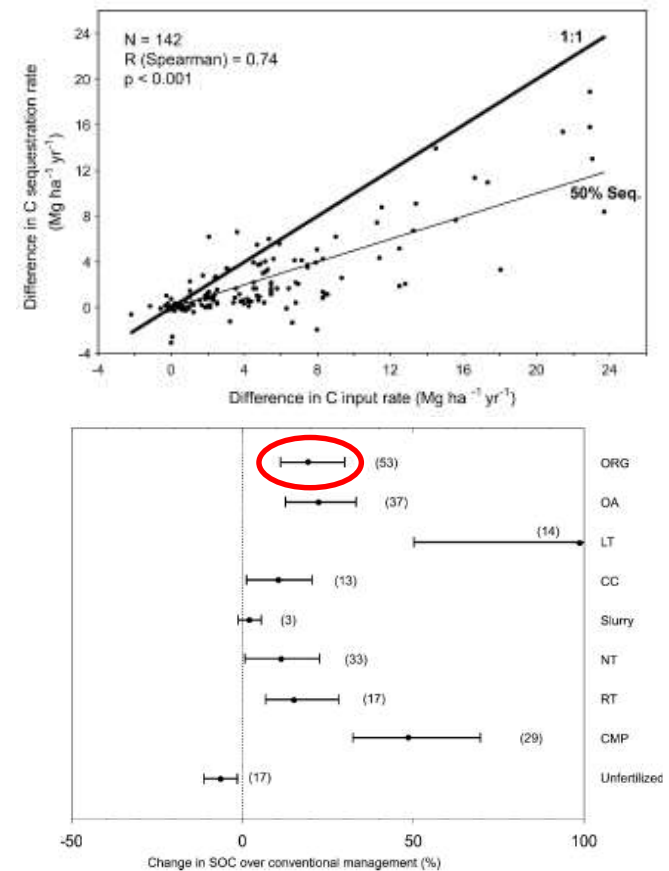
Soil processes and GHGe in Mediterranean organic agriculture

N₂O emissions affected by fertilizer type



Aguilera et al. (2013a) Agric Ecosyst Environ

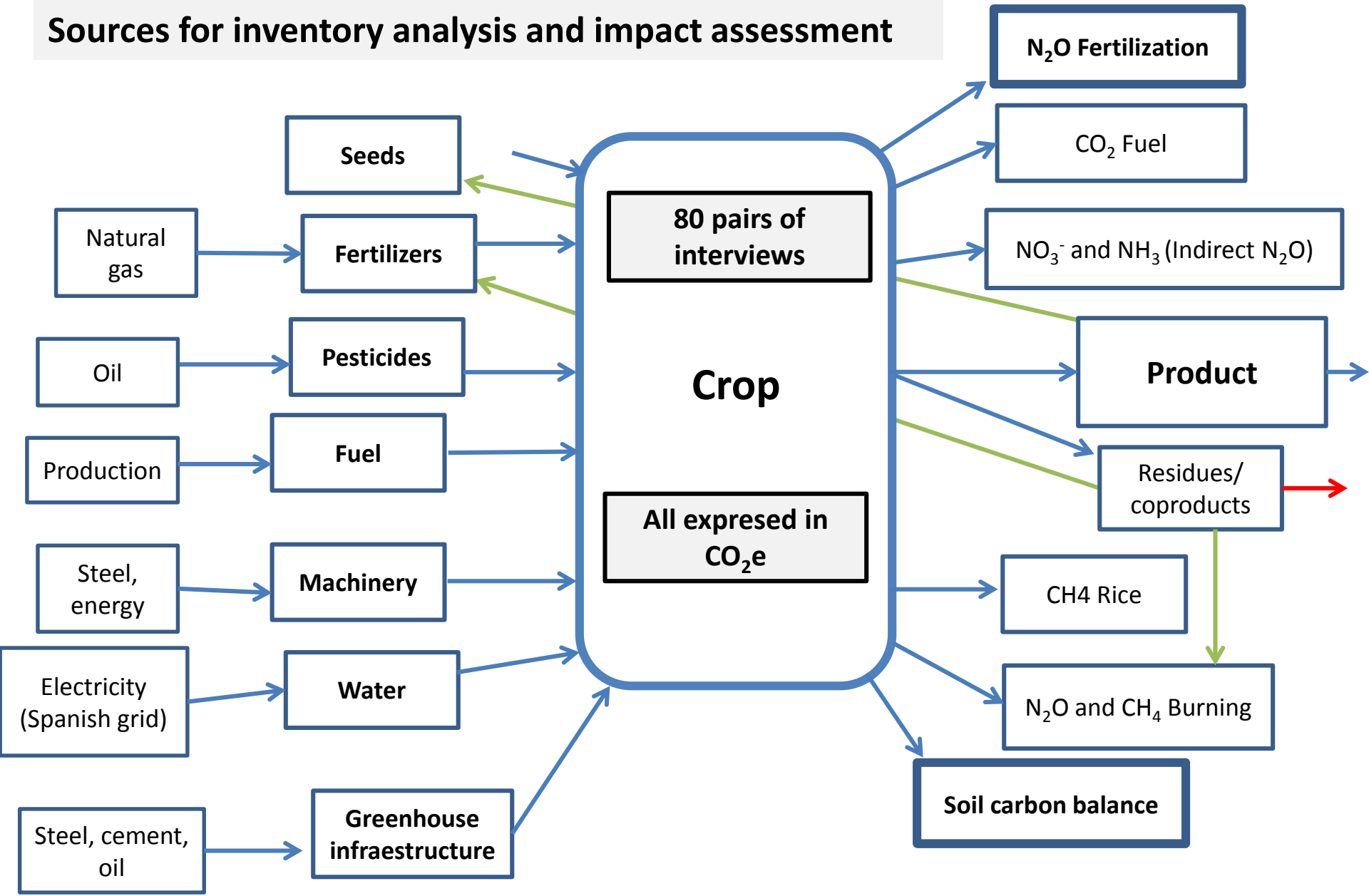
Carbon sequestration affected by management



Aguilera et al. (2013b) Agric Ecosyst Environ

LCA of Spanish cropping systems

Sources for inventory analysis and impact assessment



GHGe in conventional and organic crops in Spain

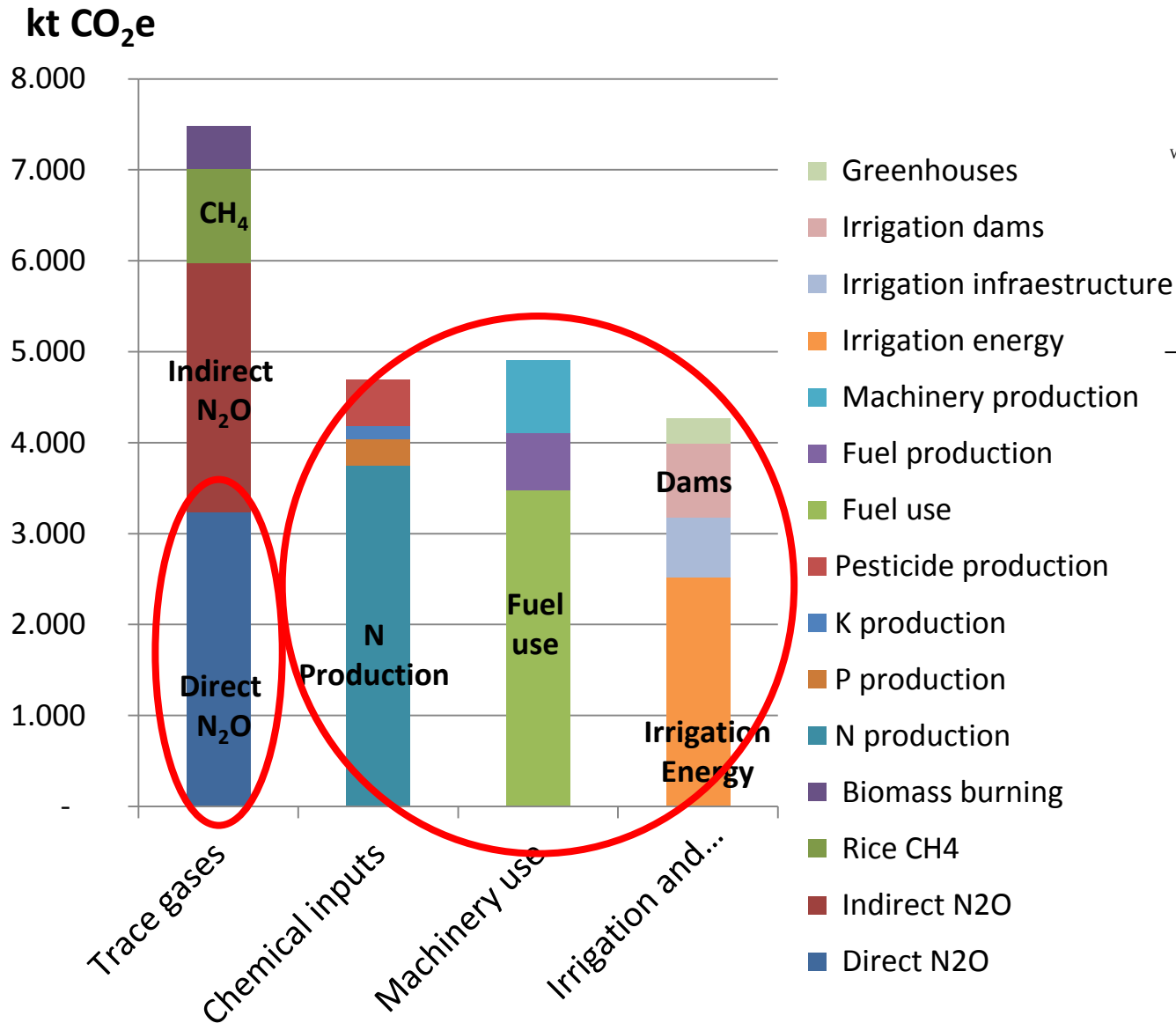
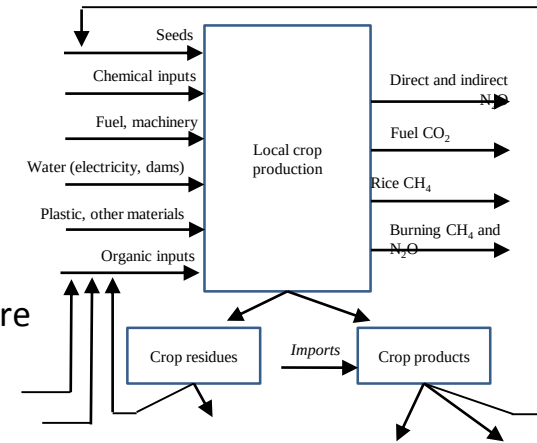
g CO₂-eq/kg



Aguilera et al. (Accepted)a, b Agron Sustain Dev



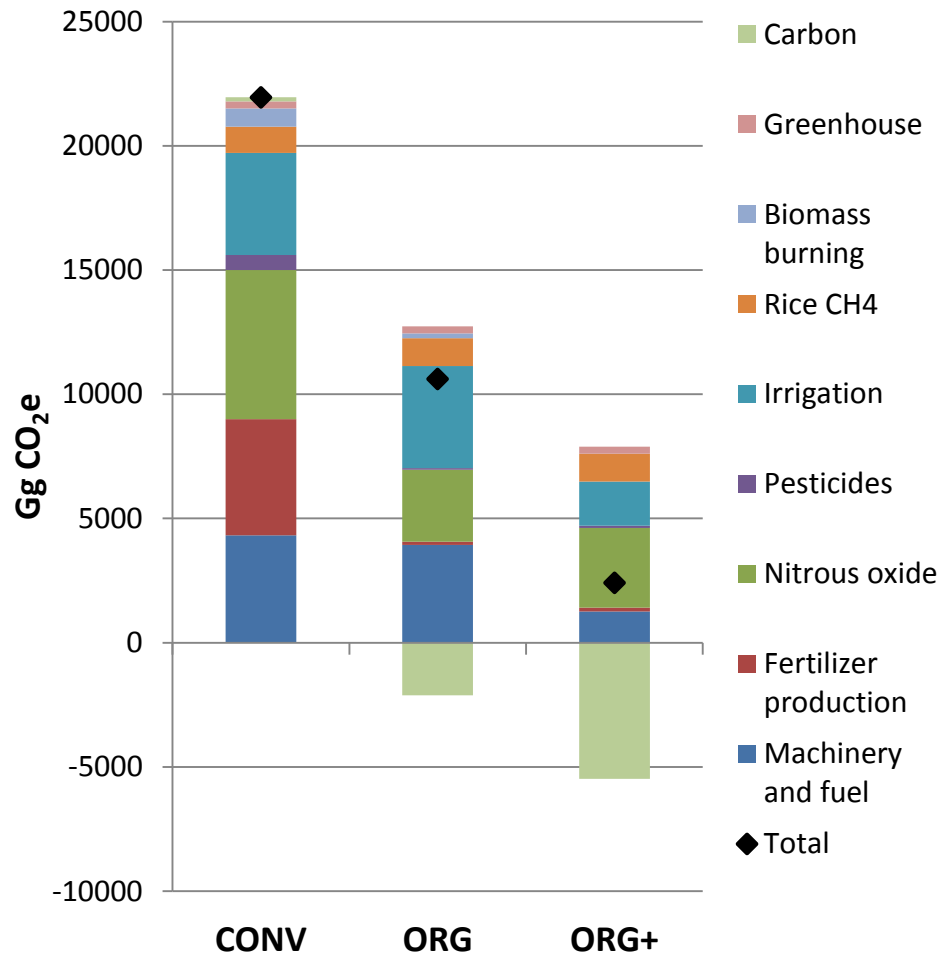
LCA of Spanish crop production



Scenario modelling: Crop production

Total GHG balance

ORG+



-Solar energy for **irrigation**

-**Biofuels** for self-consumption

-**Cover crops** in woody systems

-More **legumes** in crop rotations

-Suppression of **fallows** and
burning

-Yield change as in **ORG**

Scenario Modelling: Self-sufficient food production with dietary changes

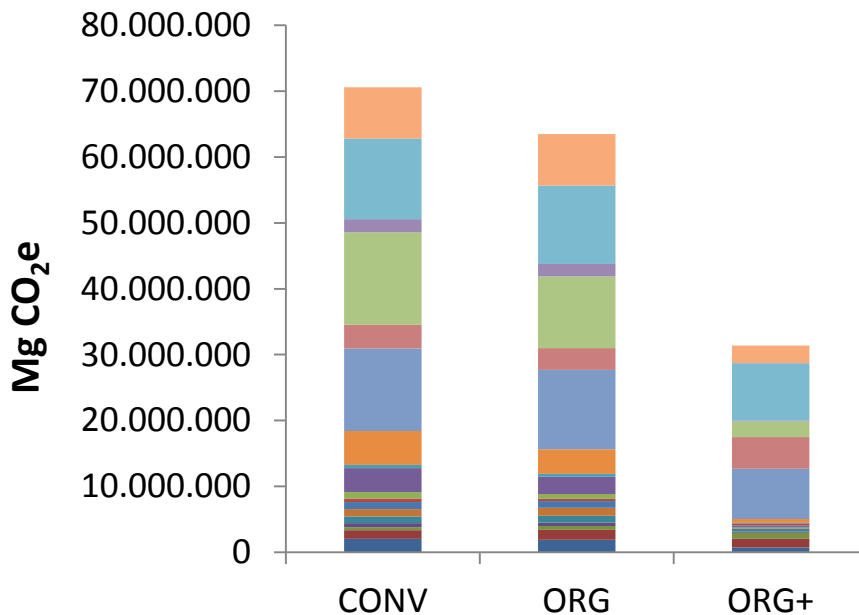
Livestock production

Feed

Suppression of imported feed

Grazing

Exploitation of abandoned grassland



Food consumption

Diet

Spanish diet in 60s. Meets:

-**Demitarian** (50% animal protein)

-**Mediterranean** (more cereals, olive oil, wine, *fruits* and vegs)

Waste

Reduction of consumption waste to developing countries level

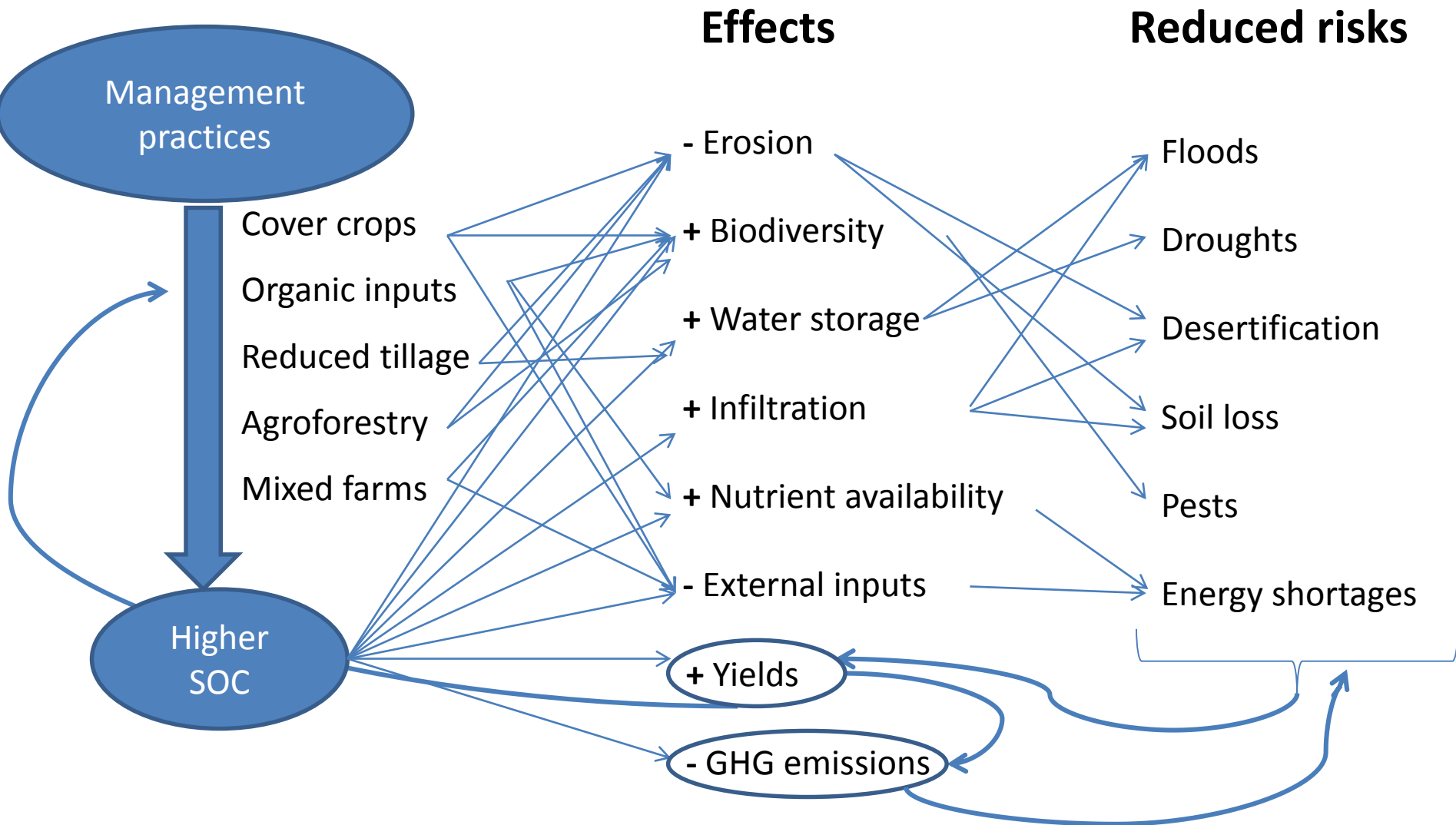


Synergies between mitigation and adaptation

16 years of organic fertilization and cover crops in olive orchards



Adaptation through organic matter management



Adaptation through organic matter management

Conventional



Organic



DOK Trial, FiBL, Suiza

Conclusions

- Conversion to organic farming (OF) usually leads to reduced GHG emissions per hectare and per kg of product
- Lower C footprint under OF is mainly achieved through reduced use of fossil energy and enhanced soil carbon sequestration
- These features, together with enhanced diversity, are related to adaptability and resilience
- Large potential for reduction of GHGe and environmental impacts of food production through combination of OF and dietary changes
- More research and extension efforts are needed to fully develop the mitigation potential of organic farming



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Thank you!



LONG-TERM SOCIO-ECOLOGICAL
METABOLISM IN WESTERN AGRICULTURE