3rd International Symposium on Organic Greenhouse Horticulture.
Izmir 11 – 14 April 2016

Soil fertility management in organic greenhouse: an analysis of the European context

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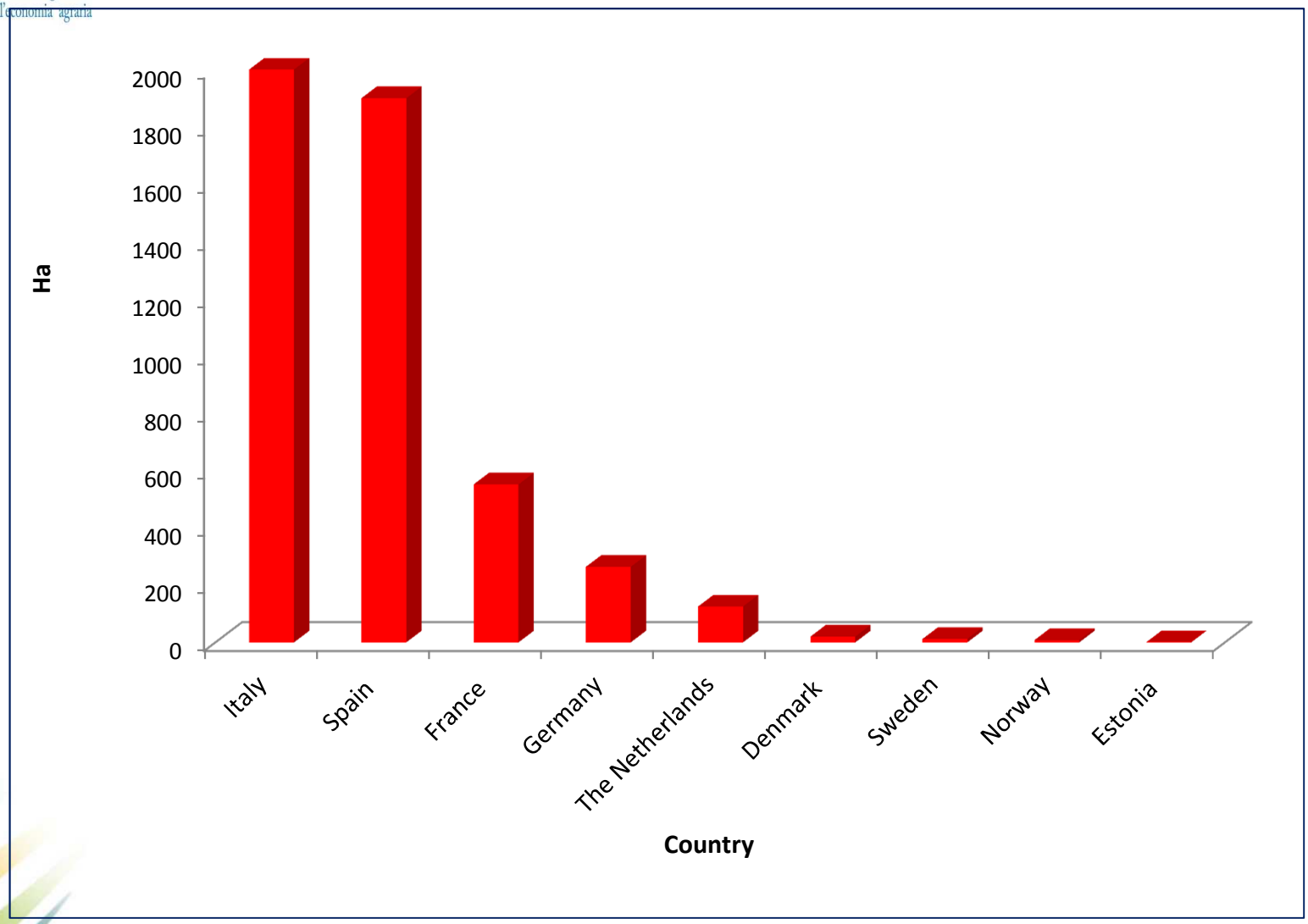
COST is supported by the EU Framework Programme Horizon 2020

CONTENTS

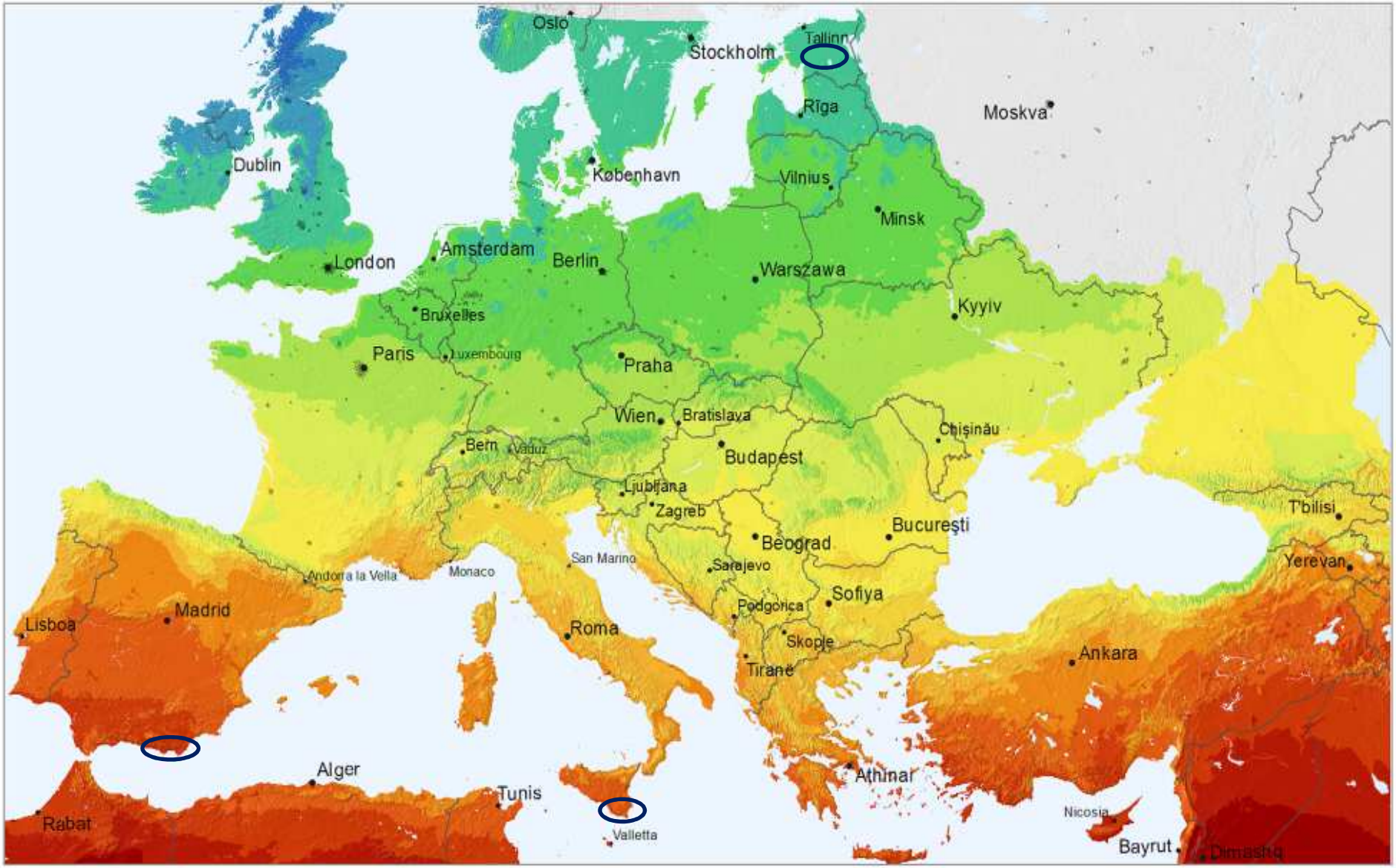
- Estimated area and distribution
- Soil fertility management: constraints and bottlenecks
- Consumer perception and WTP
- Future perspectives

Statistics on organic greenhouse in Europe (estimated values)



Global Horizontal Irradiation (GHI)

Europe



Average annual sum, period 1994-2010

< 800 1000 1200 1400 1600 1800 2000 > kWh/m^2

0 400 km

GHI Solar map © 2014 GeoModel Solar


Photo: Moral, 2012


Photo: Poldma,2012

The debate in Europe

EUROPEAN COMMISSION
DIRECTORATE-GENERAL FOR AGRICULTURE AND RURAL DEVELOPMENT

Directorate H. Sustainability and Quality of Agriculture and Rural Development
H.3. Organic farming

Expert Group for Technical Advice on Organic Production

EGTOP

Final Report On Greenhouse Production (Protected Cropping)

What is organic farming?

It is not just "*farming without agrochemicals*" (Lampkin, 1990)

Input substitution concept

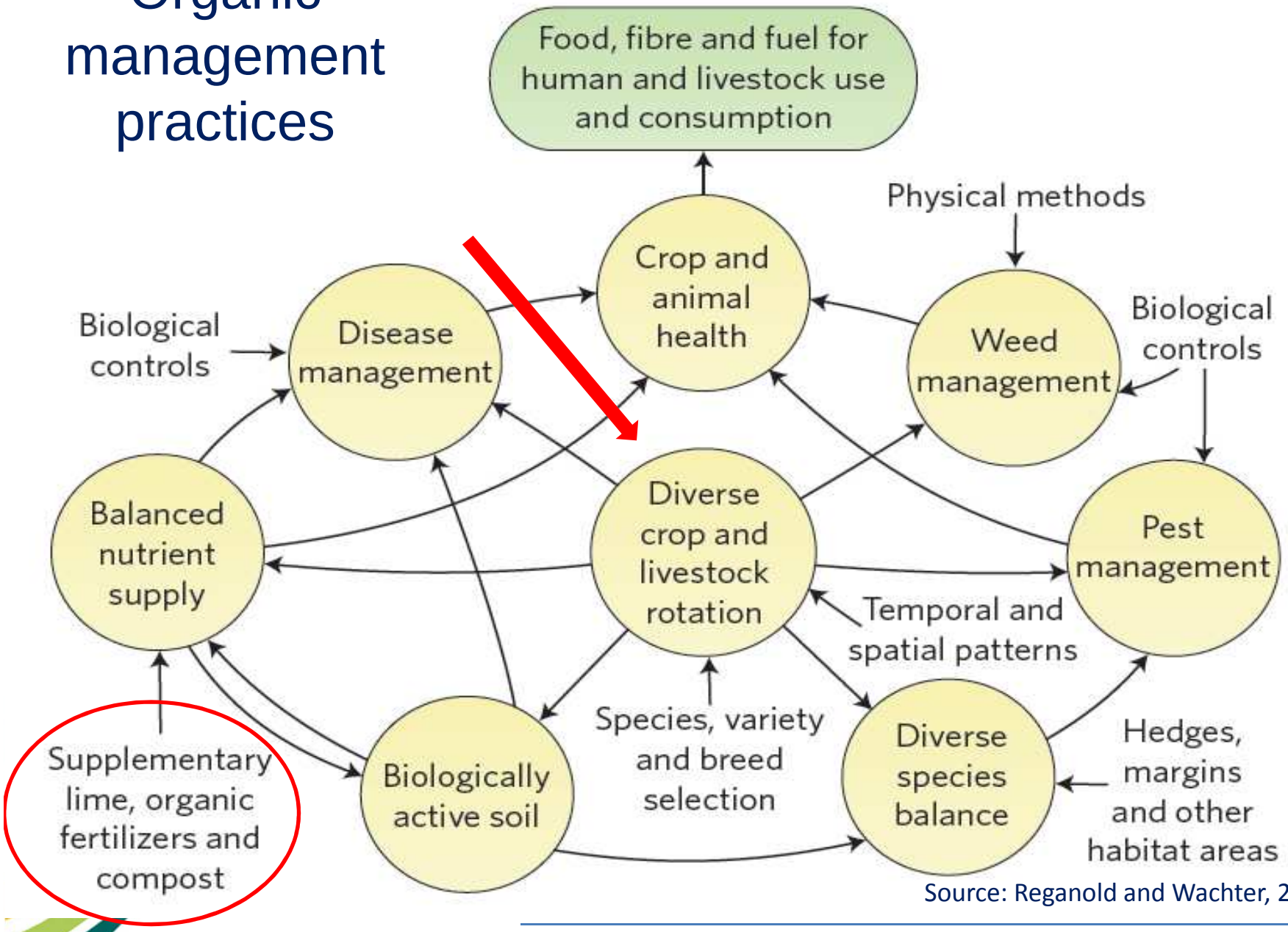
"*Organic farming defines itself by what it is doing, and not by what it is avoiding*" (Speiser and Tamm 2011)

IFOAM definition of OF

"Organic Agriculture is a production system that sustains the health of ***soils, ecosystems*** *and* ***people****. It* ***relies on ecological processes, biodiversity and cycles adapted to local conditions****, rather than the use of inputs with adverse effects…" (IFOAM, 2008)*

"More than a system of production that includes or excludes certain inputs" (IFOAM, 2002)

Organic management practices



Source: Reganold and Wachter, 2016

Soil fertility management in OGH

"It is obvious that organic greenhouse production must comply with the existing regulations regarding organic production, Reg (EC) No 834/2007 (EC, 2007) and Reg. (EC) No 889/2008 (EC, 2008)…" (Tittarelli et al., in press)

Main tools for soil fertility building

- Soil tillage practices,
- Crop rotations,
- Organic fertilisers and amendments,
- Agro-ecological service crops (ASC)

Agroecological Service Crops

Different terms used so far for crops having a role other than yield:

- catch crops;
- cover crops,
- complementary crops
- green manure
- .....

- NOT consistent terminology: connected with i) a specific purpose OR ii) a position in the rotation OR ii) a termination strategy;
- each single term is NOT always appropriate in any situation or broad enough to comprehend all the crops having agro-ecological functions

First Field

Second Field

Bare soil/ASC
(Jun–Jul'12)

Tomato
(Sept'12–Jan'13)

Green Bean
(Feb-May'13)

2012 - 2013

Bare soil/ASC
(Jun – Jul'12)

Strawberry
(Sept'12–May'13)

Bare soil/ASC
(Jun–Jul'13)

Strawberry
(Sept'13–May'14)

2013 - 2014

Bare soil/ASC
(Jun–Jul'13)

Tomato
(Sept'13–Jan'14)

Green Bean
(Feb-May'14)

Bare soil/ASC
(Jun–Jul'14)

Brassica Rapa
(Sept'14–Jan'15)

Lettuce
(Feb– May'15)

2014 - 2015

Bare soil/ASC
(Jun – Jul 2014)

Cucumber
(Sept'14–Jan'15)

Bare soil/ASC
(Jun–Jul'15)

Valerian
(Feb-May'16)

Cucumber
(Sept'15– Jan'16)

2015 - 2016

Lettuce
(Feb–May'16)

Brassica Rapa
(Sept'15–Jan'16)

Valerian
(Feb-May'15)

Bare soil/ASC
(Jun–Jul'15)


Ancona, 2015


La Notte, 2014


Ceglie, 2015


Antesia, 2015


Cana


Tittarelli, 2016

BIO
Bio-Rucola Selvatica
Sorte: Yeti – Unsprung: Italien
Nettogewicht: 80 g – Kat: II
los. nr. 0741626008
www.bio-mit-gesicht.de Nummer: 7359615
Ursprung: Italien
abgepackt durch: Soc. coop. AMICO BIO a r l
I-81043 via Grotte San Lazzaro, 9
Capua (CE), Italien
abgepackt für: tegut... gute Lebensmittel
IT-BIO-006
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Tittarelli, 2013


Canali, 2012

Main challenges and constraints in OGH

- High investment costs;
- High organic matter turnover (Voogt, 2014);
- High nutrient demands with high risk of unbalanced fertilizations (Cuijpers *et al. 2008, Voogt et al. 2011,* Zikeli *et al. 2014);*
- High soil health problems due to low crop diversification (Miller, 2015);
- High salinity risk due to imbalanced element input-output relationships (Voogt *et al. 2011);*
- Short time to cultivate ASCs (Mihreteab *et al. 2014);*
- High irrigation water needs (Voogt *et al. 2016).*

Source: Tittarelli et al, in press

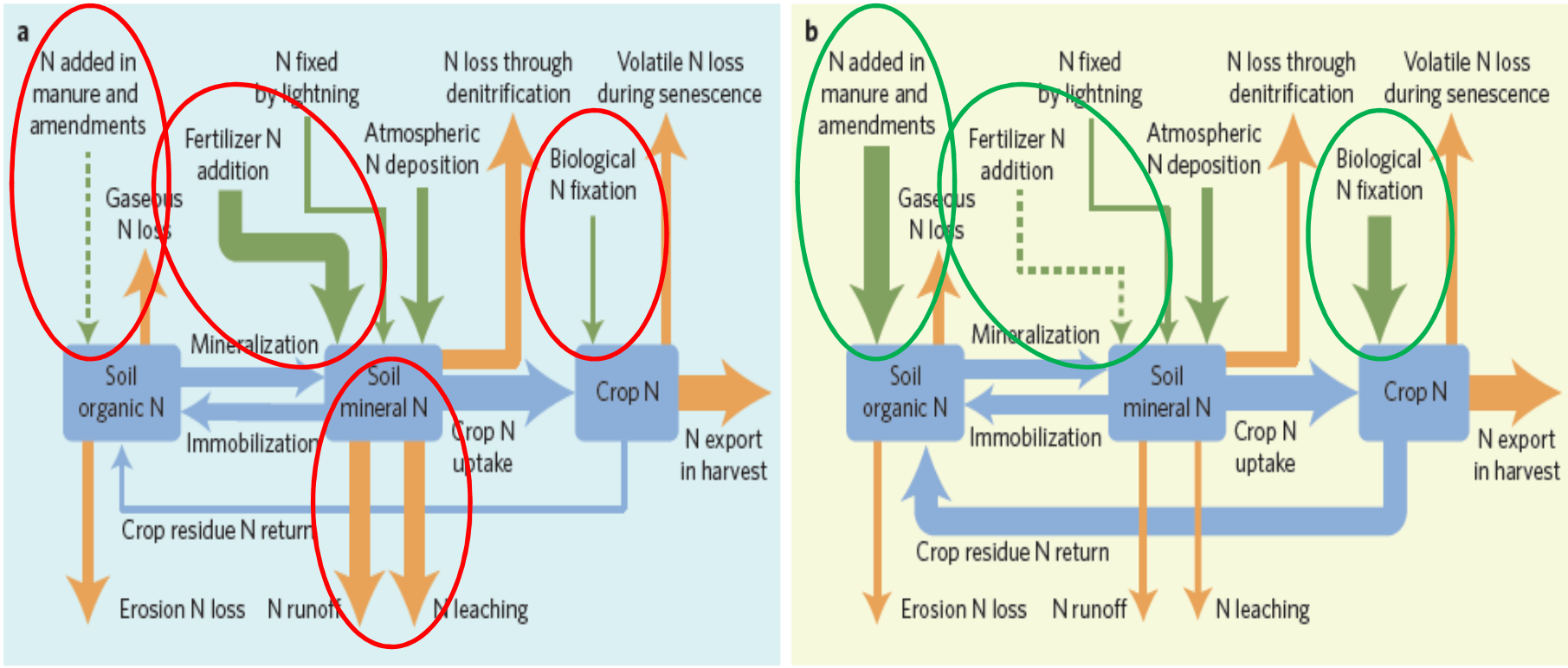

Figure 3 | Hypothetical nitrogen stocks and flows of two contrasting cropping systems. a,b, Cropping systems relying mainly on mineral nitrogen inputs (**a**) have relatively higher nitrogen losses to air and water than cropping systems with emphasis on biological N fixation, manure and other organic matter amendments, cover crops and perennial crops, and low reliance on mineral N fertilizer, such as organic and integrated systems (**b**). The width of the arrows is relative to the size of the nitrogen flux; boxes representing nitrogen stocks are not scaled to the pool size. Figure adapted from ref. 100, © 2015 The National Academies[100]. Arrows represent nitrogen inputs (green), losses (orange) and transformations (blue).

Source: Reganold and Wachter, 2016

High risk of unbalanced fertilization

High levels of production mean that large amounts of plant nutrients are exported out of the greenhouse and have to be replaced

High amount of fertilizer inputs can lead to strong nutrients imbalances

Knowledge Gaps

Diversification of cropping systems – Introduction of ASC in the rotation – Estimation of ASC rate of mineralization

Nutrients imbalances and design of more balanced systems

Assessment of N mineralization rate of different N sources

Influence of soil fertility management on GHG emission

Source: Tittarelli et al, in press

CONSUMER PERCEPTIONS

The future of organic agriculture will depend, to a large extent, on consumer demand (Yiridoe et al, 2005)

“Current consumers of organic food, both regular and occasional, are confused on many fronts” (Hughner et al., 2007)

Some skepticism about the true attributes of organic and organic labels may hold some consumers back from purchasing organic.

Maintain Public Trust

More efficient use of external inputs to maintain the public trust in the sustainability of organic greenhouse production (EGTOP, 2013)

NO SHORTCUT IN OGH PRODUCTION

TIVES FOR OGH

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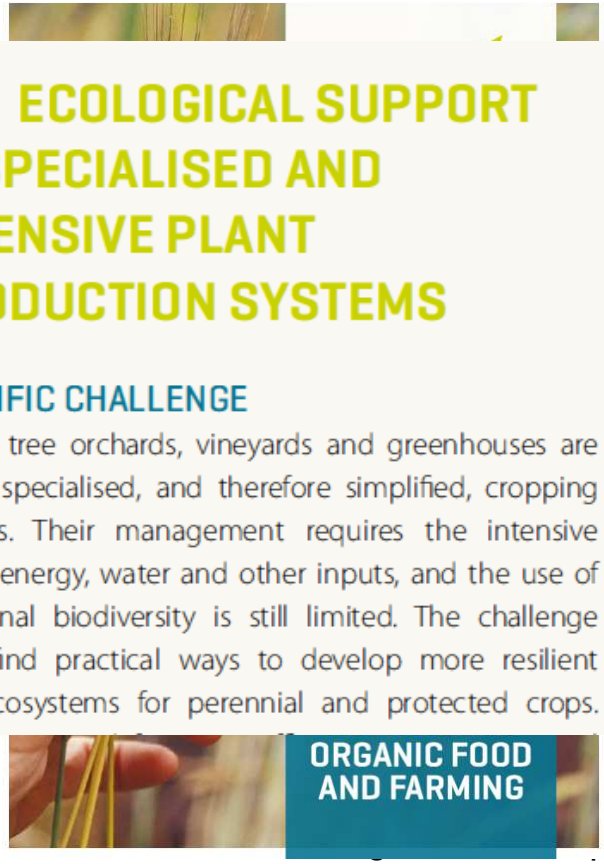

Organic by agroecological approach
(EPM, ENM, EWM, ERD, EFSD..)

Area of "sustainable ecological intensification"

Organic "input "substitution"

ut
(IPM, INM, IWM ..IQS)

Conventional

Sustainability

Knowledge/Innovation

(Source: *Canali*, 2015 modified)

crea
Consiglio per la ricerca in agricoltura

Thank you for your attention

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Horizon 2020

Who are organic food consumers

Table 2. Themes identified among buyers and non-buyers of organic food

I. Consumers' purchasing motives		
	Theme 1.	Health and nutritional concern
	Theme 2.	Superior taste
	Theme 3.	Concern for the environment
	Theme 4.	Food safety, lack of confidence in the conventional food industry
	Theme 5.	Concern over animal welfare
	Theme 6.	Support of local economy
	Theme 7.	More wholesome
	Theme 8.	Nostalgia
	Theme 9.	Fashionable/Curiosity
II. Deterrents		
	Theme 10.	High price premiums
	Theme 11.	Lack of organic food availability, poor merchandising
	Theme 12.	Skepticism of certification boards and organic labels
	Theme 13.	Insufficient marketing
	Theme 14.	Satisfaction with current food source
	Theme 15.	Sensory defects

Source: Hughner et al., 2007

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