

2014
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Agriculture and its contribution to green growth

“Sustainable Agriculture and Healthy Diet”

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September 14th, 2010
Knowledge Based Bio-Economy towards 2020
Brussels

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- ❑ An increasing demand in an uncertain context
- ❑ A need for breakthroughs
- ❑ Towards a cooperative agricultural research

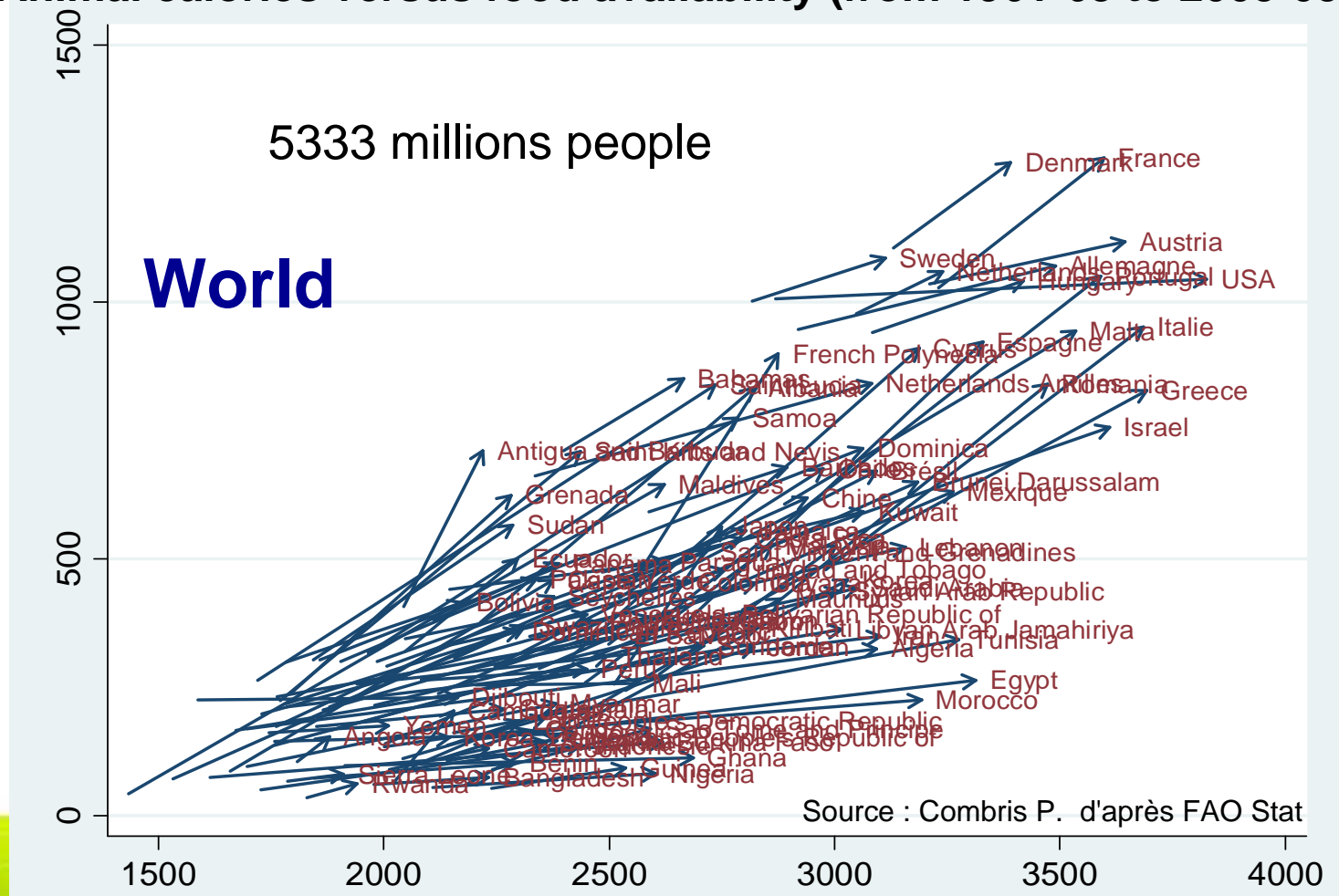
Global Challenge of FOOD and NUTRITION SECURITY



- ❑ Demography & urbanization
- ❑ Diet and health transitions
- ❑ Natural resources dependence
- ❑ Fossil carbon limitation
- ❑ Climate Change pressure

A dominance of more animal products consumption...

Animal calories versus food availability (from 1961-63 to 2003-05)



... but diversification remains

Diets impact production balance and natural resources (soil, water, biodiversity, ...)



**Apparent food availability
(Kcal/hab/day – world average)**

	2003	2050 AGO	2050 AG1
Total	3 015	3 590 (+20%)	3 000 (stable)
Plant Product	2 488	2 698	2 500
Animal Product	498	834 (+67%)	439
Aquaculture	29	58	61

**Plant calories consumption in the world
(Gkcal/day)**

	2003	2050 AGO	2050 AG1
For people	15 435	23 743 (+54%)	22 000 (+43%)
For animal	9 731	22 755 (+134%)	11 497 (+18%)
Total	29 341	53 551 (+83%)	37 646 (+28%)

Source : Agrimonde ®

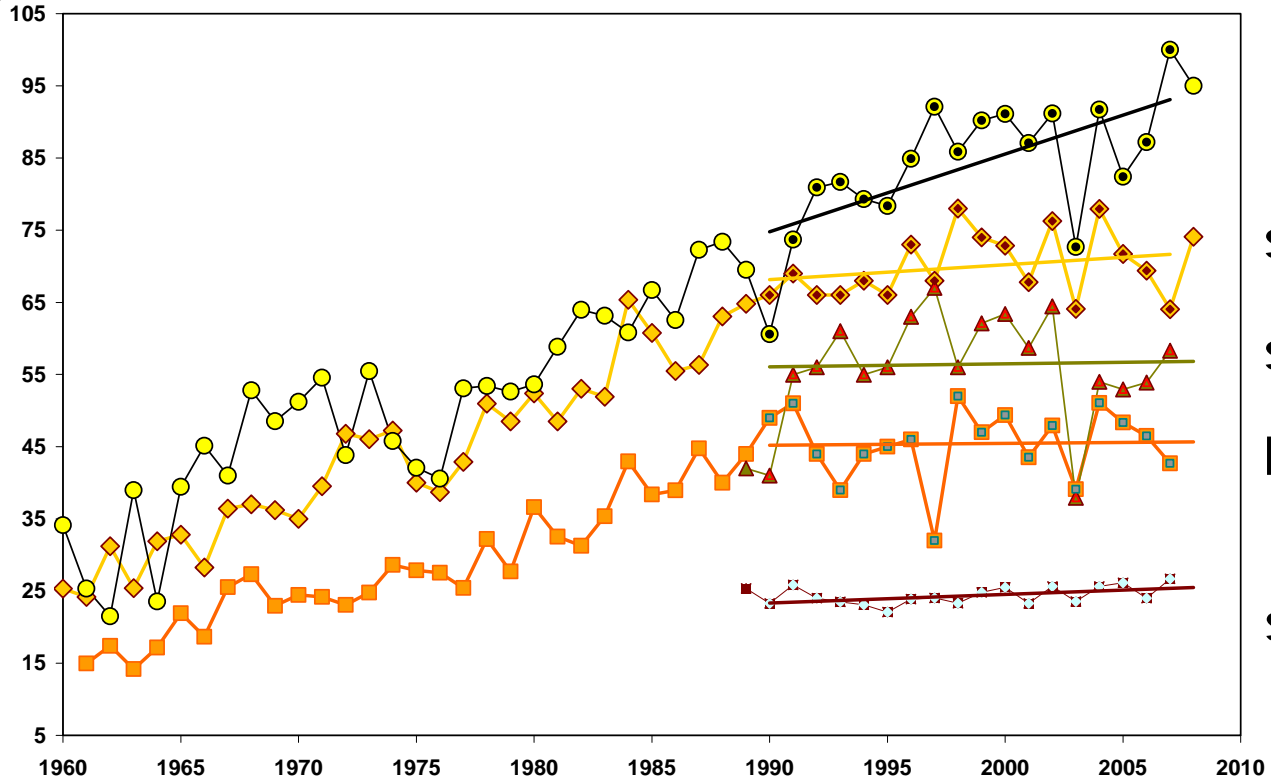


Climate change, a major stagnation "factor" on crop yield evolution

1826-2006

(source APCA-Etudes économiques d'après INSEE-ONIGC)

q/ha



maize

soft wheat

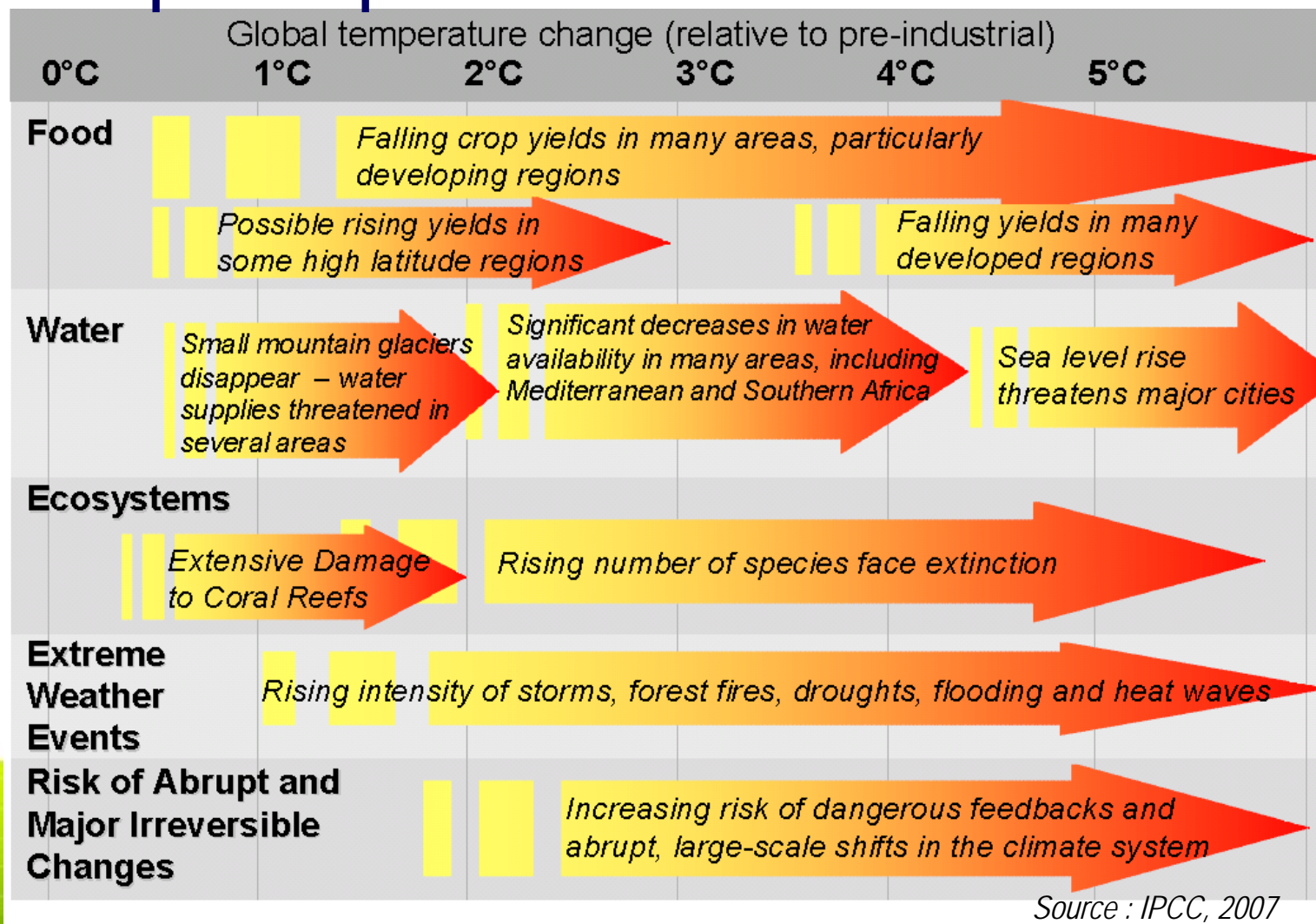
sorgho

hard wheat

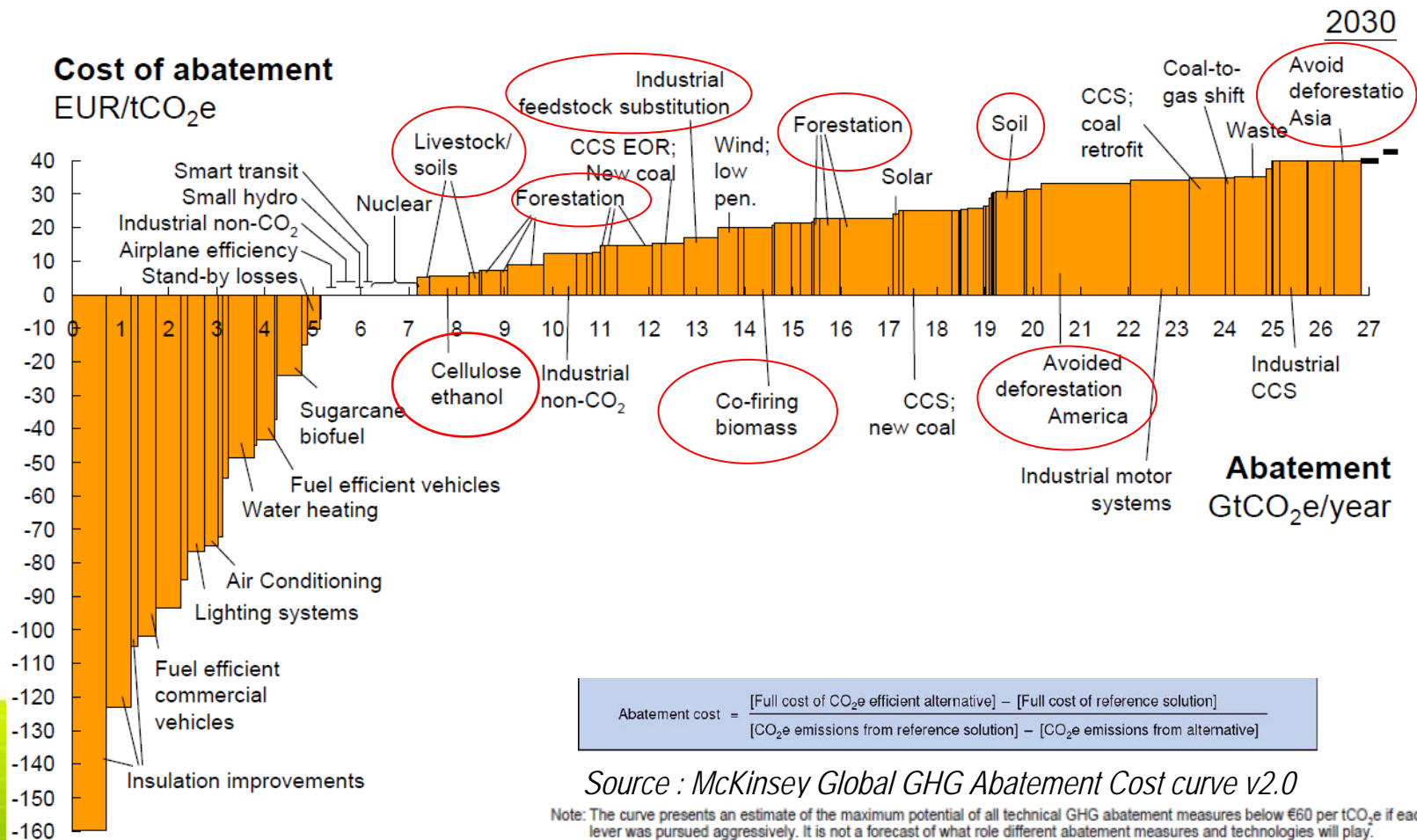
sunflower

(SCEES, France)

Climate change, a complex impact on food and natural resources



Most future benefits of decarbonising the economy depend on the agriculture, forestry and land use sector (AFOLU)



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1. Genomic breeding

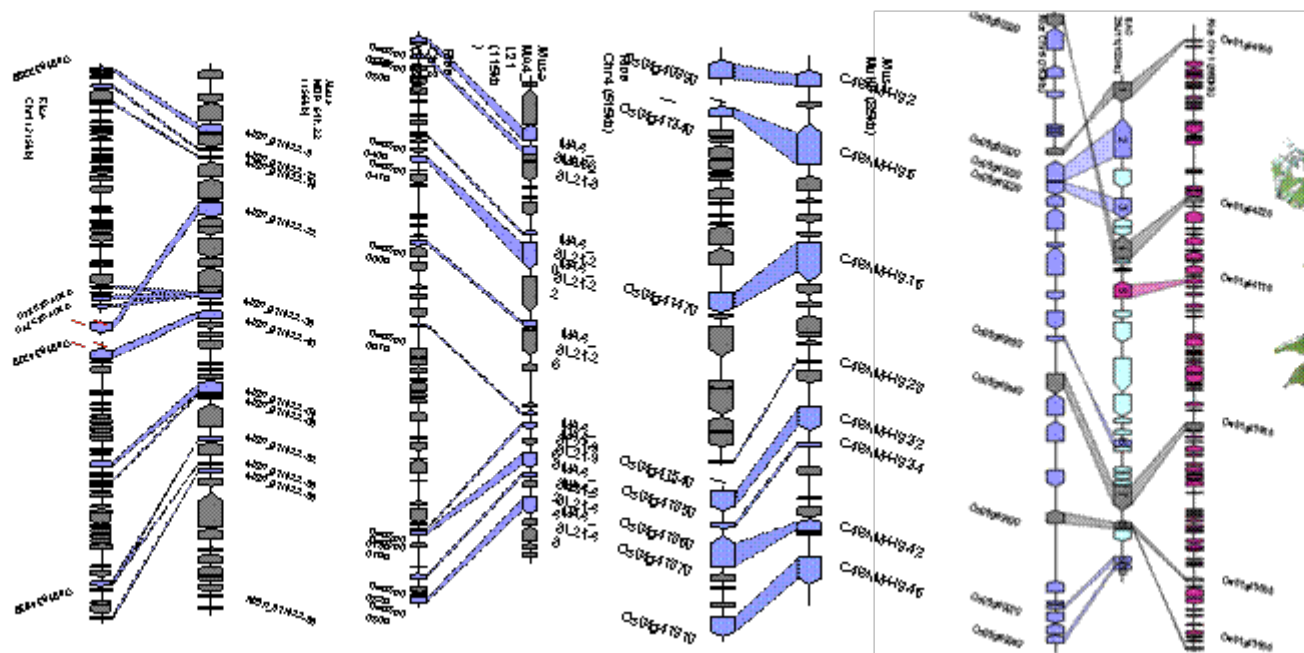


(Xu et al, Nature 2006)

- ❑ High throughput genotyping of germplasms
- ❑ Coupled with high throughput phenotyping
- ❑ Valorized by high throughput bioinformatics
- ❑ Organise large worldwide network within public research

New avenues, from model to (other) crops

Genomic sequence comparison between Rice and Musa



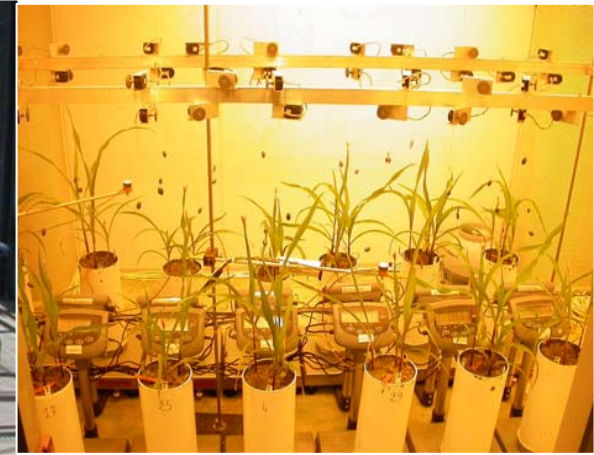
(Lescot et al., BMC Genomics 2008)



PHENODYN platform



400 plants



50 plants

**Soil water status
transpiration rate**

(Sadok et al. 2007 PCE)

Meristem
temperature



data logger



Evaporative
demand

Light



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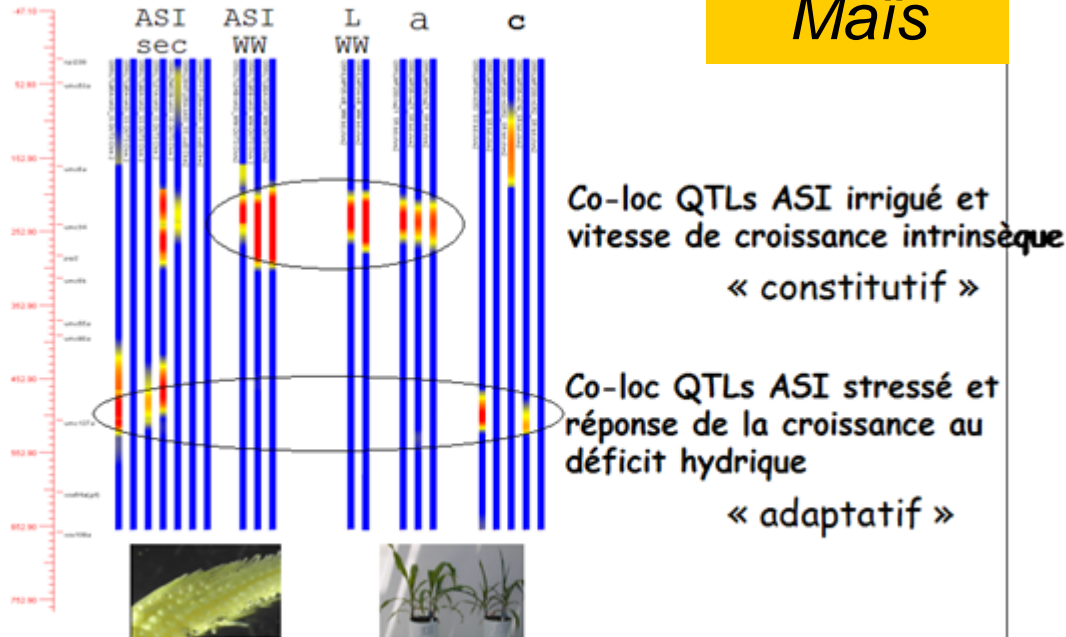
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Design of new plants tolerant to environmental stresses

QTLs

Maïs



Identification of regions of the genome controlling mechanisms of growth under water deficit

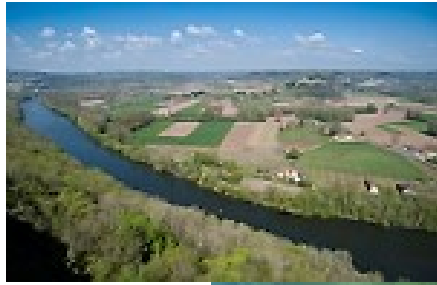
Anthesis–Silking Interval

LEAVES

Welcker et al., 2007, JEB

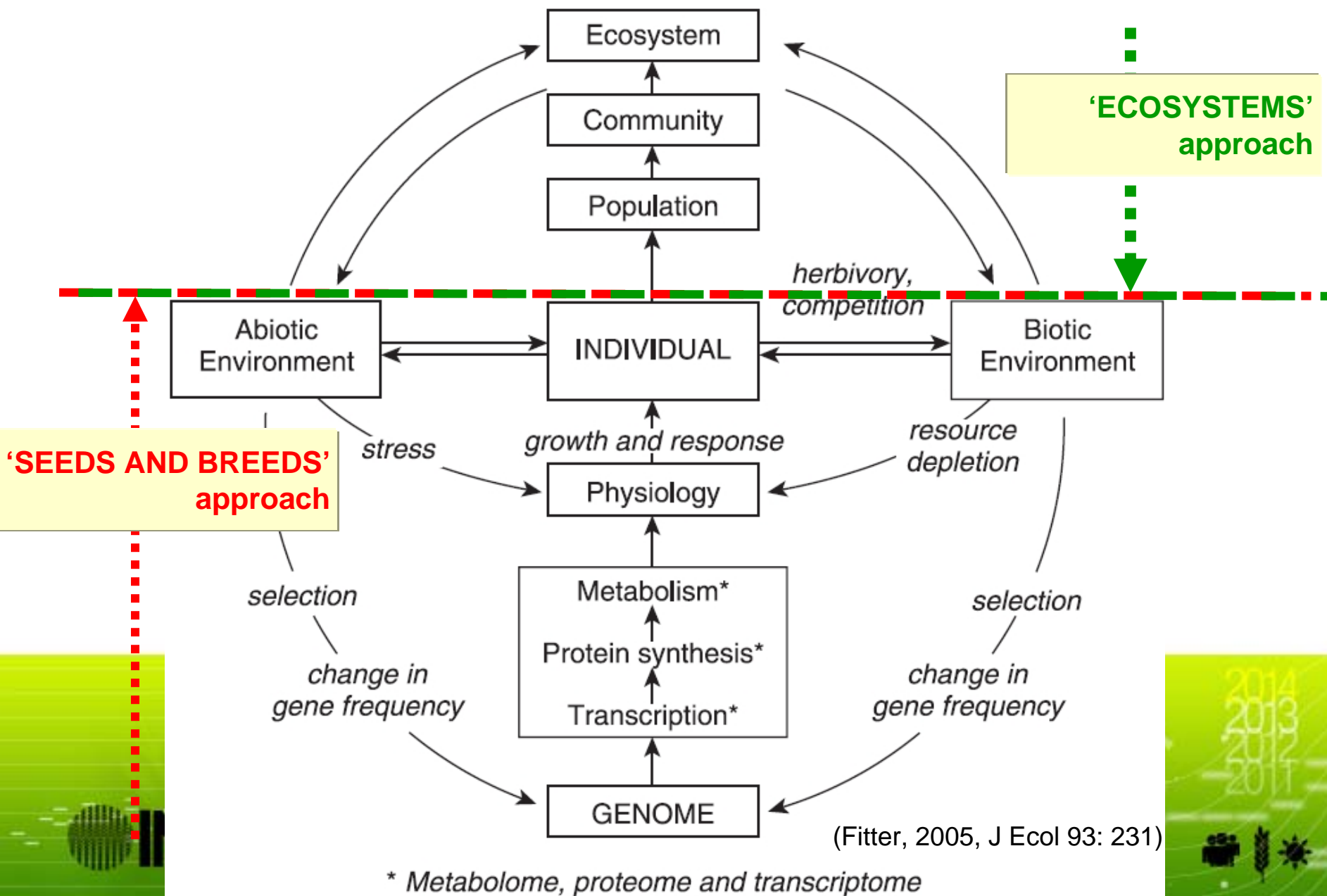


2. Agro-ecology, a new agronomy

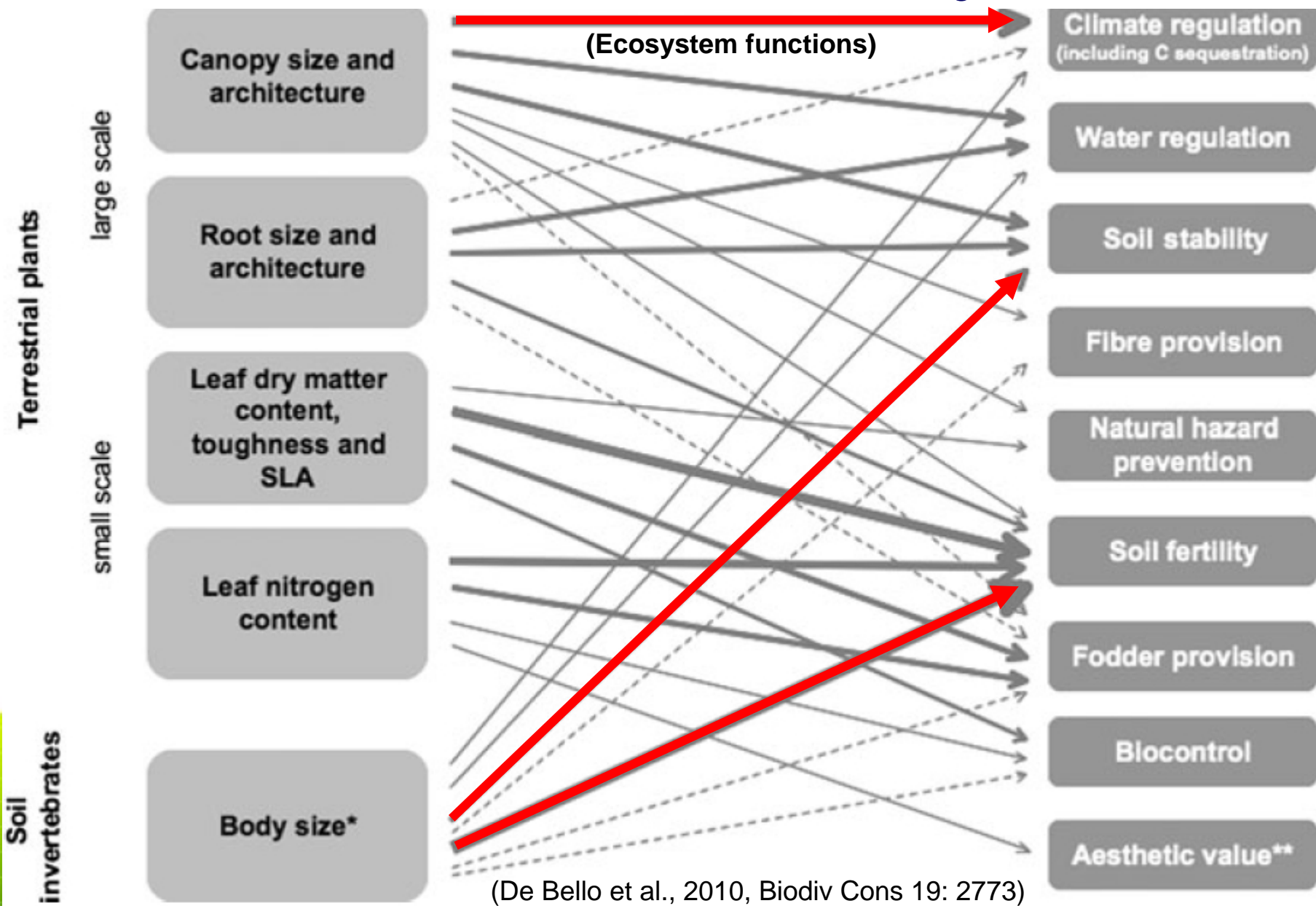


- ❑ Conceiving new production systems, towards a sustainable management of natural resources
- ❑ Assessing positive and negative agricultural impacts on the environment
- ❑ Developing integrated strategies of ecosystems management
- ❑ Assessing economic and social consequences of those new practices on farm and value chain

Combining multi-scale approaches to sustainable agriculture



Links between Traits and Ecosystems services

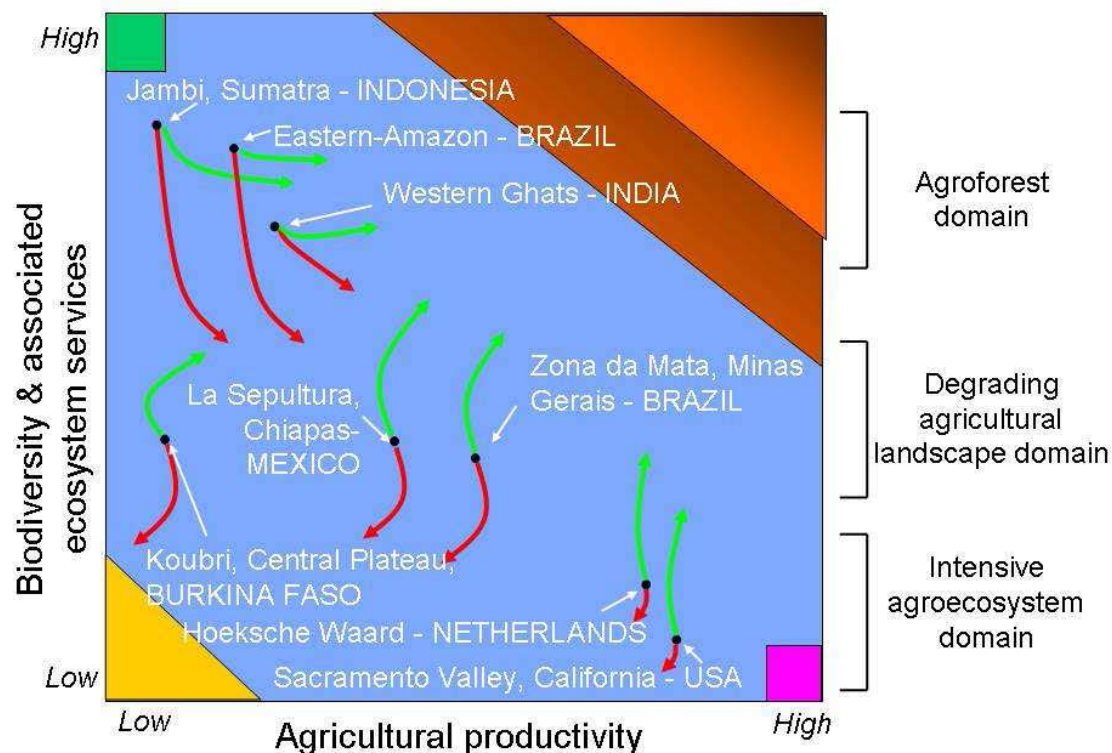


(De Bello et al., 2010, Biodiv Cons 19: 2773)

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DIVERSITAS : agroBIODIVERSITY network



Considers biodiversity – ecological functions in mosaics of crop production areas and natural habitats

Sets sustainable management of biodiversity in a social-ecological framework

Builds upon local experiences and participatory experimentation with diversified production systems

→ Current dominant trend → Biodiversity-based alternative pathway

8 research sites representing landscapes positioned along a biodiversity-productivity gradient and a wide range of socio-economic conditions



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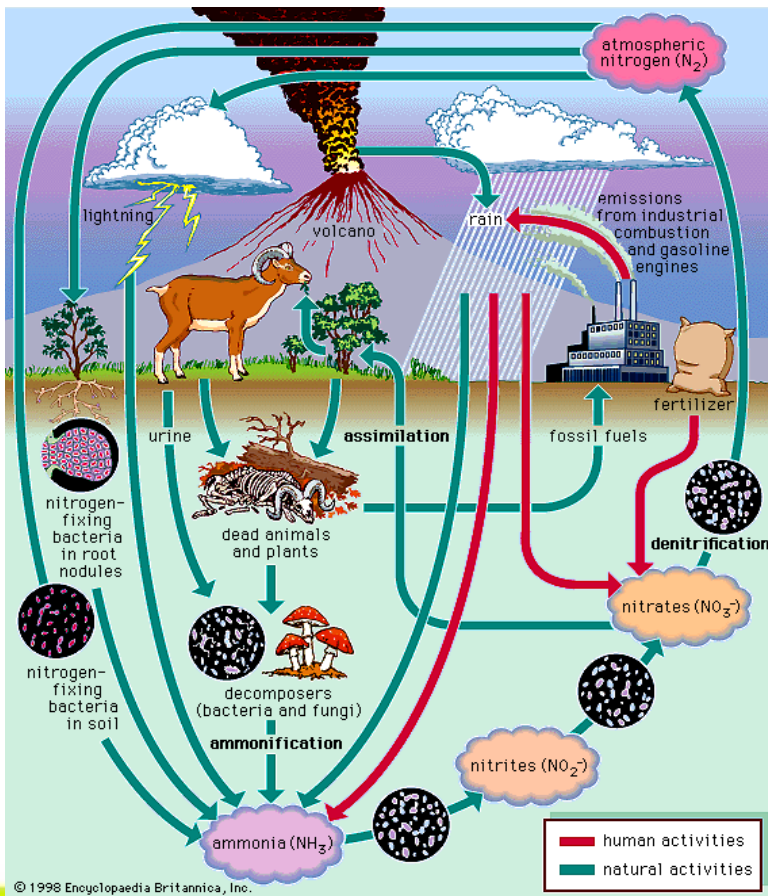
3. Diets and human health, new paradigms

Microbe "run the world"

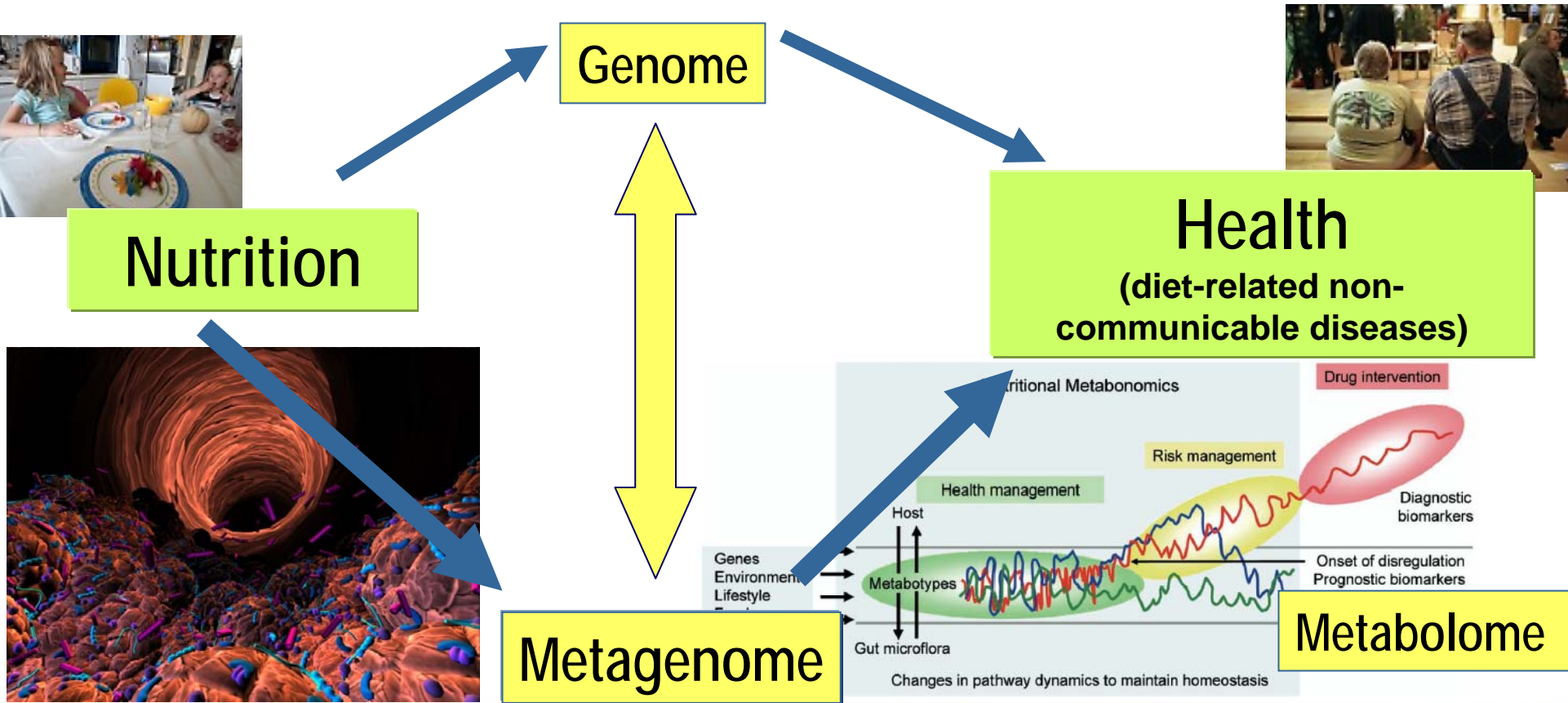
❑ Most microbes live in complex population, and as many as 99% of prokaryote taxa are not currently cultivable

❑ Universal implication

- Food, health, environment, agriculture
- Fundamental knowledge of genome and population functioning and evolution



Metagenomics for understanding the microbial world



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Strengthening the research capacities quickly with regard to global challenges

- ❑ Anticipation
- ❑ Co-operation rather than competition
- ❑ Integrated and long-term program
- ❑ Local and global scales sustainable solutions
- ❑ Preservation of public goods
- ❑ Resilience towards public policies
- ❑ Citizens implication
- ❑ Evolution of education

EURAGRI



SCAR
Standing Committee
on Agricultural Research

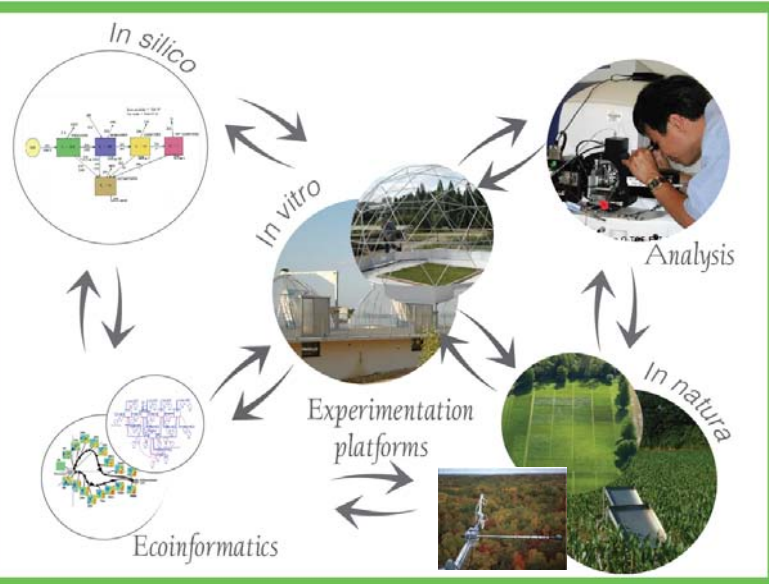


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A new agricultural European research agenda, for a better knowledge and competitiveness



- ❑ Large multidisciplinary Program
- ❑ Shared world class infrastructures (ORE, cohorts, “omics” platforms, data)
- ❑ Foresight and Expertise
- ❑ Ethics and debate

⇒ Program, Joint Programming Initiative, ESFRI, ...

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Thank you for your attention



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