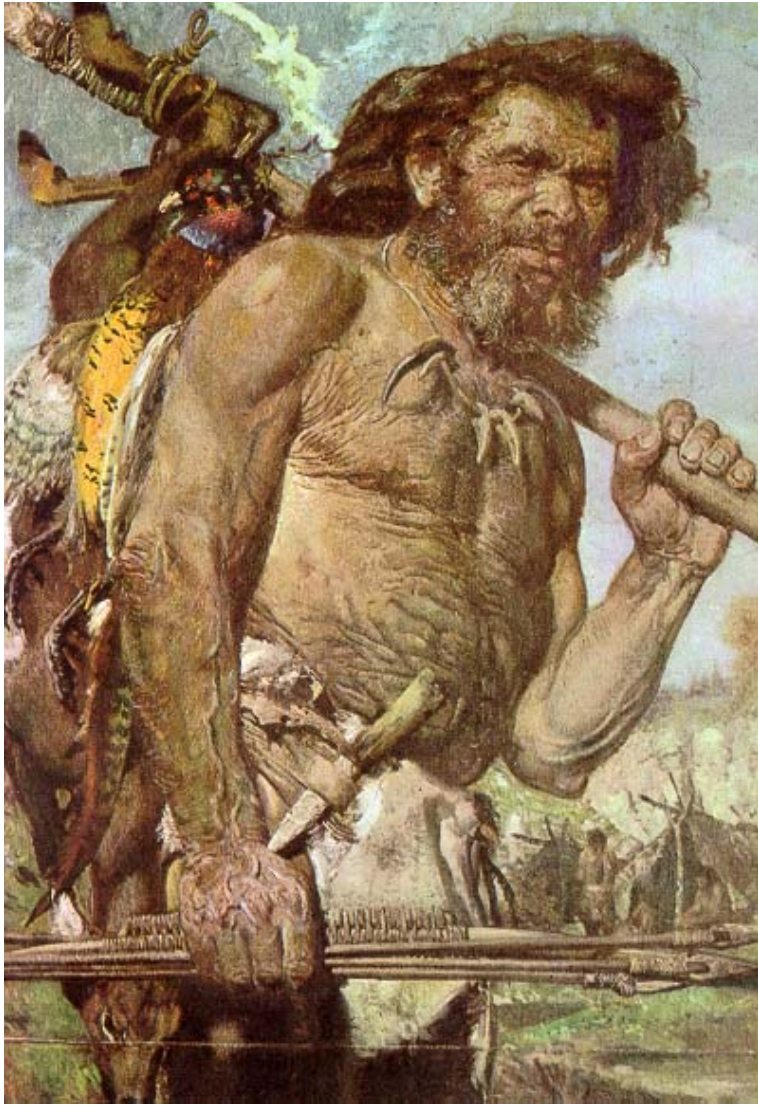


Too slow motion of new scientific results
demands more efforts to define food qualities
with novel methodologies



Humans need food



- already ancient hunters did know good food qualities
- Without agriculture 250 mio humans can survive on earth.
- Agriculture was invented 10,000 years ago (together with settled life: both are success stories)

Chemical knowledge has made food production powerful

- 1840: Liebig developed the understanding of plant and animal nutrition
- 1893: Gosio discovered antibiotics (30 years before Fleming, but he wrote in Italian and was ignored)
- 1910: Haber and Bosch invented the N-synthesis
- 1953: Watson and Crick discovered the structure of DNA

7 billion people could have enough food



- affordable, enough and healthy -

> 1 billion are hungry



1,2 billion people are too fat



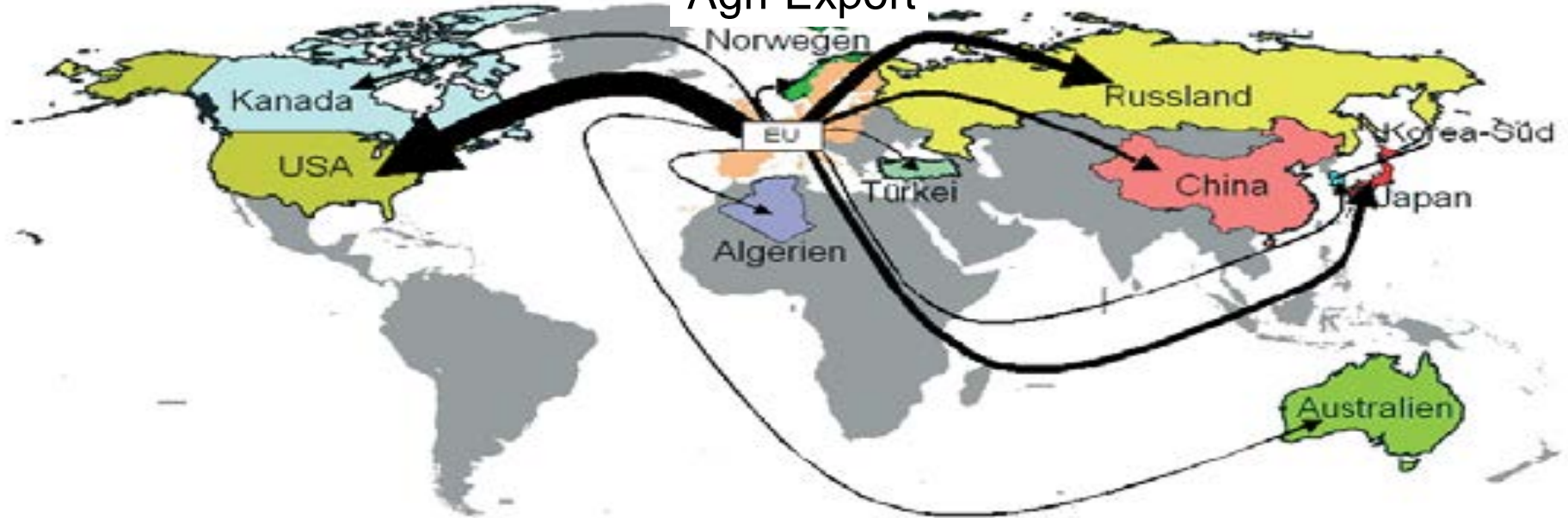
Every ha farm land gets 2.5 kg of pesticides a year



250 to 600 kg mineral N-fertilizers are applied per ha and year



Agri-Export



Agri-Import



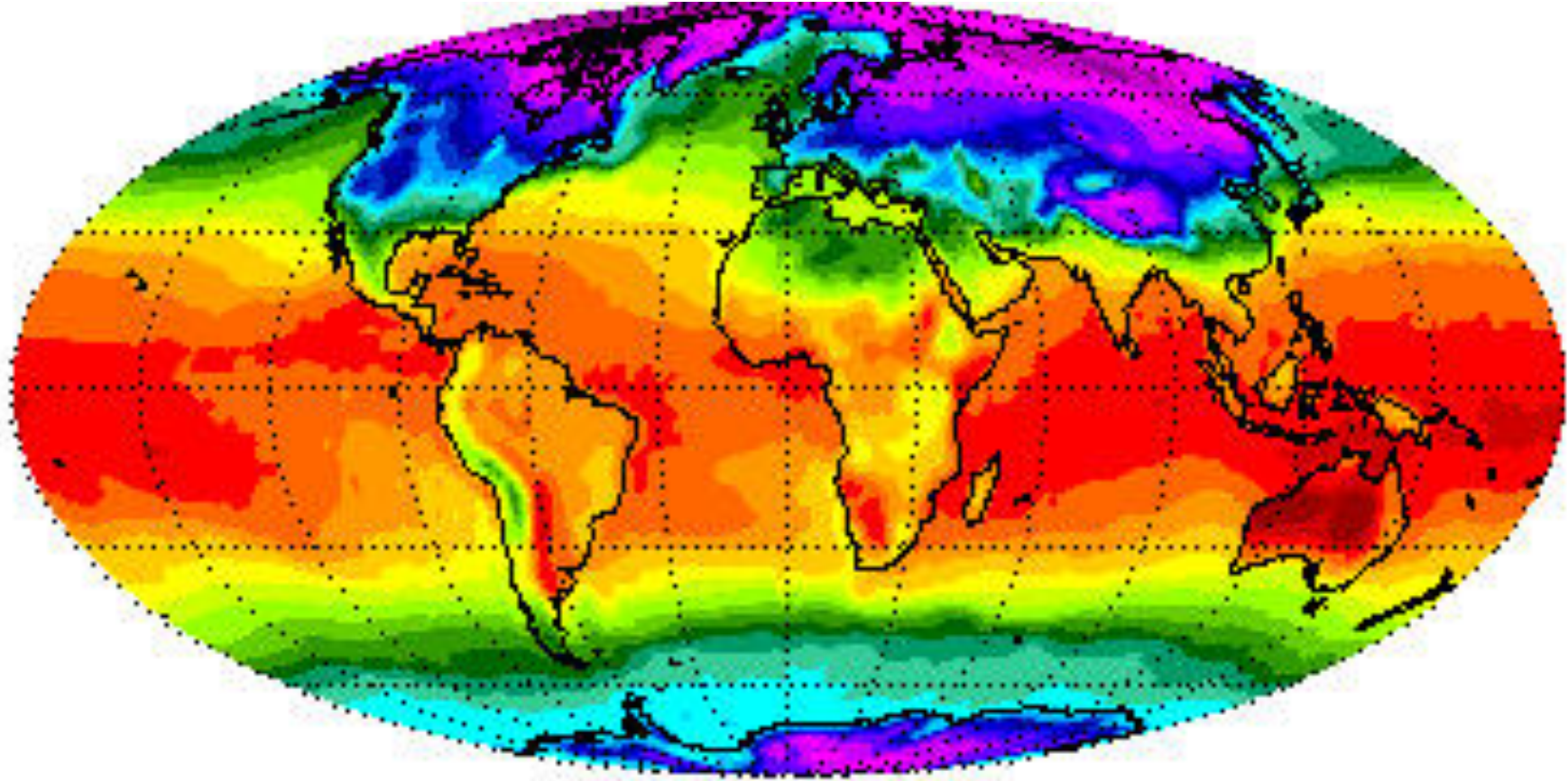
Quelle: UN-Comtrade

The most important trade partners of the EU

GM crops are cultivated on 170 mio ha



Climate will change



Agricultural Biodiversity endangered



Water contamination through pesticides and fertilizer



The future agricultural challenges:



- **Food security and safety**
- **End of fossil energy**
- **Climate change**
- **Endangered biodiversity**
- **Pollution (soil, water)**
- **Income**
- **Changing ethics**

Recently we use our world 1.5-times

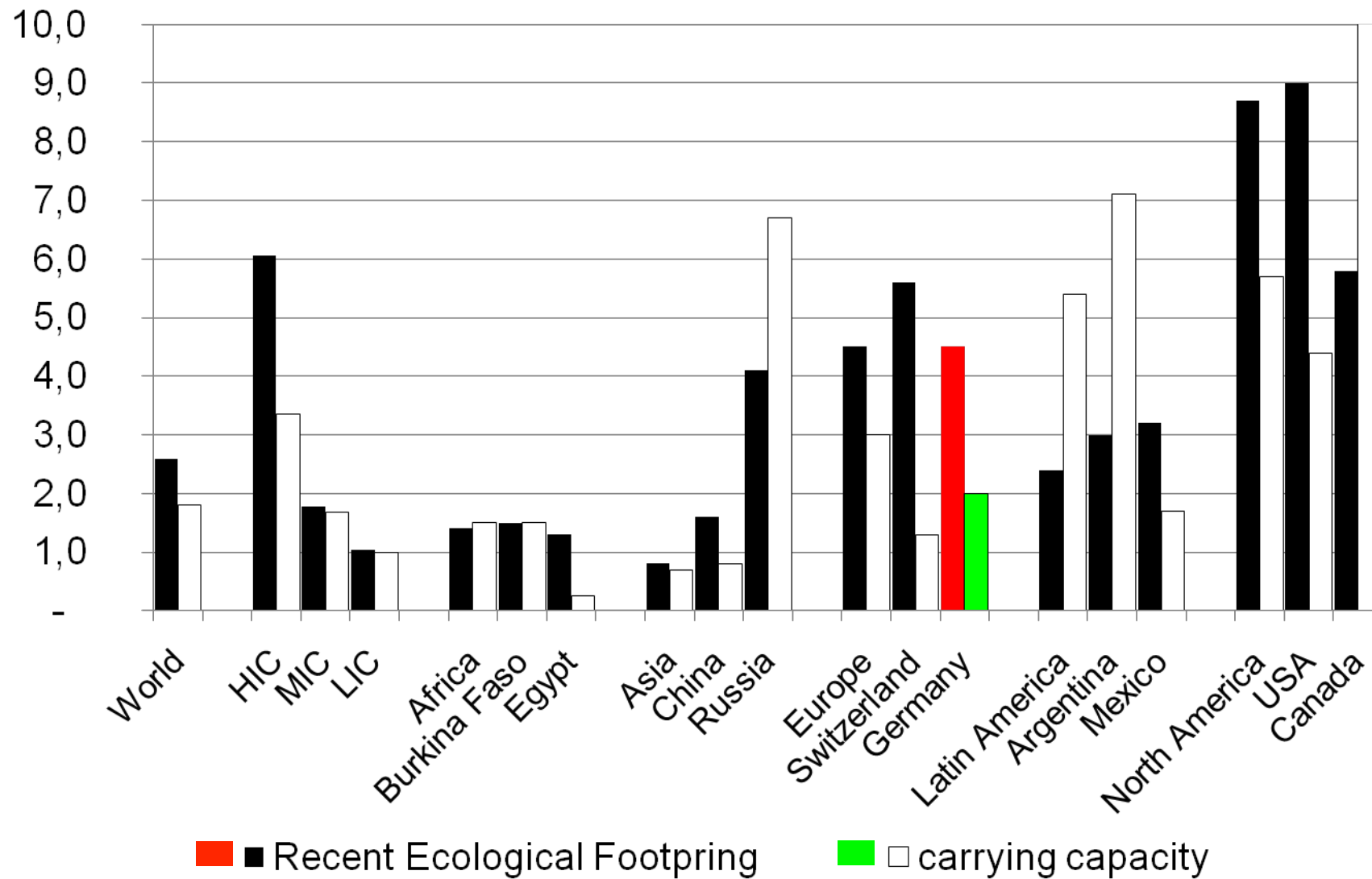
Biosphere II failed



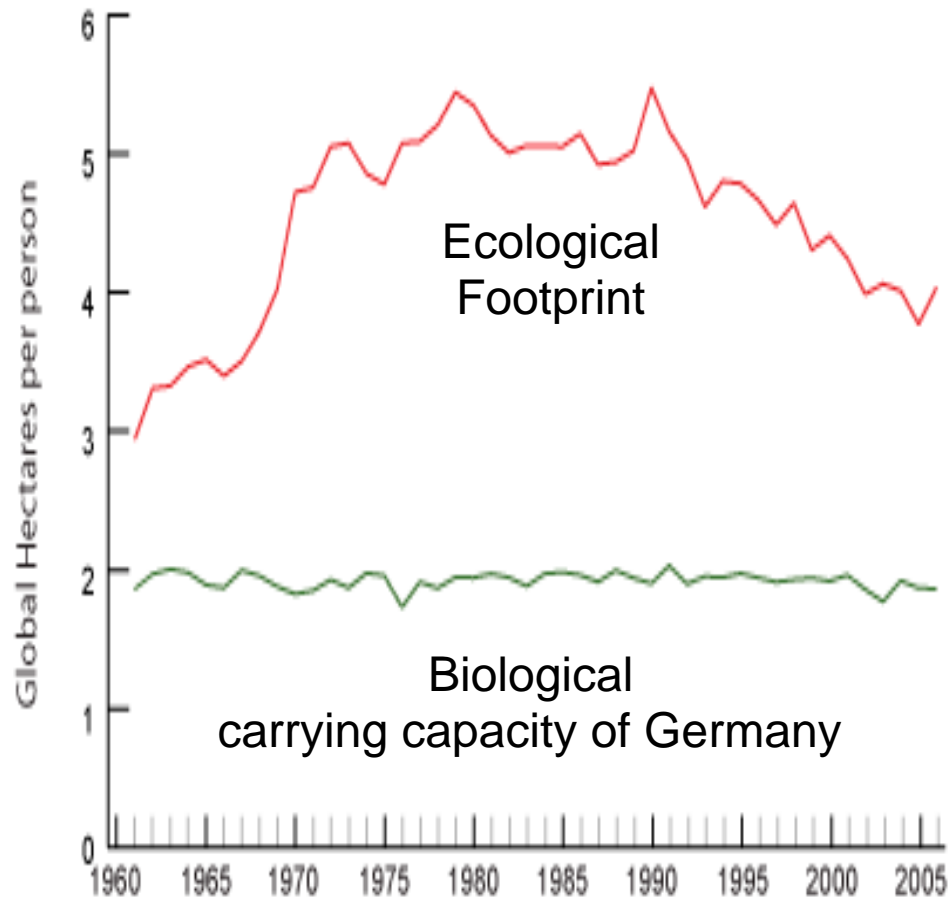
Our beautiful little earth - facts

| Earth | unit | result |
|-------------------------------------|-----------------|--------|
| Total area (Land, wate) | Billion ha | 51 |
| Land | Billion ha | 15 |
| Utilisable land | Billion ha | 11 |
| Population today | Billion persons | 7.2 |
| Utilisable land per capita | ha / capita | 1.5 |
| Population tomorrow (2050) | Billion persons | 9.0 |
| Utilisable land tomorrow per capita | ha / capita | 1.0 |

Ecological footprints of selected countries and regions



German Ecological Footprint

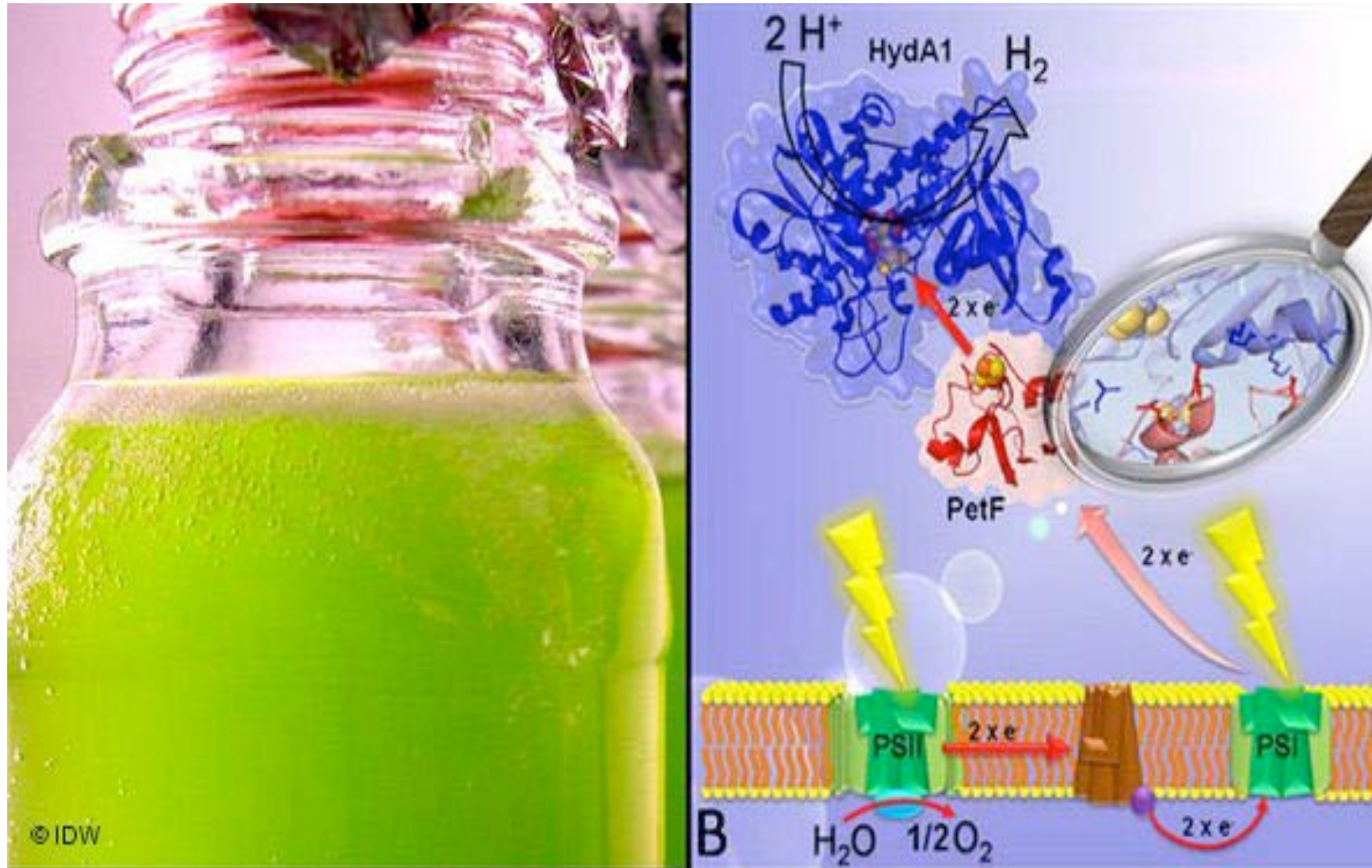


| Categories | today real |
|--|-----------------------|
| Living (everything related for housing: building material, heating energy) | 1,2 ha (27%) |
| Food (everything related to food, processing and consumption) | 0,8 ha (18 %) |
| Mobility: all vehicels (production and utilisation) incl. traffic infrastructure | 0,6 ha (13 %) |
| commodities (all, what is used and not included in the previous goods) | 1,1 ha (24 %) |
| Gray area (public buildings and commodities without traffic infrastructure) | 0,8 ha (18 %) |
| Ecological Footprint Germany | 4,5 ha (100 %) |

If every Chinese ...



Options against designer and molecular food



Natural versus Artificial food ?



Organic Farming as ONE solution for future sustainable food chain?

- Organic food production as process qualities
- Food qualities are not promised and only seen as result of good process qualities (natural food)

Organic pioneers have seen risks in chemical and industrialized food production

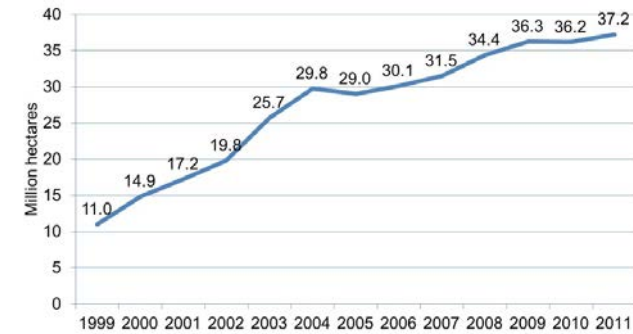
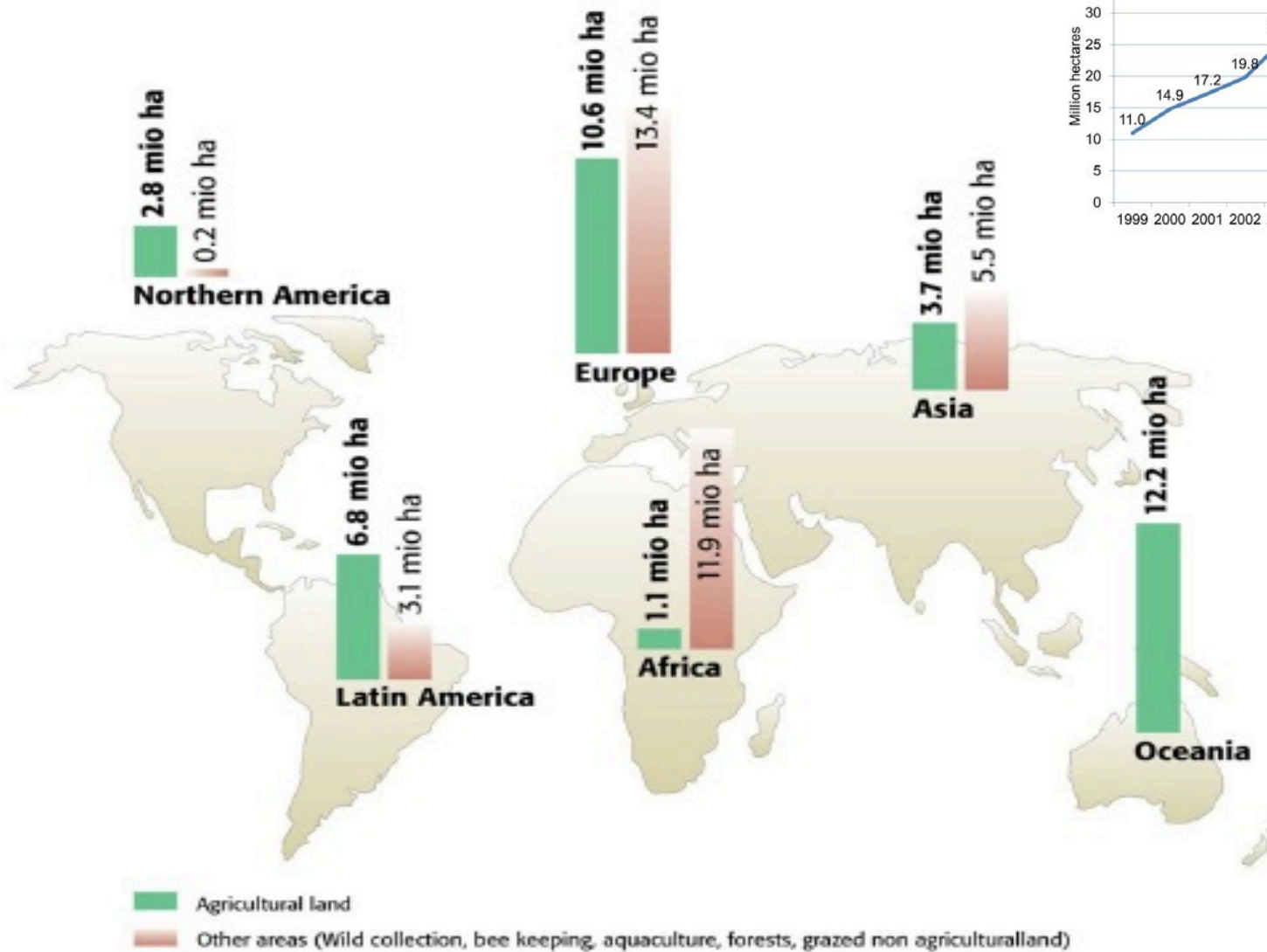
- 1924: Steiner has spoken to farmers in Poland to use a novel method of farming: biological dynamic agriculture was born.
- 1943: Lady Eve Balfour published a book about her experience in farming without chemistry (founder of soil association).
- 1950 onwards: Müller and Rusch have defined the biological organic (Bioland founded 1971) farming to release farmers from the pressure of intensive farming: soil health was the focus.
- ...

Global development of Organic sector

- More hectares,
- more farmers,
- increased market share,
- more in the head of consumers,
- globalisation
- accepted and promoted

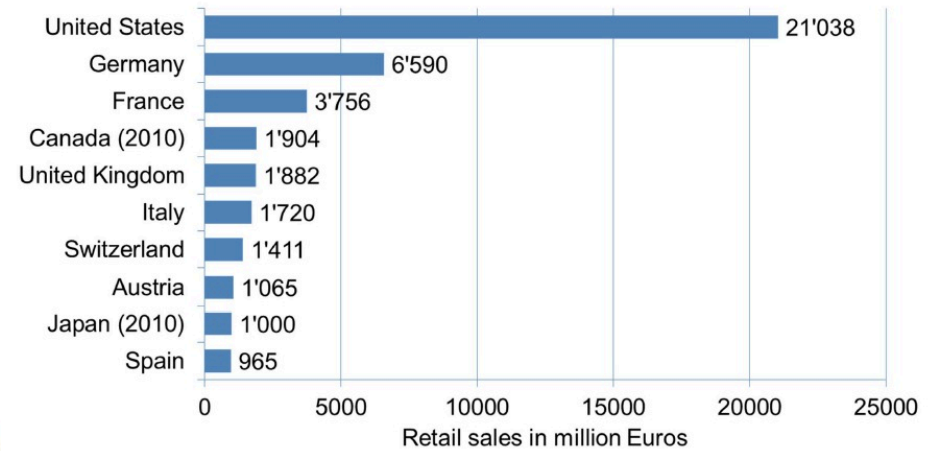
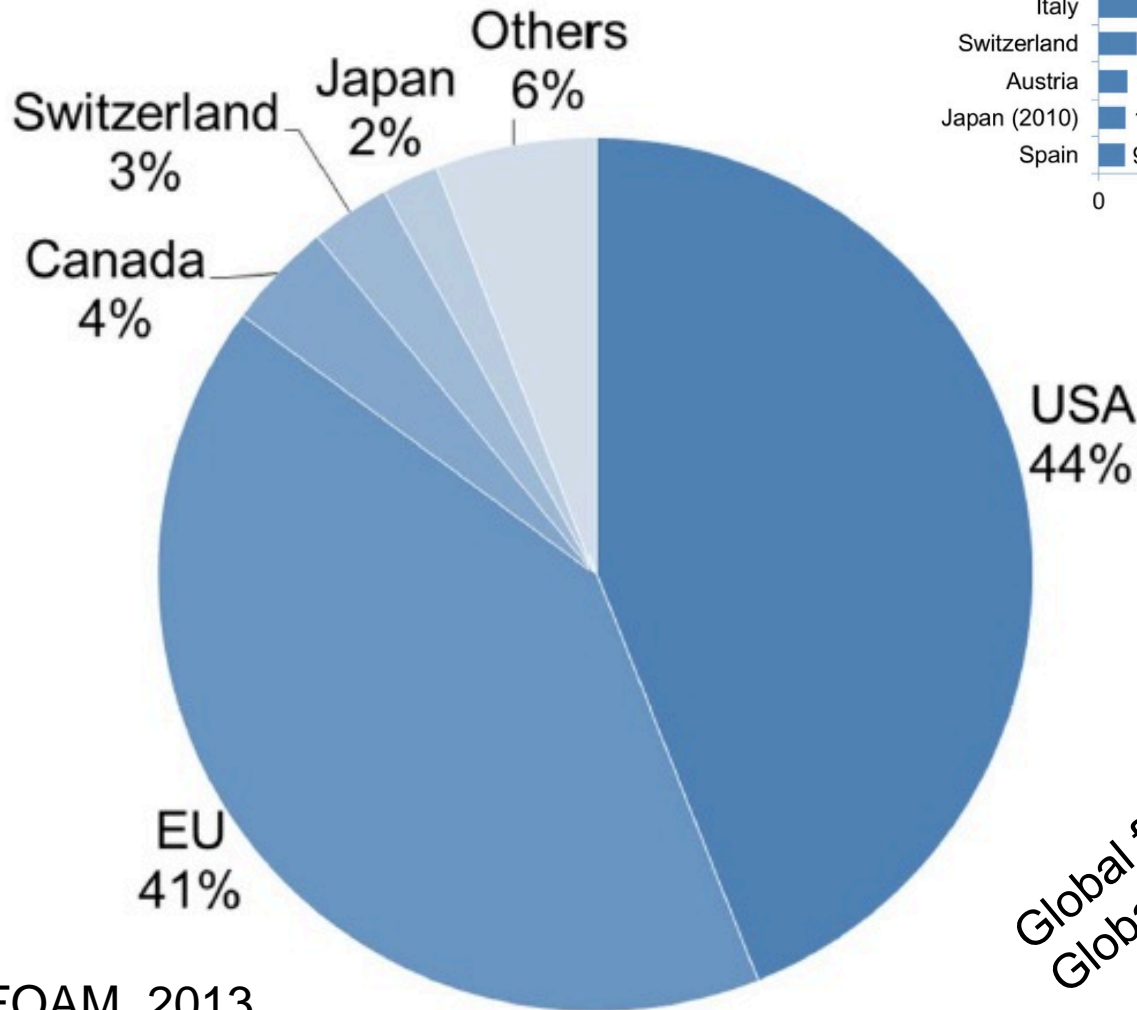


The world of Organic Farming 2011



IFOAM, 2013

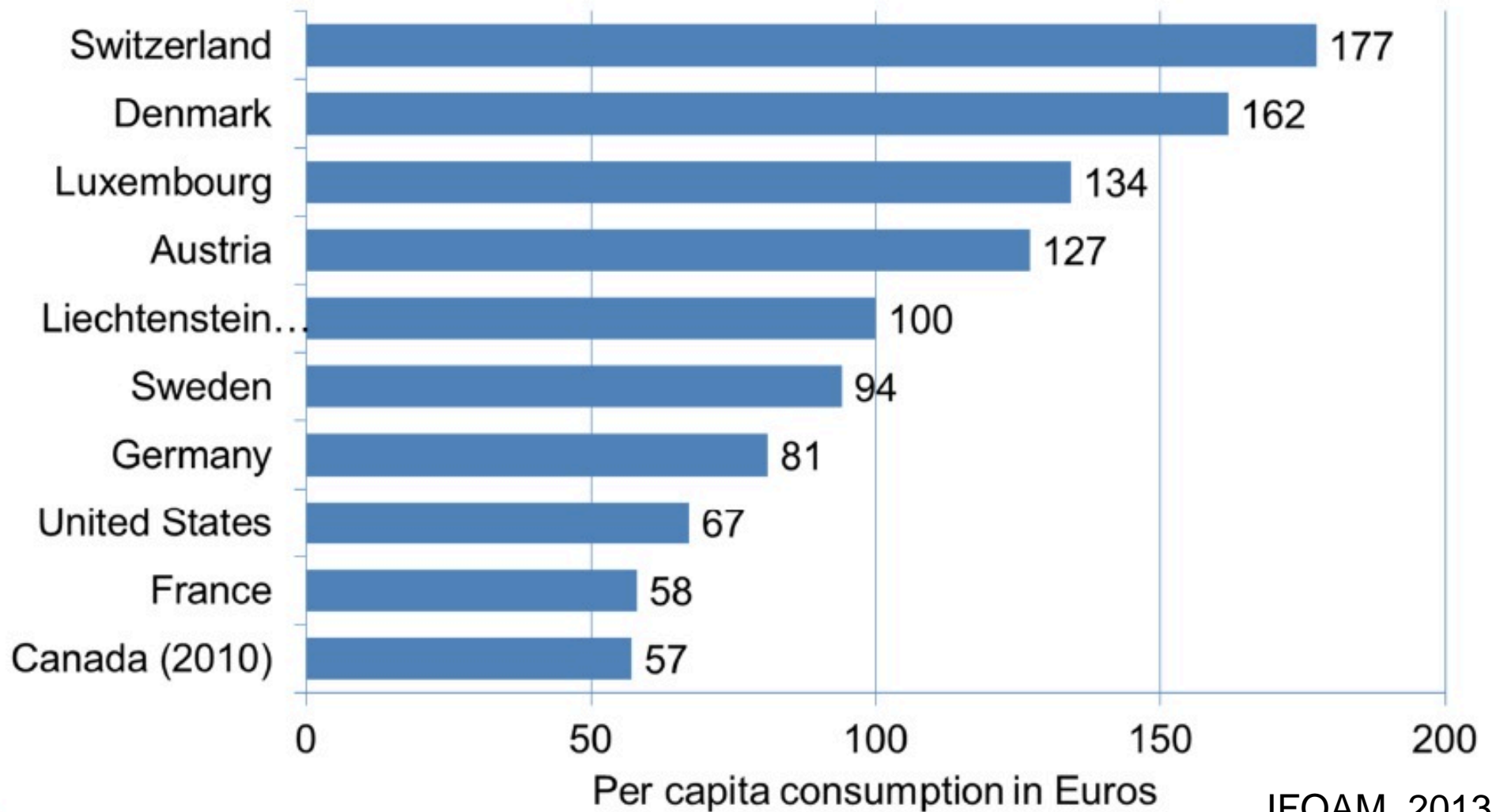
Organic world market 2011



Global food trade: 4 trillion Euro
 Global organic trade: 40 billion Euro (1%)

IFOAM, 2013

Organic food per capita, 2011



Organic consumers eat more healthy



Organic enters the market – slowly but continuously



Marketing of organic products



100% Organic supermarkets

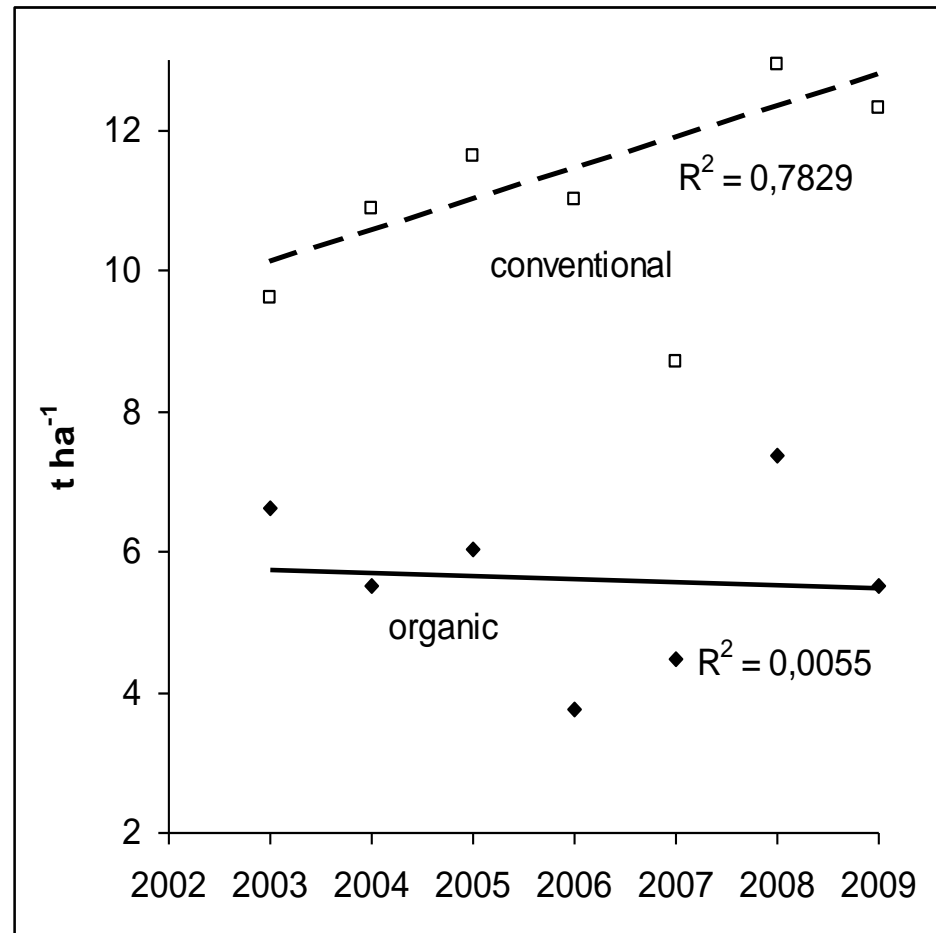
Same price – same quality?



Non-Development of Organic sector

- Good and bad organic farming and processing is possible
- Promises like sustainability, animal welfare, fair production are not fulfilled always (not possible or not intended in production: sustainability benchmarks missed)
- Frauds
- Link between consumers and producers is lost
- Organic research has not answered the questions ...

The problem: Yield and quality stagnation



10.5-11.9%
raw protein

8.5-9.5%
raw
protein

Organic versus conventional:

High input – high output systems:

- Organic has <50 % output

Medium input – medium output systems:

- Organic has 75 % output

Low input – medium output systems:

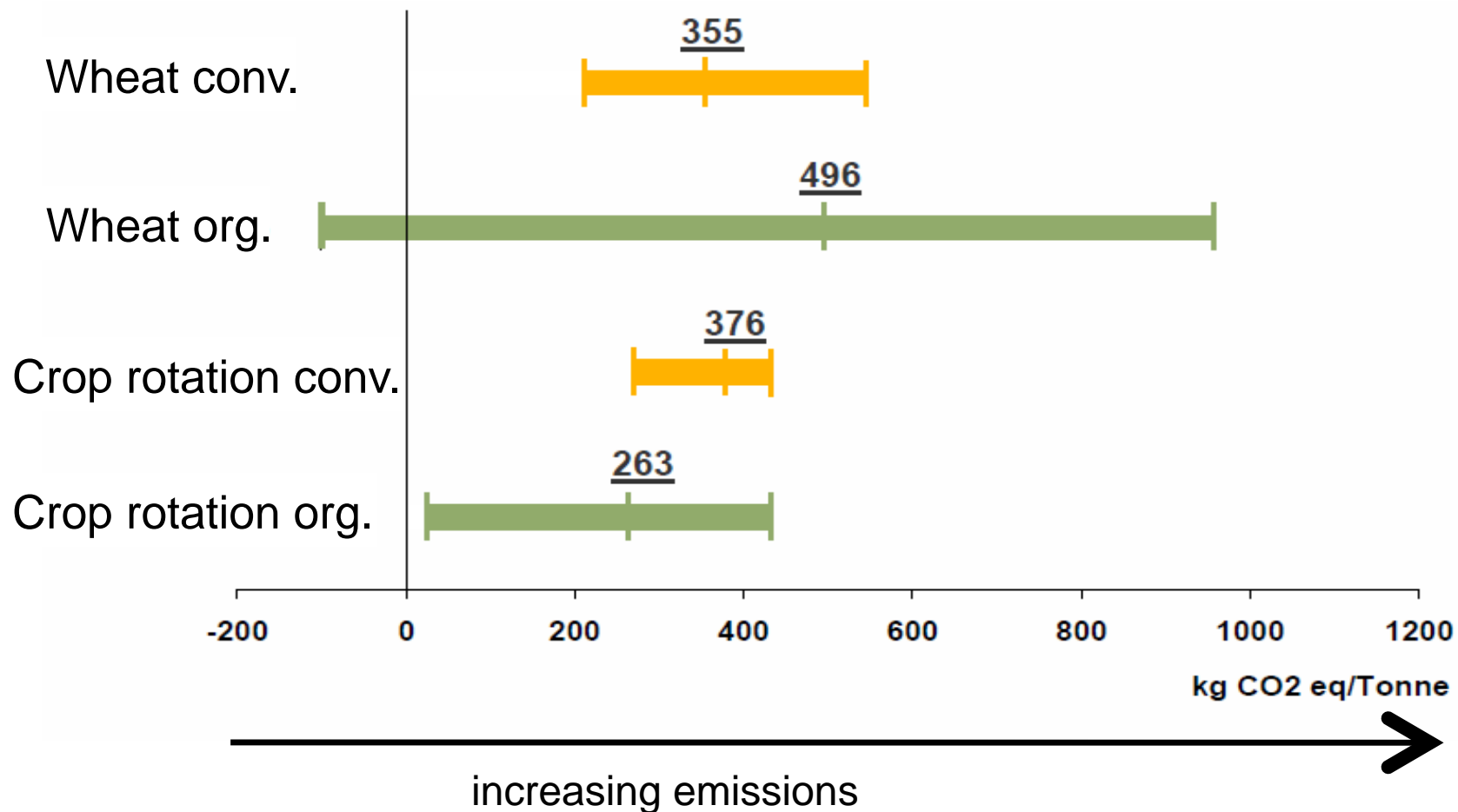
- Organic is like conventional

Low input – low output systems:

- Organic can have 125 % output.

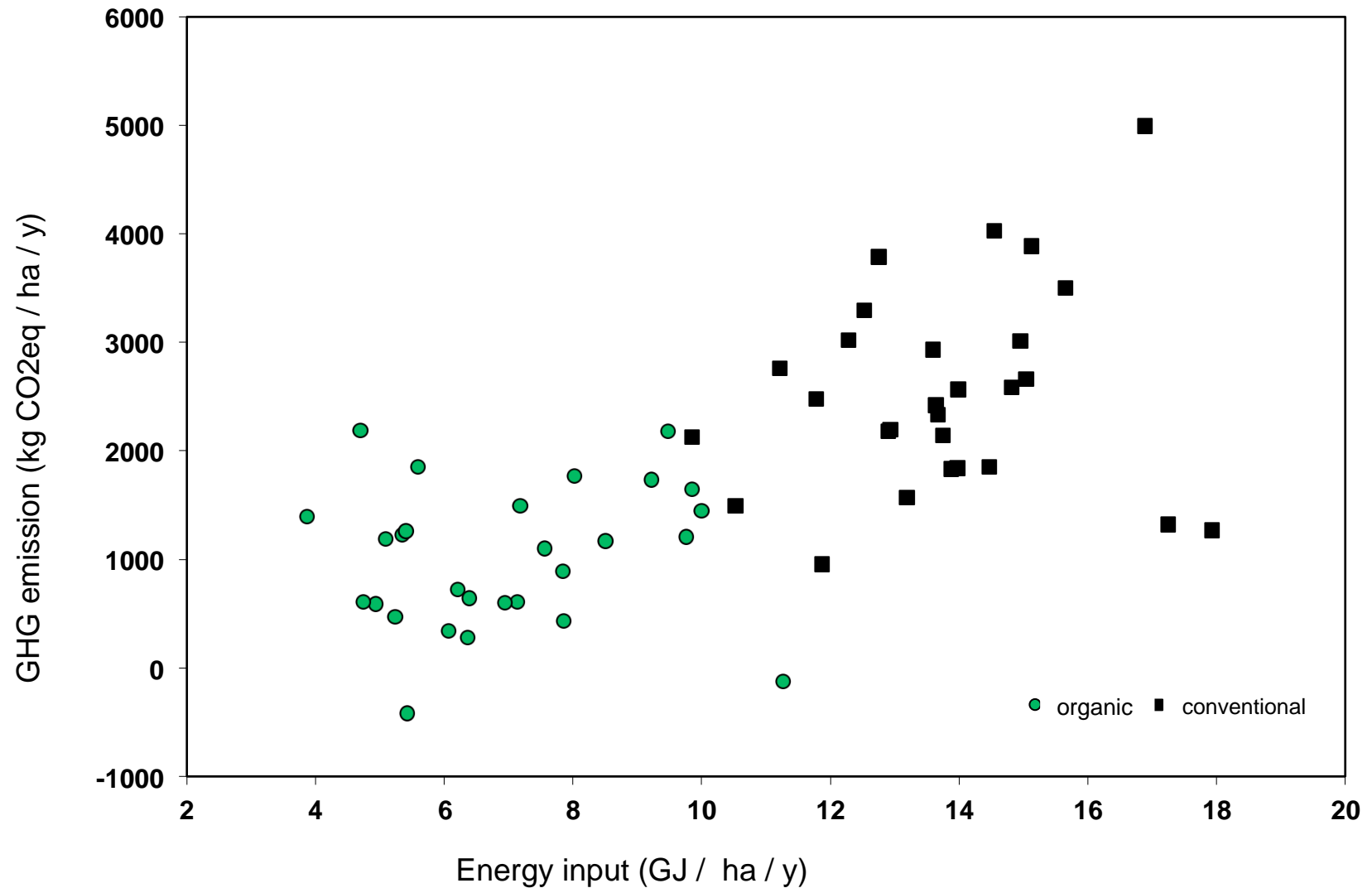
Yield development in variety trials in winter wheat in organic and conventional production (North Germany, Schleswig-Holstein, data: Landwirtschaftskammer - official advisory centre)

GHG emission from conventional and organic farms (20:20) per ton of wheat and crop rotations

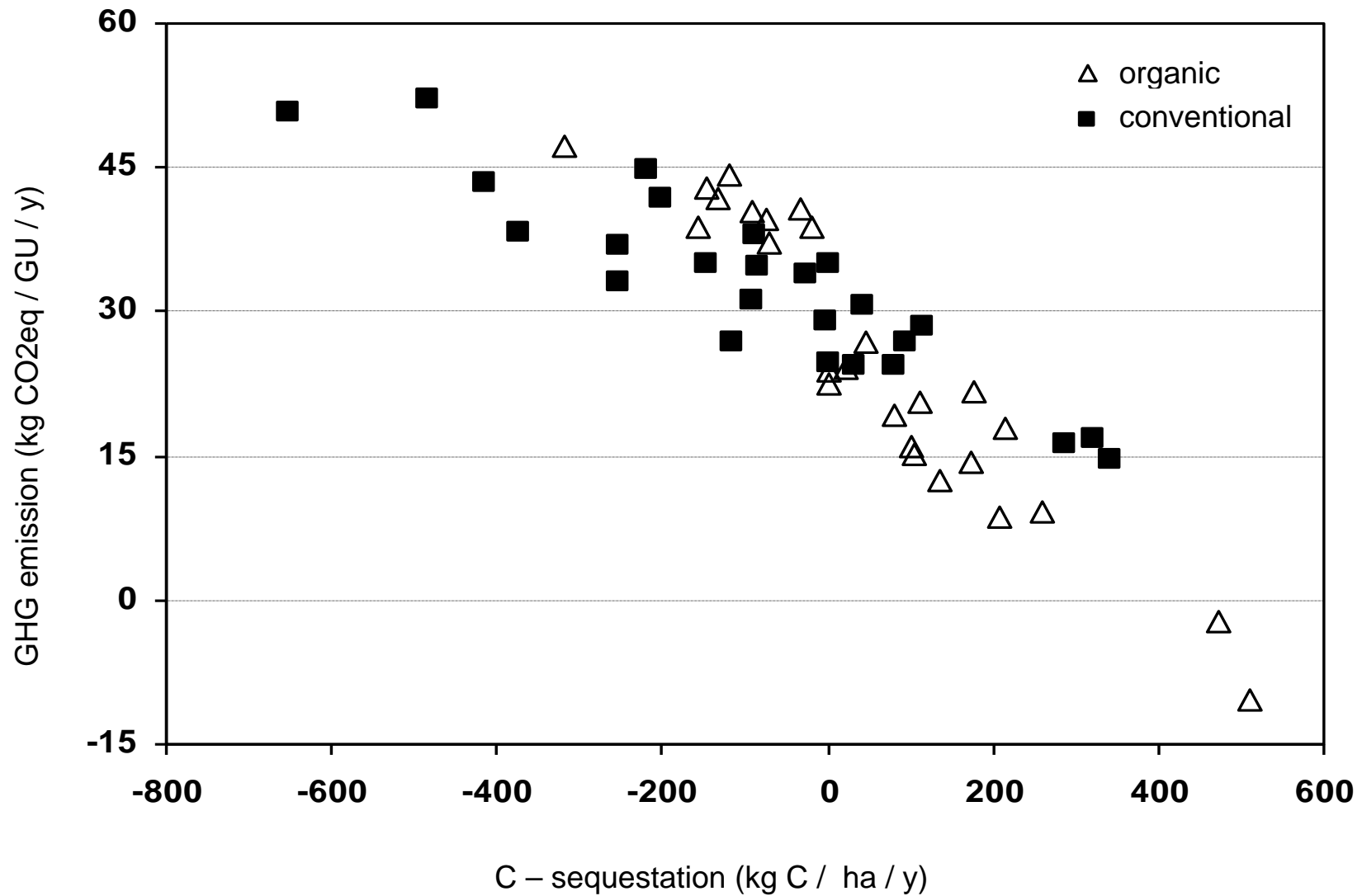


(Heißenhuber 2008)

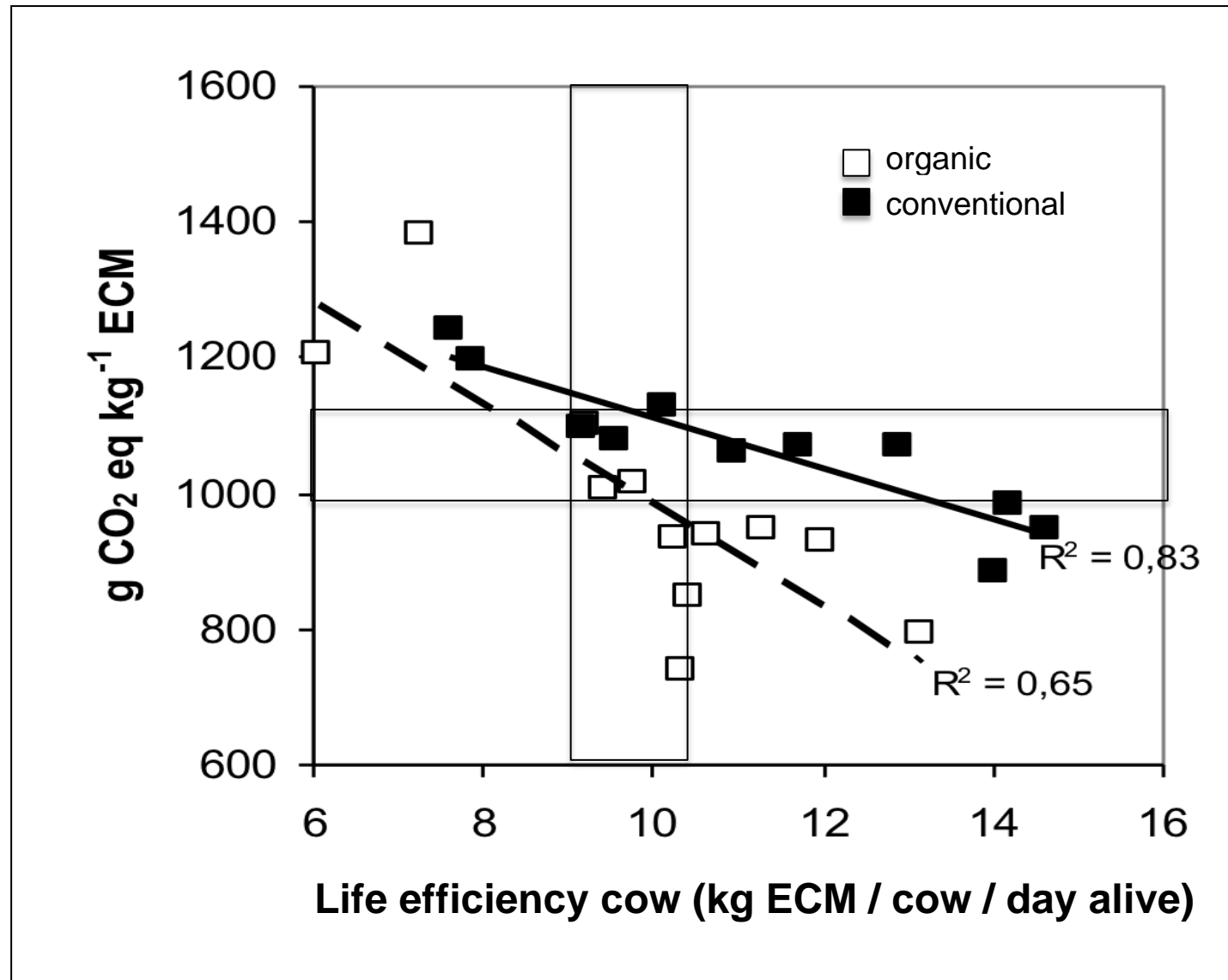
Energy-Input and Energy-Output (2010)



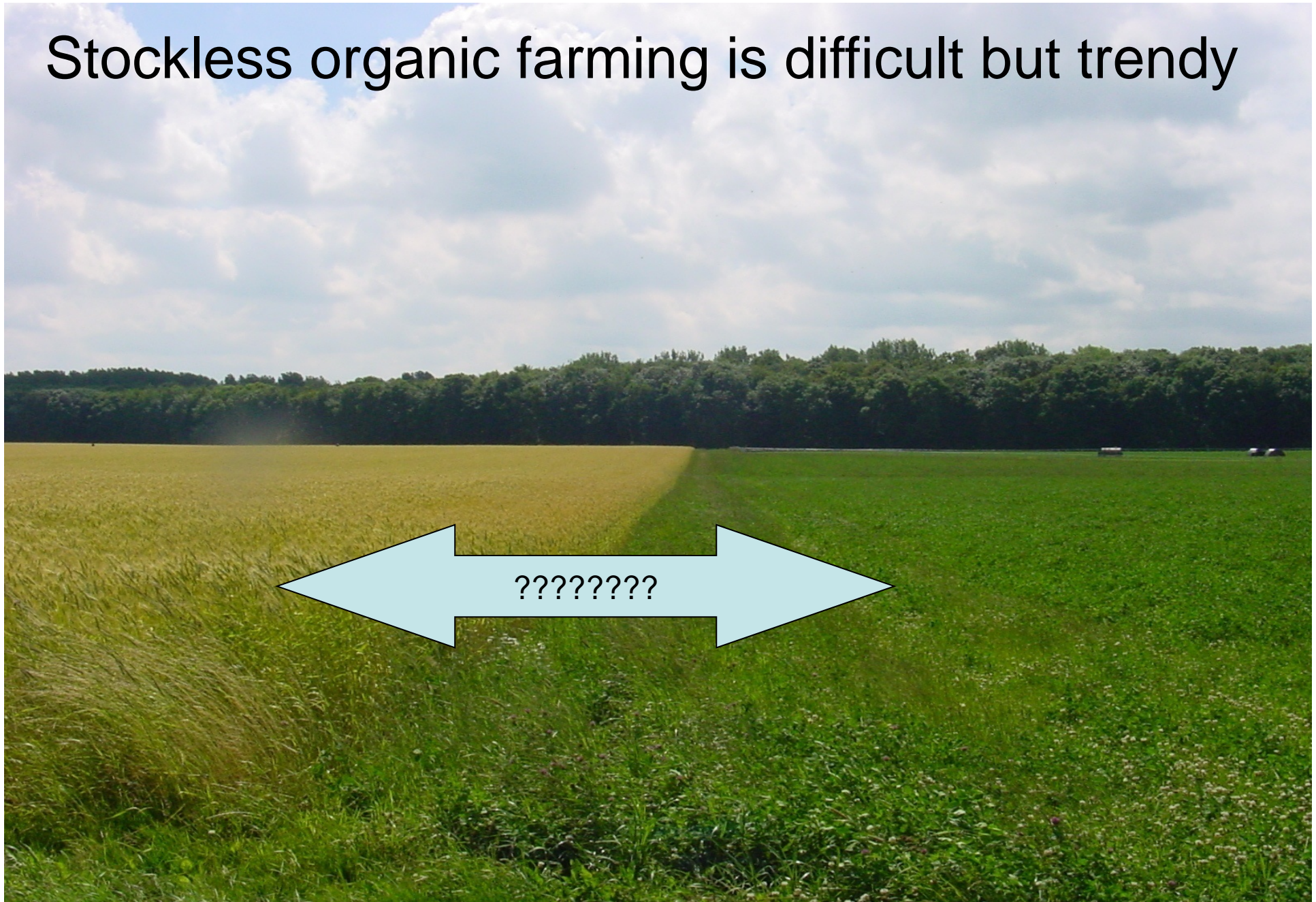
GHG and organic matter per grain unit



Life efficiency of a cow and GHG emission



Stockless organic farming is difficult but trendy







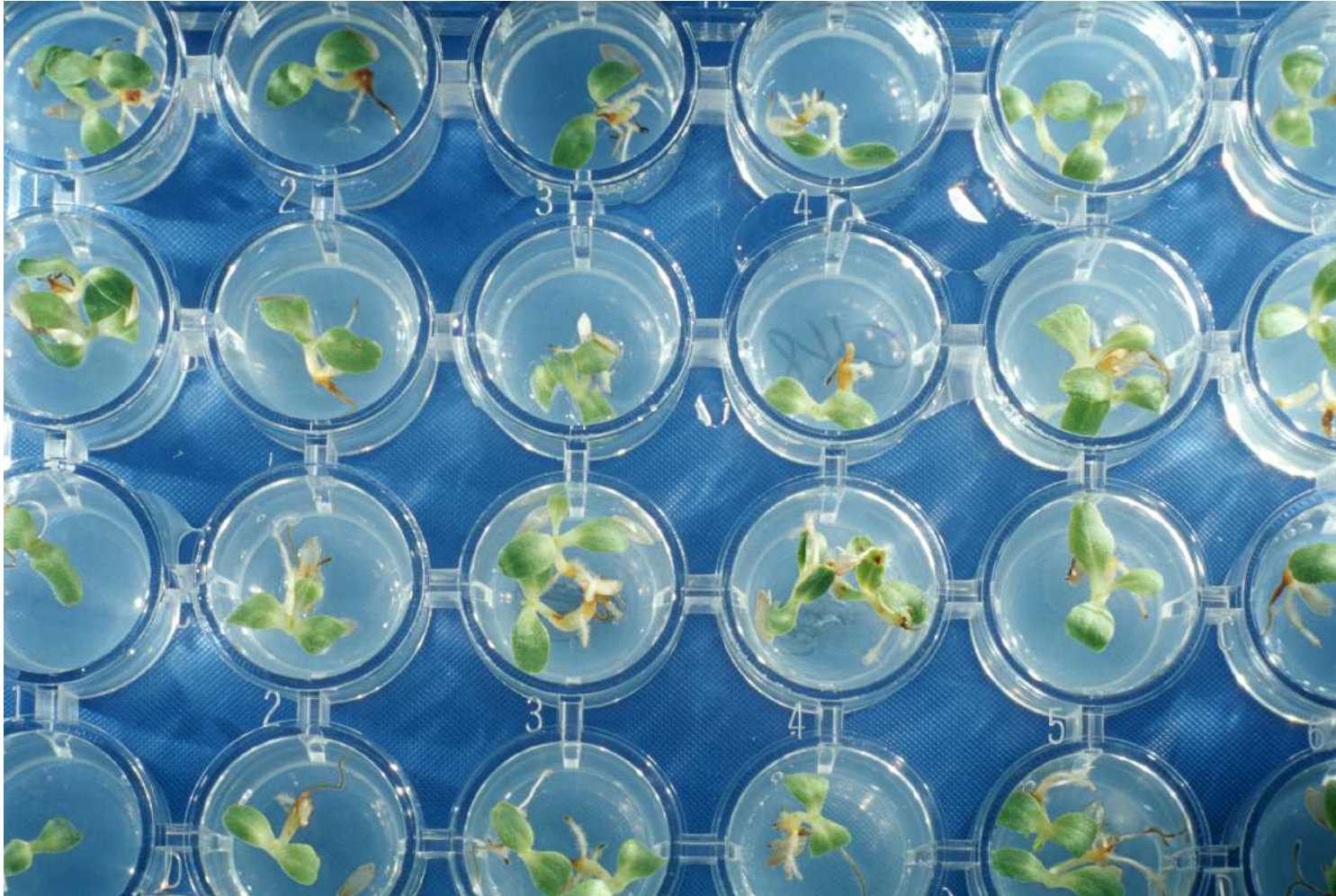
Organic food can make people sick and kill



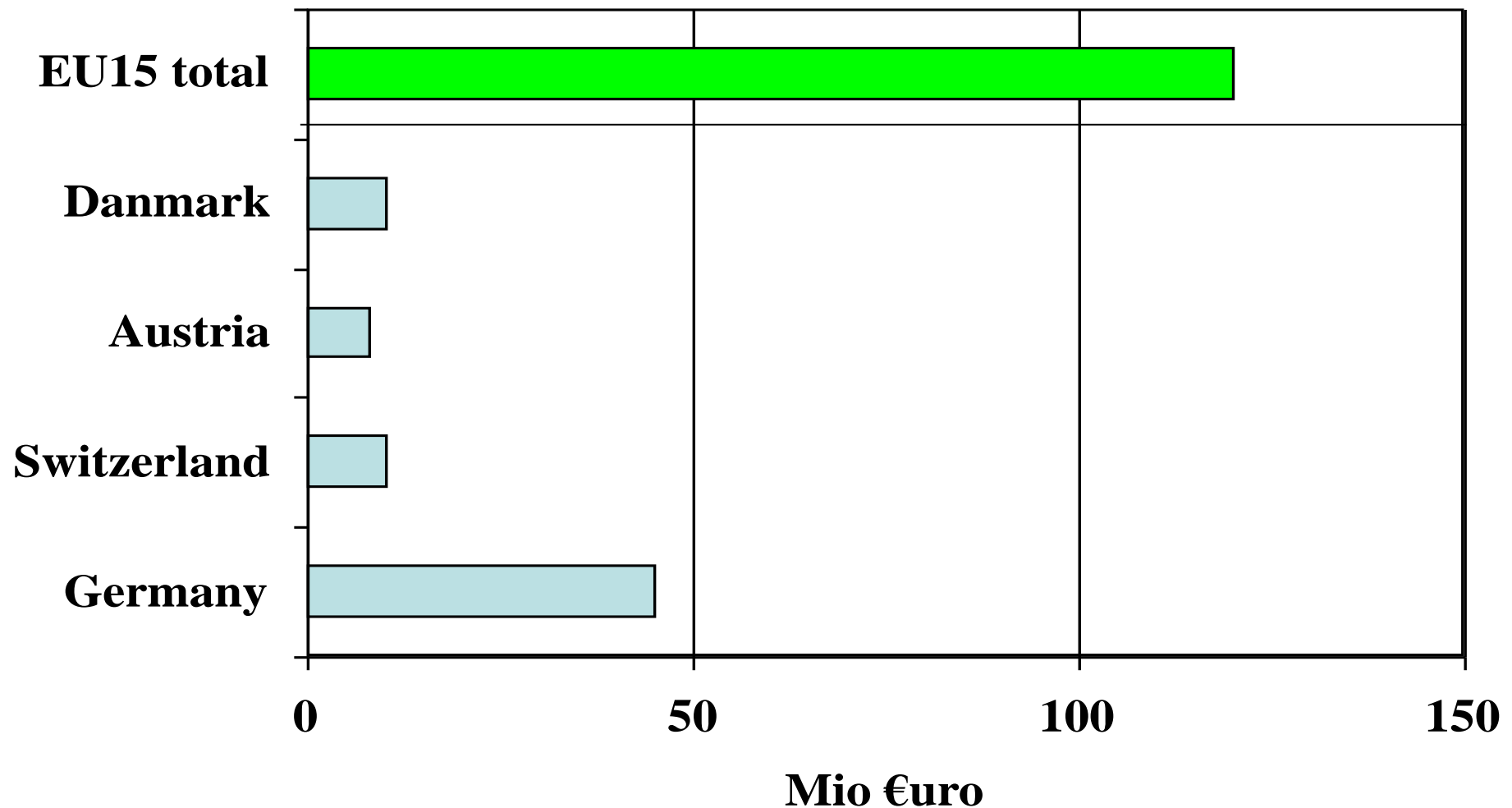
Organic research has tried to find answers ...

- Pfeiffer has tried to proof the preparates of bio.-dyn. farming as introduced by Steiner.
- Balzer and Balzer-Graf: vital power of food, picture making methods
- Vogtmann (first organic chair 1982) has asked questions about organic food qualities and the need for research
- FiBL was founded 40 years ago (1973) and tried to answer the impact of organic farming on food.
- Millions of Euro have been spend to find answers about food qualities from organic products
- ...

Organic farming needs more research



Organic Farming Research Budgets in Europe in 2010



Organic Research in Germany

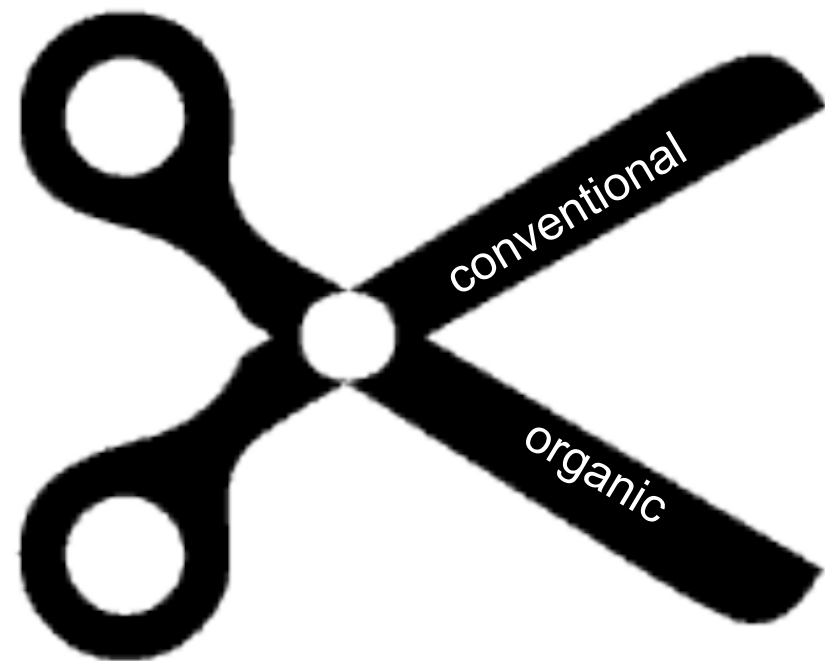
(scientists, money, research facilities)

- University chairs: about 35 Professors and 100 permanent scientists, good research facilities with experimental stations (all together 1000 ha farm land and greenhouses), labs and infrastructure, 30 mio Euro / y, about 150 finishing students / y.
 - Federal research institutes: about 50 scientists, 7 mio Euro / y, 600 ha experimental station, modern labs and infrastructure
 - state research facilities: about 100 scientists, 3-4 mio Euro / y, experimental facilities
 - organic action scheme: since 2002 annually, 17 - 36 Mio. Euro / y
 - Private research: 150 scientists, 4-10 mio Euro / y, labs and stations
- = 435 scientists, 61-87 mio Euro / y, 2000 ha experimental stations

Agricultural Research

- Global:
 - Total: 40 billion Euro / y public and private, (IFPRI, 2008)
 - Organic: about 200 mio Euro (Germany: 25-30 %, Europe: 85 %): mainly public (0.5 % of total agri-research) (share of organic farm land: 0.8 %)

- Germany:
 - 3,800 mio Euro / y (BMELV, 2011)
 - Organic Germany: 61-87 mio Euro / y, (1.0-1.6 %) (Share of organic farm land: 6.7 %)



Main topics for scientific support of the organic sector

- Increase production per hectare and animal (resource efficiency): agronomy and livestock science
- Make organic farming more sustainable (environmentally friendly, animal welfare, fair in the whole chain): ecology, biology, veterinary, policy science
- Make more healthy food: reduce negative and increase positive ingredients (nutritional value): medicine, food processing science
- Make food profitable for the whole chain: economics and marketing science
- Understand consumer trends and habits: sociology and psychology
- Communication with farmers: towards good farm practice

Organic food research conclusion:

- In the last 15 years, there is a trend of professionalism in organic (food) research observable (mainly in Europe).
- The speed of development is – much – too slow.
- The resources for increasing speed in organic research is not sufficient (international and national public funds, private money).
- Organic farming research is focusing mainly on „last millenium“ questions and methodologies and does not have answers for future „next millenium“ challenges (hindered by standards and regulations, even in thinking)
- Organic research has lost the image as trend setter.
- Organic research must be brave for new competitions, questions and methodologies.

A sunset scene with a gradient sky from blue to orange. Three birds are flying in the sky, their silhouettes forming a smiley face shape. The bottom of the image shows a dark silhouette of trees and a body of water.

Thank you