



# OK-Net Arable

**State of the art research results and best practices – Task 3.1: D 3.1**

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et al. (2016)**

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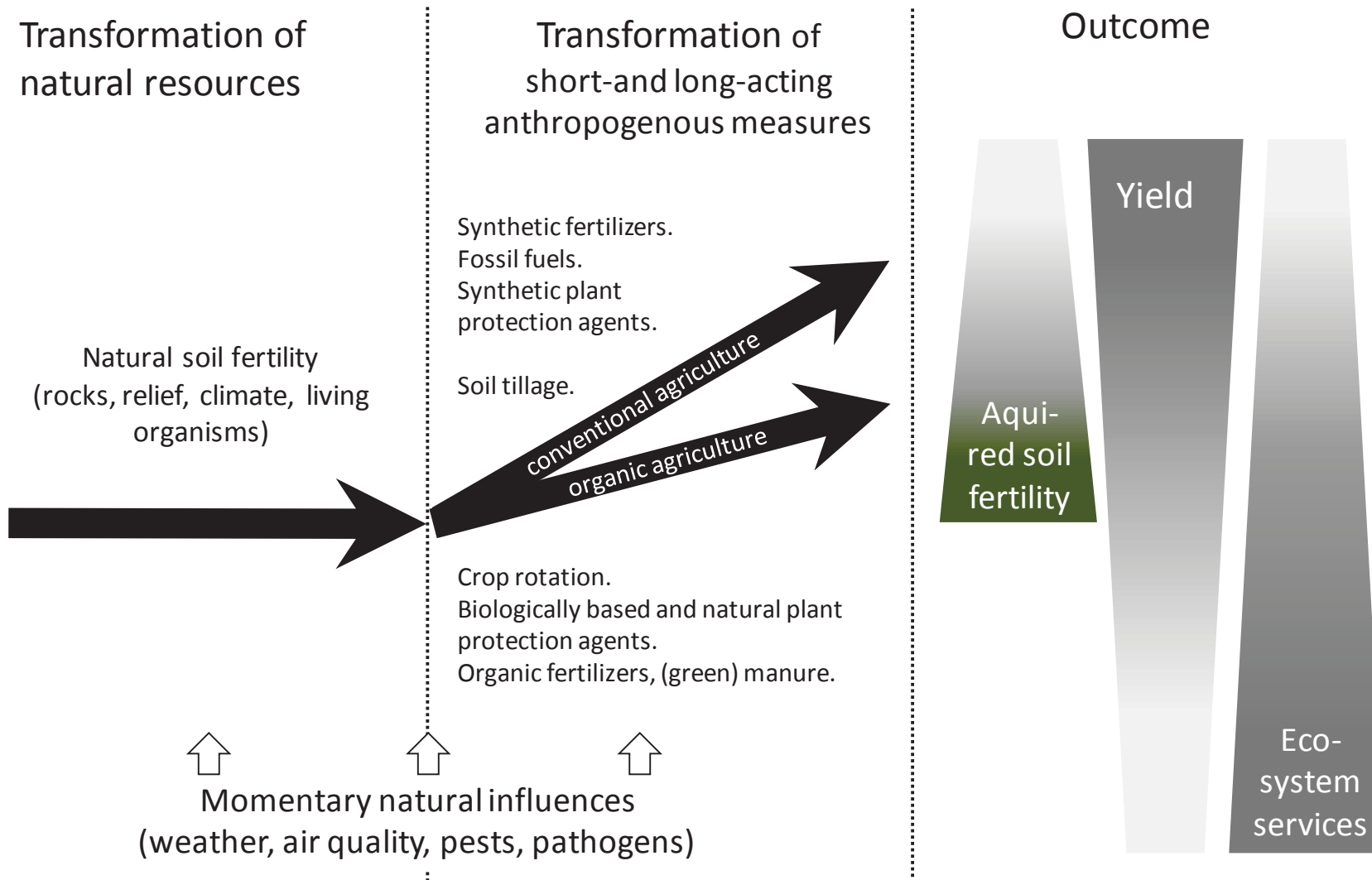
# Done



- Identification of bottlenecks on organic practices based on the scientific and grey literature of 3 decades.
- Intensive involvement of 30 scientists and farm advisors at FiBL and 5 key experts from UK, EE, IT, PO and GER.
- Screening for solutions ready to become used by farmers.

## Knowledge Synthesis

- Meta-meta analysis.
- Sound concept of transformation in different farming systems.
- In-depth analysis crop by crop.
- Identification of deficits and best solutions (ready, half-ready and up-coming).
- Clear recommendations for the farmer innovation groups.
  
- To be published by the end of January 2017 (Science or PNAS).



## Table 1: Yield gaps calculated by different meta-analyses (all crops under consideration)

Study	Yield gap
Lotter 2003	-10 to -15%
Seufert et al. 2012	-25%
Stanhill 1990	-9%
Ponisio et al. 2014	-19%
de Ponti et al. 2012	-20%
Badgley et al. 2007(developed countries)	-9%

# Crop-specific meta-analysis:



Study	Crop	Yield gap
Seufert et al. 2012	Legumes	NS
Badgley et al. 2007	Legumes (developed countries)	-18%
de Pontiet al. 2012	Legumes (global average)	-12%
Cavigelli et al. 2008	Soybean	-19%
Wortman et al. 2012	Soybean	-17%
Lotter et al. 2003	Soybean (legume rotation)	+96%
Lotter et al. 2003	Soybean (manure-fertilized)	+52%
Larsen et al. 2014	Corn	-50%
Posner et al. 2008	Corn	NS
Study	Crop	Yield gap
Seufert et al. 2012	Oil crops	NS
Badgley et al. 2007	Oil crops (developed countries)	-1%
de Pontiet al. 2012	Oil crops (global average)	-26%
Wortman et al. 2012	Sorghum	-10-27%
Cavigelli et al. 2008	Wheat	NS
Posner et al. 2008	Wheat	-17-24%
Study	Crop	Yield gap
Eltun et al. 2002	Potato	-15%
Mäder et al. 2002	Potato	-36-42%
Badgley et al. 2007	Starchy roots (developed countries)	-11%
de Pontiet al. 2012	Roots/tubers (global average)	-26%
Mäder et al. 2002	winter wheat	-10%
Mäder et al. 2007	Winter wheat	-14%
Mayer et al. 2015	Winter wheat	-36%
Posner et al. 2008	Corn, soybean, wheat	-10%



# Grain yields of winter wheat varieties

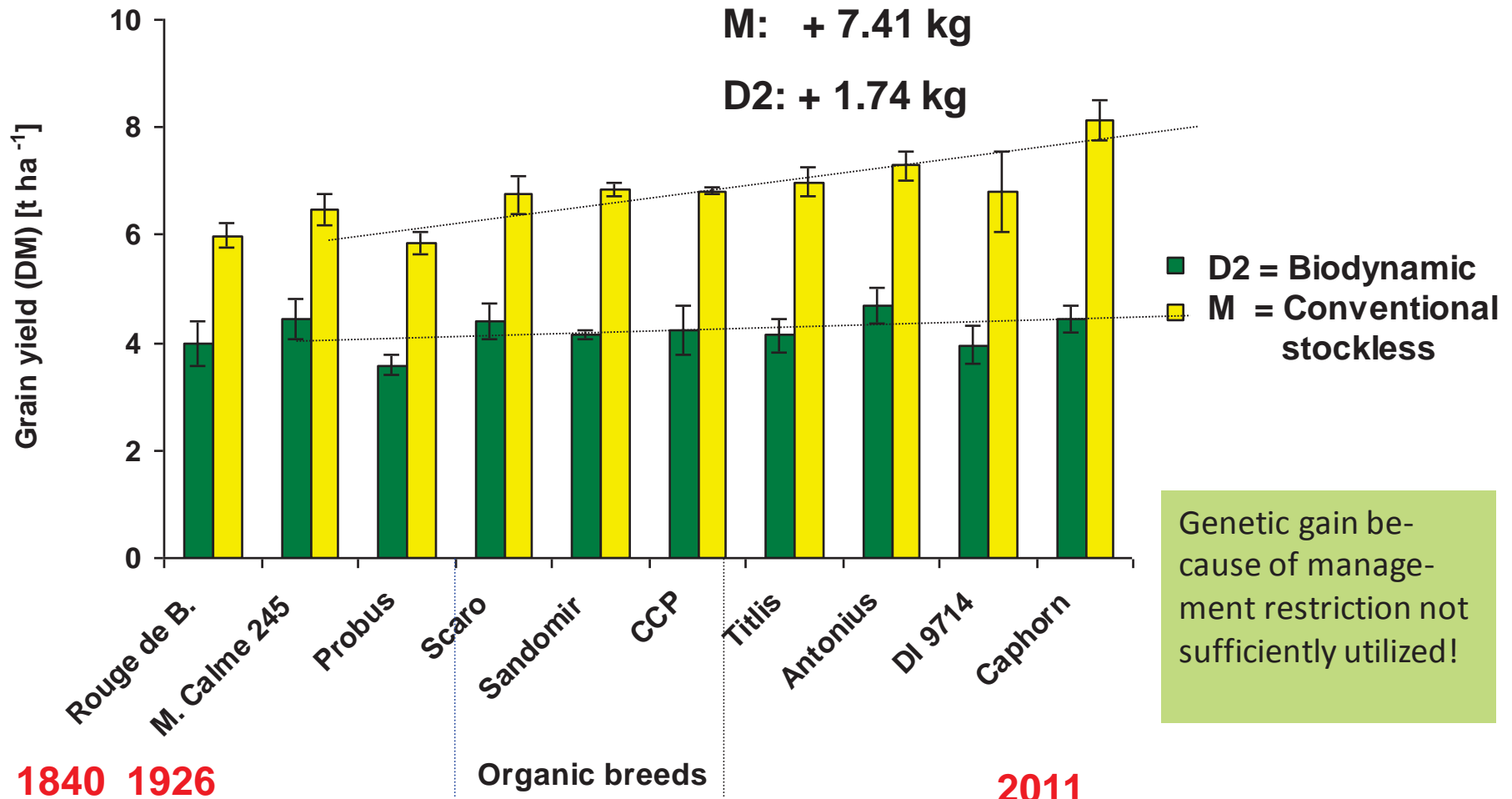


Mäder, Fliessbach, Niggli (2002), Science 296

Yield increase per year

M: + 7.41 kg

D2: + 1.74 kg



## Key lever: Soil fertility

- Soil organic matter:
  - C: soil depletion, compaction, erosion etc., nutrient insufficiency.
  - M: Reduced tillage, fungi based associations.
- Legumes:
  - C: low variety choice and availability, lack of understanding of management and system level benefits.
  - M: Alternative crops, alternative techniques (intercropping, pre-cropping, crop species, variety choice, crop rotation, green manure, bio-effectors).
    - Tools as VSA, Soil Quality Test Kit, Spade Diagnosis.

C=Challenge

M=Measure



# Key lever: Nutrient management



- Sewage sludge:
  - C: Not accepted by organic regulations, pollutants.
  - M: Precipitation processes for P-recycling.
- Organic fertilizers:
  - C: Costly N and K sources from animal feathers, horns, hoofs, meat-bones, wool, hides.
  - M: Vinasse.
  - C: Phosphate rock and potassium sulphate for P and K insufficiently available and inefficient.

C=Challenge

M=Measure

## Key lever: disease control



- C: Multifactorial and variable → few direct measures available.
- C: Development of PPP-compounds: long and costly.
- M: Decision support systems (Öko-SIMPHYT).
- M: variety choice through breeding programs (i.e. potatoes, legumes):
  - Diversification strategies
  - Combination of different approaches
- M: Crop rotation and intercropping.
- M: Soil tillage and appropriate tillage choice.
- M: Seed quality: inspection, PPPs or heat treatment.
- M: PPPs, plant strengtheners, basic compounds.

C=Challenge

M=Measure

# Recommendation from Report



- Disease control:
  - Preventive M:
    - Tolerant/crop resistant varieties: variety testing and breeding
    - Priority on potato and legume breeding (ex. late blight)
    - Crop rotation design, soil tillage, cultivation techniques...
  - Direct M:
    - Novel techniques (physical methods, biocontrol agents, botanicals) needed against virulent diseases. *Thanks to intensification of research in the last 10 years, considerable progress is expected.*

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