

## **OK-Net Arable**

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

Urs Niggli, Malgorzata Conder, Klaus-Peter Wilbois et al. (2016) Research Institute of Organic Agriculture (FiBL)

#### Done



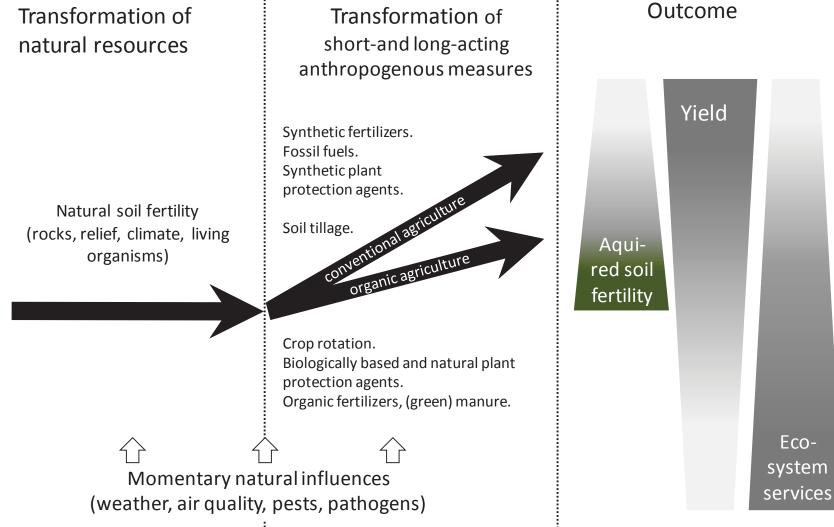
- Identification of bottlenecks on organic practices based on the scientific and grey literature of 3 decades.
- Intensive involvement of 30 scientists and farm advisors at FiBL and 5 key experts from UK, EE, IT, PO and GER.
- Screening for solutions ready to become used by farmers.

### **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)

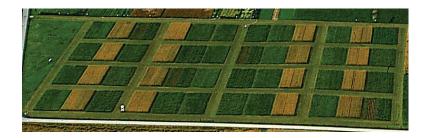
Study	Yield gap
Lotter 2003	-10 to -15%
Seufert et al. 2012	-25%
Stanhill 1990	-9%
Ponisio et al. 2014	-19%
de Ponti et al. 2012	-20%
Badgley et al. 2007(developed countries)	-9%



### **Crop-specific meta-analysis:**

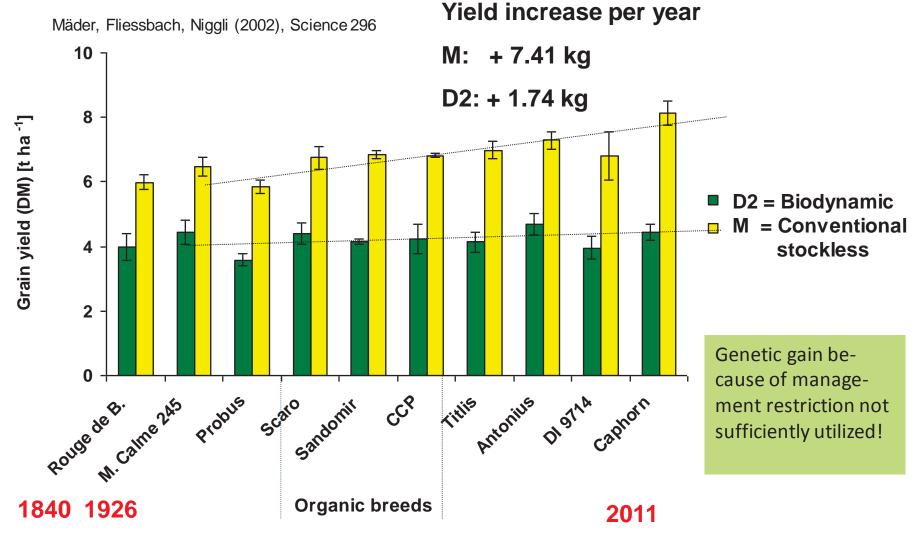


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Posner et al. 2008 Corn, soybean, wheat -10%	Mayer et al. 2015	Winter wheat	-36%
	Posner et al. 2008	Corn, soybean, wheat	-10%



# Grain yields of winter wheat varieties





Isabelle Hildermann, 2010 (FiBL)

## **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.

### Key lever: disease control



- C: Multifactorial and variable  $\rightarrow$  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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