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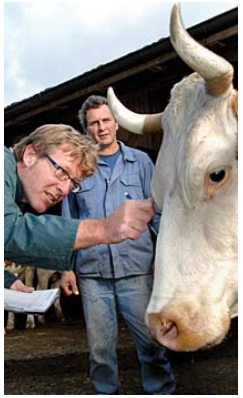
Research Institute of Organic Agriculture
Forschungsinstitut für biologischen Landbau
Institut de recherche de l'agriculture biologique








Outcomes from the RTOACC's Work Program on Scientific Methods, Models and Data for Supporting Adaptation and Mitigation in Organic Agriculture

Side event - Conference on Agriculture, Food Security and Climate Change, November 5th, The Hague

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Round Table on Organic Agriculture and Climate Change

The Roundtable on OA and CC

- RTOACC brings together stakeholders and partners along the organic food production chain (research, standard setters, certification bodies, NGOs, trade,...)

- Learning platform – central body, national networks, exchange in between, knowledge distribution, etc.

The goals are to

- initiate, support and facilitate research on organic agriculture and climate change
- advise the international community on organic agriculture and climate change issues
- develop a measurement method to enable reliable quantification and certification of carbon sequestration in organic agriculture

The Roundtable on OA and CC

- Focus 2010: Develop a measurement method to enable reliable quantification and certification of carbon sequestration in organic agriculture

As there is a need for a broadly accepted basis in

- scientific knowledge and gaps regarding Soil-C and GHG emissions in OA vs. CA
- methods for GHG accounting in OA vs. CA (carbon certificates, LCA, footprint, etc.)
- standards/guidelines for climate friendly agriculture

In this talk I focus on:

I) Soil-C (data, gaps, etc.),

II) carbon certificates

I) Soil Carbon and OA

- Increasing and maintaining soil organic matter is a core principle in organic farming
- It is essential for plant nutrition and soil fertility built-up in organic (= low external input) farming systems
- Diverse and legume containing crop rations and organic manuring are integral measures in OA

- Hence soil carbon sequestration levels are higher under OA practices?

Address this via meta studies on the state of the art scientific knowledge

Studies

- **Niggli et al. 2009; non peer-reviewed: 7 studies; 5 comparisons**

  Average difference OA vs. CA: 590kg C per ha and year (2.2 t CO_2eq)

- **Soil Association 2009; non peer-reviewed: 39 studies, more than 100 comparisons**

  Average difference OA vs. CA: 560kg C per ha and year (2.0 t CO2eq)

- **Leifeld & Fuhrer 2010; peer-reviewed: 32 studies; 68 comparisons**

  - 2.2% annual C_{org} increase under organic, no increase under conventional farming;
  - No data from developing countries included

Studies

- **Gattinger et al, ongoing: >60 studies;**
  - Based on multivariate analysis of variance and meta-analysis
  - Allows to identify mean drivers of potential differences and to control for effects such as climate-zone
  - No results yet
  - Until now only 4 studies from developing countries. No African study at all

-> Request for further reliable data sets!!!

Results

- We will soon have a state-of-the-art overview on soil carbon in OA vs. conventional agriculture

Key challenges:

- Lack of soil bulk density data
- Sampling depth
- Comparability (e.g. crop rotations)
- Lack of data on control variables (e.g. nutrient inputs)
- Separation of the relevant driver variables

Whether the management system is key is an open question – definition of “organic” and “conventional”

GHG emissions and OA

- No synthetic N fertilizers are used
- Less (and less easily available) N is applied in organic agriculture

- But nitrogen fixing legumes, green and organic manuring are key elements in organic crop rotation and bear the potential of N_2O losses when incorporated/applied to the soil
- and easily available synthetic N fertiliser can be applied according to the plant nutrient status

- Hence GHG emission rates (esp. N_2O) are lower or higher under OA practices?

GHG emission from soils under conventional and organic management (preliminary compilation)

	Type of study	CON > ORG	CON = ORG	CON < ORG
Petersen, 2006: A, DK, FIN, I, GB	Field measurement	x		
Chirinda, 2010: DK	Field measurement		x	
Küstermann, 2008: D	Modelling	x		
Flessa, 2002: D	Field measurement	x*		
Sehy, 2003: D	Field measurement	x*		
Lynch, 2008: Canada	Field measurement	x		
Nemecek, 2005: CH	Life cycle assessment	x**		
Hansen, 2008: N	Field measurement	x		
Alluvione et al. 2010	Field measurements	Compost <	synthetic fertilizer	= legumes

* no difference when related to unit of yield
** lower GHGE in ORG when related to unit of yield

GHG emissions and OA

- Very poor data base
- Very few system comparisons based on field measurements

- No systematic overview available

- Data only from northern countries

- Results depend on short-time dynamics (soil/weather)
- Measurements are very demanding

-> Request for further reliable data sets!!!

Overall Results

- Soil-C: Indication of climate friendly practices in OA (e.g. composting)
- Huge uncertainties

II) Certificates – climate policy institutions and quantification

- OA employs many climate friendly practices

- Hence OA is particularly adequate for carbon certificates from agriculture?

This boils down to solving MRV (Measurement – Reporting – Verification) aspects; similarly for LCA

Mitigation practices/methodologies typical/fitting for organic agriculture practices

- Fertilizer replacement
- Composting
- Legumes
- Soil Carbon Sequestration

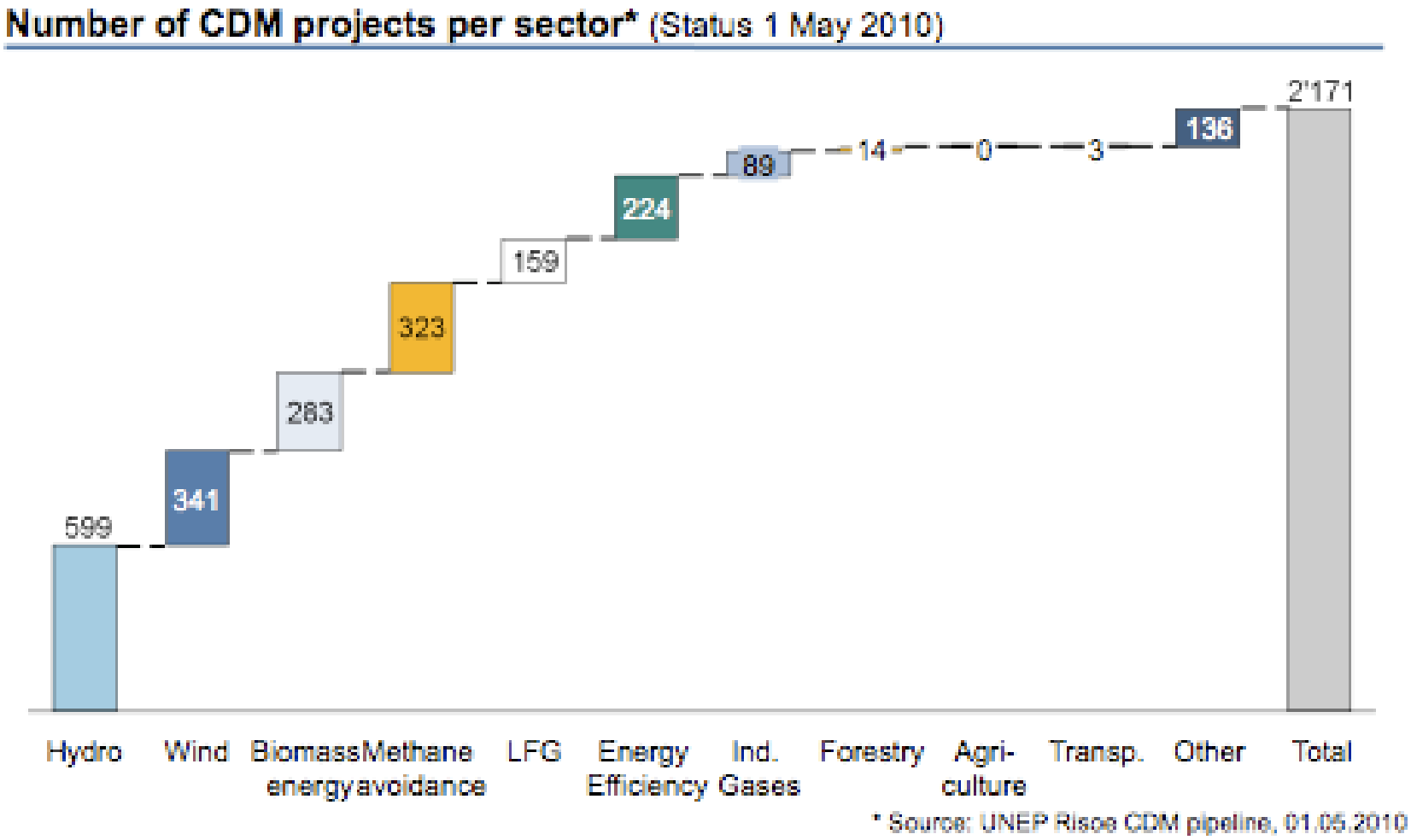
- Methane recovery from biomass waste/manure (biogas/electricity)
- Avoided biomass burning

- Agroforestry

- Energy efficient processing (wine, cheese)
- Rice production?

But there are only few projects in agriculture:

And some of the agriculture methodologies have no projects (MRV?)

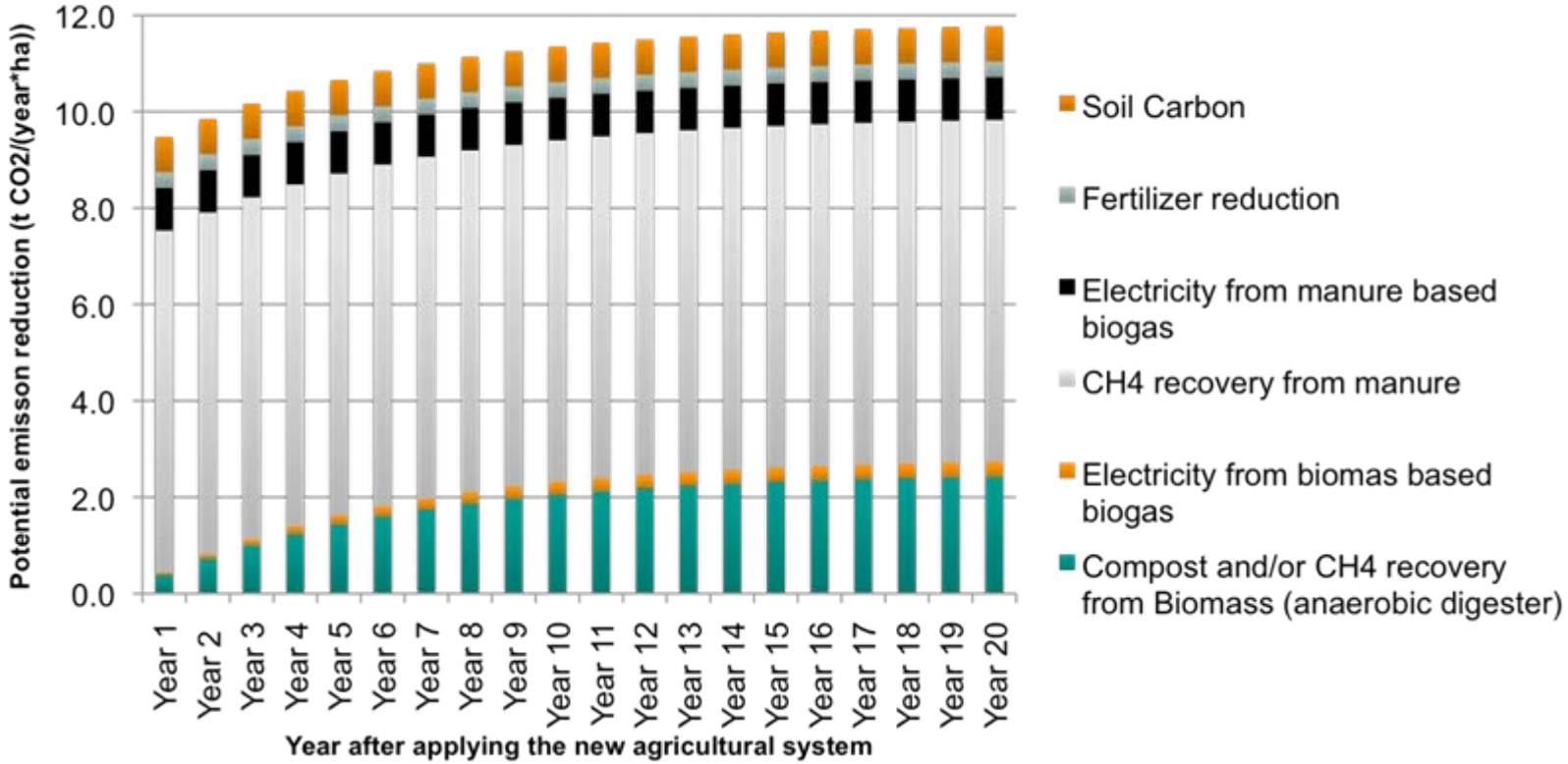


(Compilation: SouthPole Carbon 2010)

Combination of methodologies in the context of organic farming

Estimation based on an optimised crop rotation including optimized manure handling

(business potential: low < 5 $tCO_2e/ha*y$, medium: 5-10, high: >10)



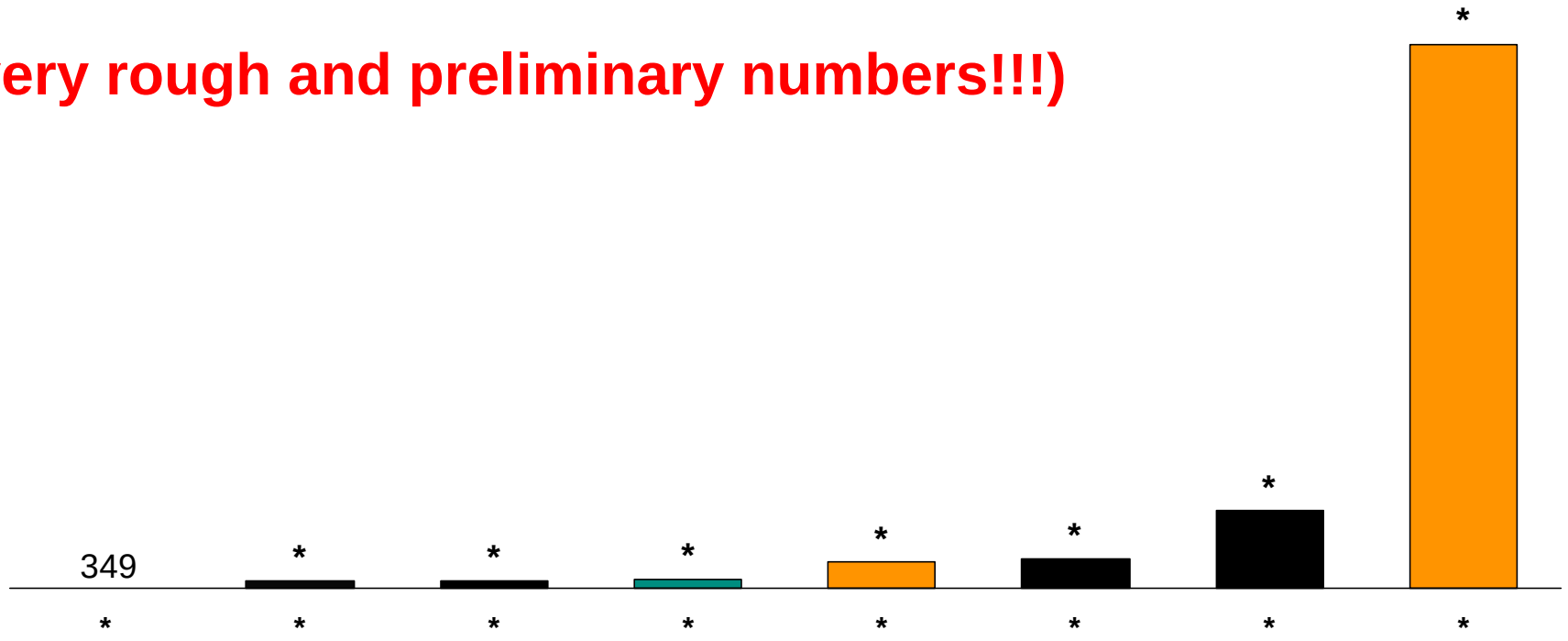
(very rough and preliminary numbers!!!)

(Source: SouthPole Carbon 2010)

Most agricultural projects need to be big to achieve critical size

Project size in ha to achieve 30‘000t CO2e/a (financially interesting project size)

(very rough and preliminary numbers!!!)



(Source: SouthPole Carbon 2010)

New/Revised methodologies

- Add biomass burning to the baseline of composting and biogas methodologies
- Develop a new methodology for compost application and replacement of synthetic fertilizer
- Add soil carbon to this methodology
- Further ideas:
  - improved process steps (wine, cheese)?
  - apply existing methodologies (agroforestry)

Results

- New/revised methodologies with some chance of getting approval (CDM or VCS)

Key challenges:

- Based on many default values – scientific credibility?
  Applicability conditions: realistic (e.g. prescribing crop rotations)?
- Monitoring requirements

- Business case (additionality)?

Organic agriculture in the context of climate change mitigation and adaptation

Insight: Project based quantification is very difficult – but some general trends can be identified

Do not forget the co-benefits of OA:

- Positive environmental impacts: soil fertility, biodiversity, resource conservation
- Contribution to food security: yield security
- A new income opportunity for small holders: empowerment, food security

Should adaptation and not mitigation be the main focus of agriculture in the context of climate change?

Conclusions

- Soil-C: comparison possible but difficult (practices more important than OA vs. CA?)
- GHG emissions: huge data gaps
- Carbon certificates: possible – but not very profitable, and partly subject to many assumptions (problem of credibility) – may rather rely on general trends (e.g. inventories, NAMAs) than on project wise accounting (certificates)?
- Side-benefits: Big potential for adaptation - more research needed (also conceptual – beyond case studies but avoiding too theoretical approaches)
- Avoid dominance by mitigation MRV – develop a holistic approach to sustainable agriculture also in the face of dominant climate change mitigation policies

Thank you for your attention!