FiBL
EXCELLENCE FOR SUSTAINABILITY

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

Organic farming systems and the development of a methodology for the carbon market

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Contents

Hypotheses

- The mitigation potential of single projects in agriculture (involving soil, biomass sequestration, compost,…) cannot be quantified correctly.

- Such projects have however considerable sustainability benefits (soil structure, water, nutrient management,…),…

- …and on aggregate (i.e. for the average of thousands of projects), a considerable mitigation potential can be quantified and realised.

- Thus, project based offsets from agriculture are problematic, while sectoral and national quantification and mitigation strategies (inventories, NAMAs,…) are promising and need to be developed further.

A) Methodology – a cooking recipe for carbon credits

1) Technology/measure: specify the exact technology/measure the proposed small scale methodology is applicable to and describe in detail the applicability conditions

2) Boundary: specify the project boundary of the proposed methodology.

3) Baseline: specify the baseline scenario and the way baseline emissions (**BE**) are calculated.

4) Leakage: specify if leakage emissions can occur and how they should be calculated.

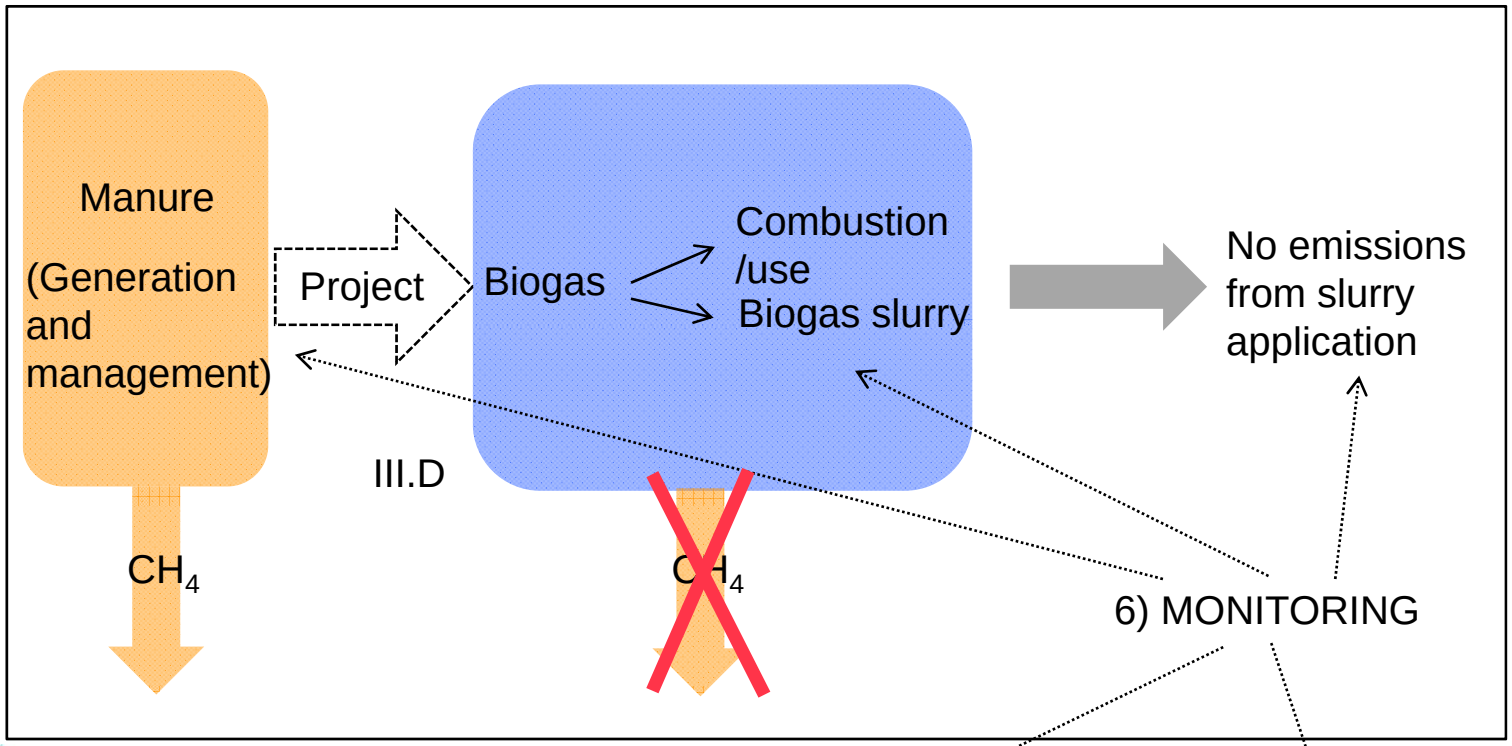
5) Project activity emissions (PE): please specify possible project activity emissions and how they should be calculated.

6) Monitoring: specify which parameters should be monitored and how they should be monitored

3) BASELINE

1) TECHNOLOGY/ MEASURE

2) BOUNDARY



B) Types of Carbon Credits

- Clean Development Mechanism (CDM; and JI): 10-15 Euro
  - highest standard (regarding calculations, monitoring, additionality, etc.)
  - can be used to meet the Kyoto Targets

- Voluntary Carbon Market: 0-50 Euro (Forest 5-15; Agroforest 5, A/R 2-30: Avoid Def: 0-13; Ag. Soil 1-5)
  - all from very high to very low standards (VCS, CCX, Gold Standard,…)
  - cannot be used to meet the Kyoto Targets
  - broader range of project types

- We decided to go for the CDM a a benchmark
  - Most demanding
  - Most informative
  - Highest acceptance

C) Project types: technology/measure

- Typical practices in organic agriculture
  - Fertilizer replacement
  - Composting
  - Legumes
  - Avoided biomass burning
  - Increase soil organic matter (-> soil carbon sequestration)

- Optimal agricultural waste management
  - Methane recovery from biomass waste/manure (biogas/electricity)

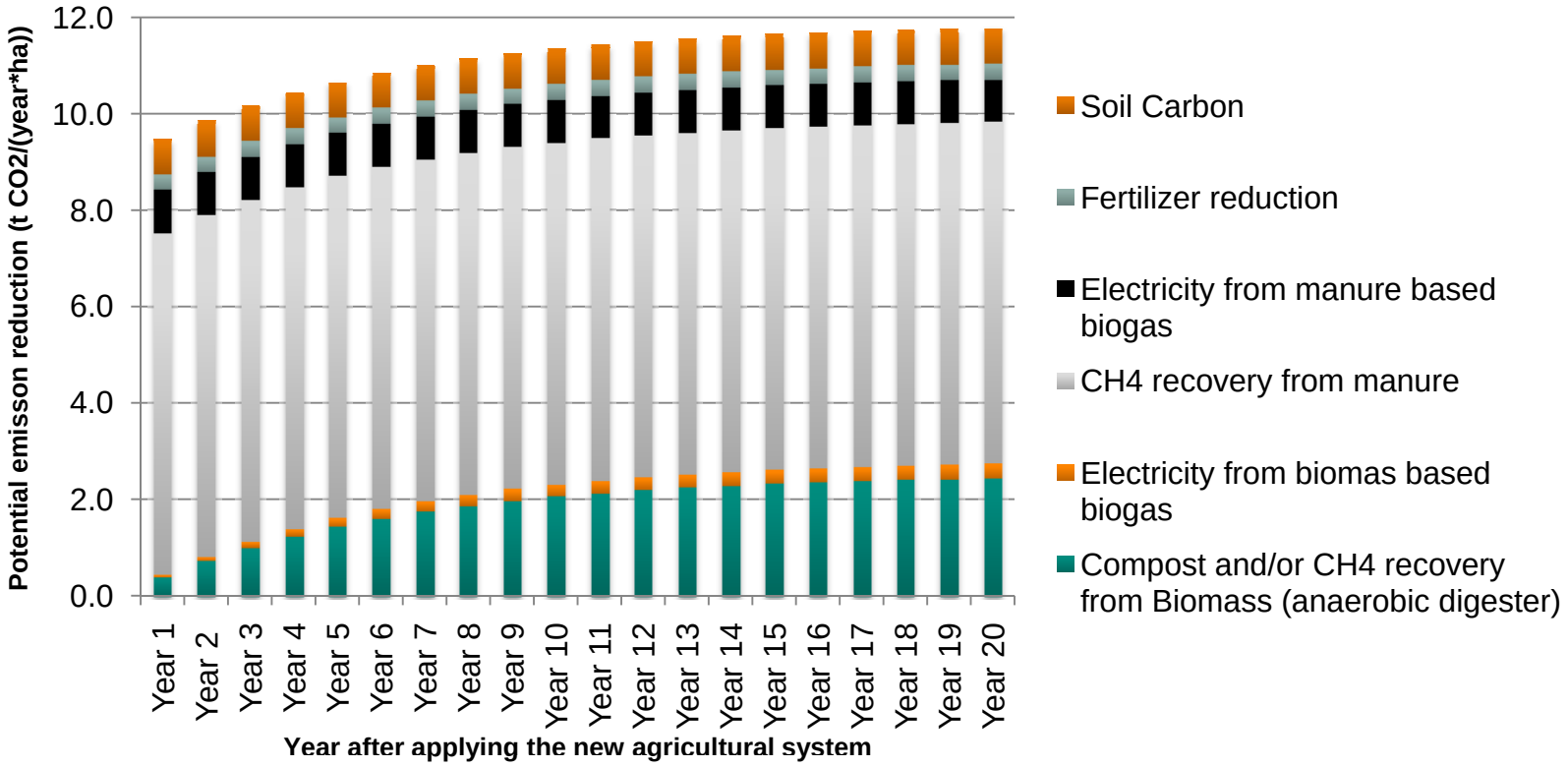
- Further sustainable options
  - Agroforestry
  - Peatland restoration
  - Rice production
  - Replacement of peat as planting substrate

  - Energy efficient processing (wine, cheese)

Set into context: Combination of measures and their relative potential

Estimation based on an optimised crop rotation including optimized manure handling

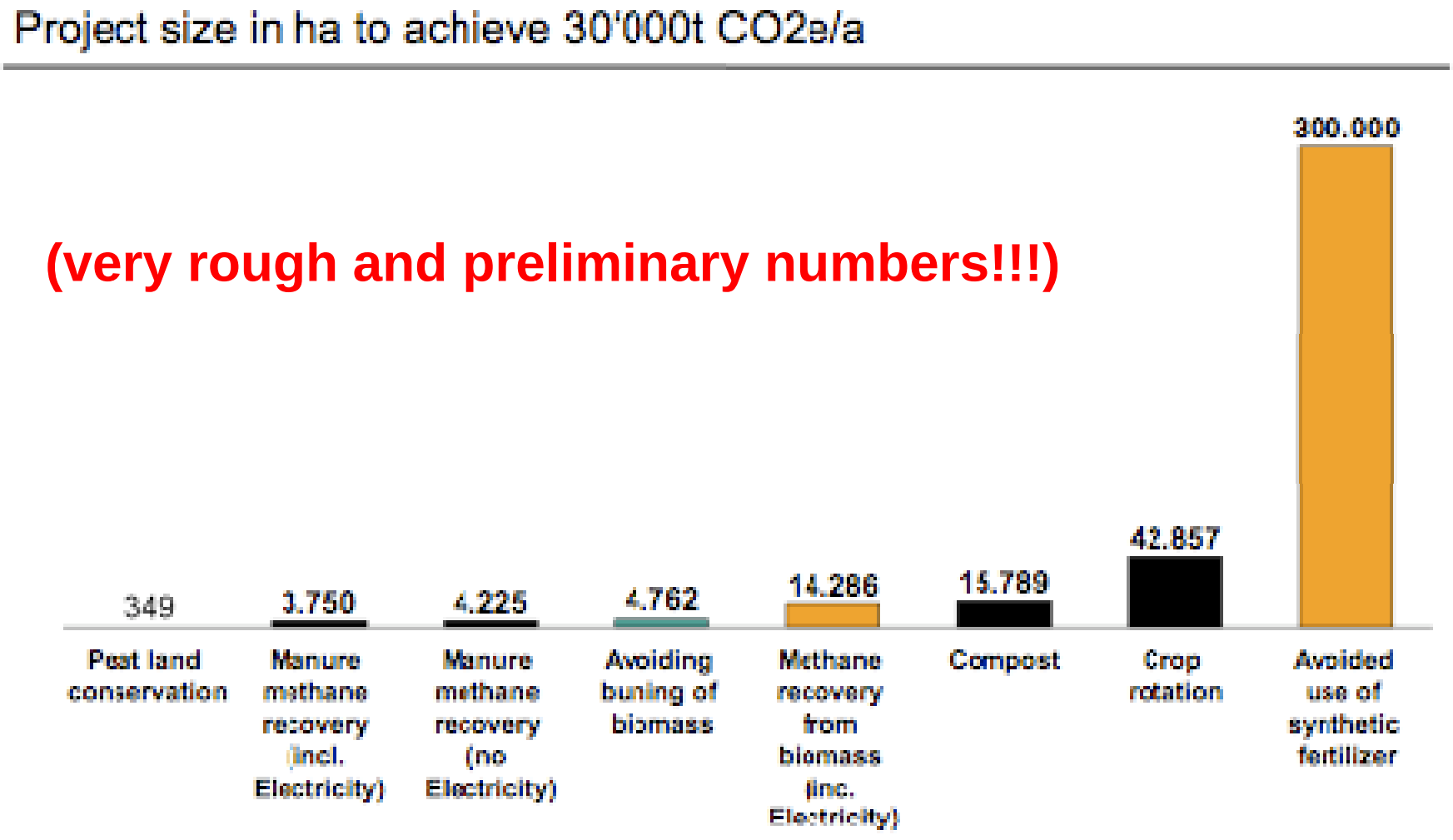
(business potential: low < 5 $tCO_2e/ha*y$, medium: 5-10, high: >10)



(very rough and preliminary numbers!!!)

Source: SouthPole 2010

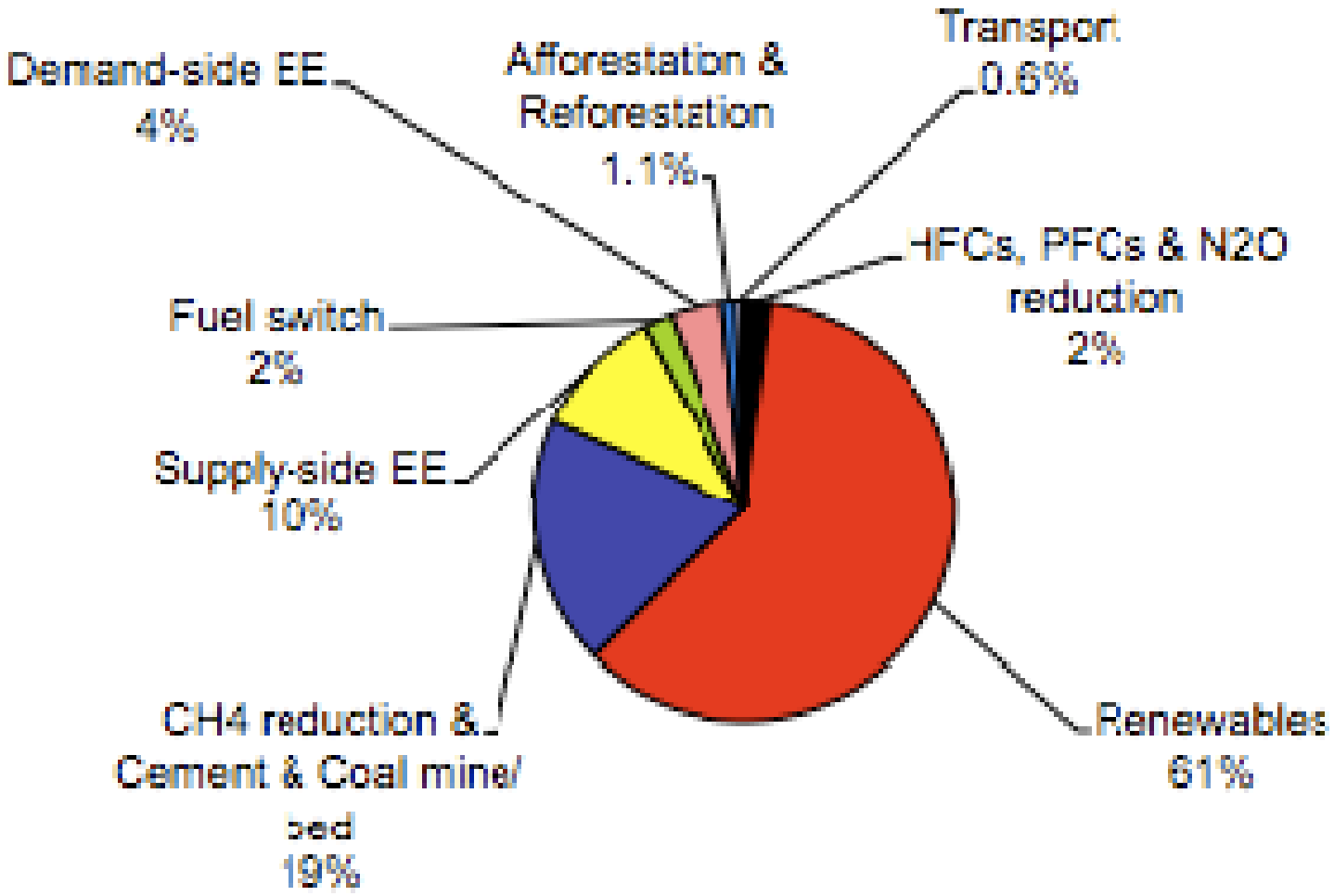
Set into context: Most agricultural projects need to be big to achieve a profitable size



Source: SouthPole 2010

CDM project pipeline, Nov. 2010

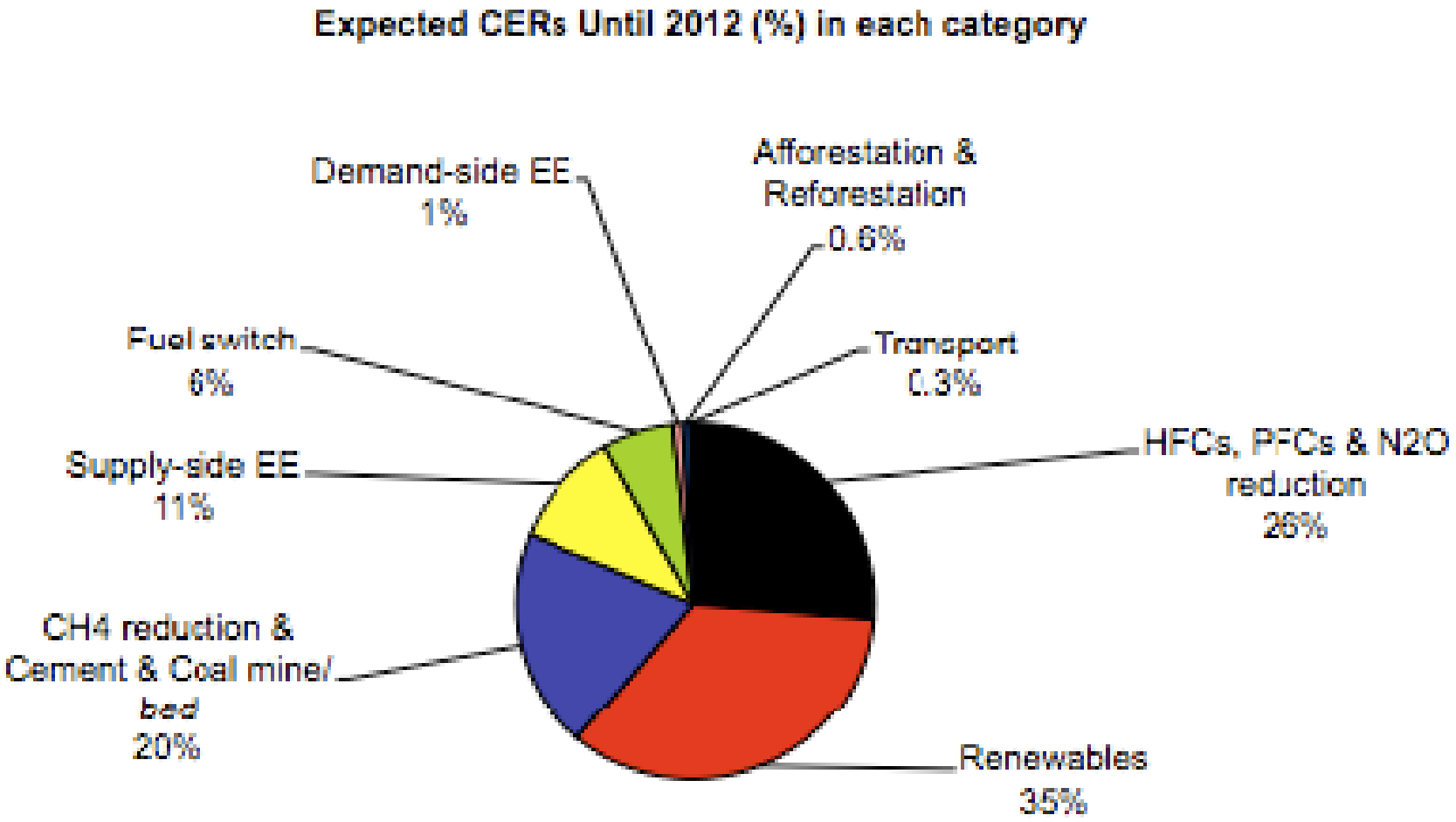
(Total: 5600) **Number (%) of CDM projects in each category**



(Source: CDM pipeline November 1, 2010, UNEP-RISOE)

CDM project pipeline, Nov. 2010

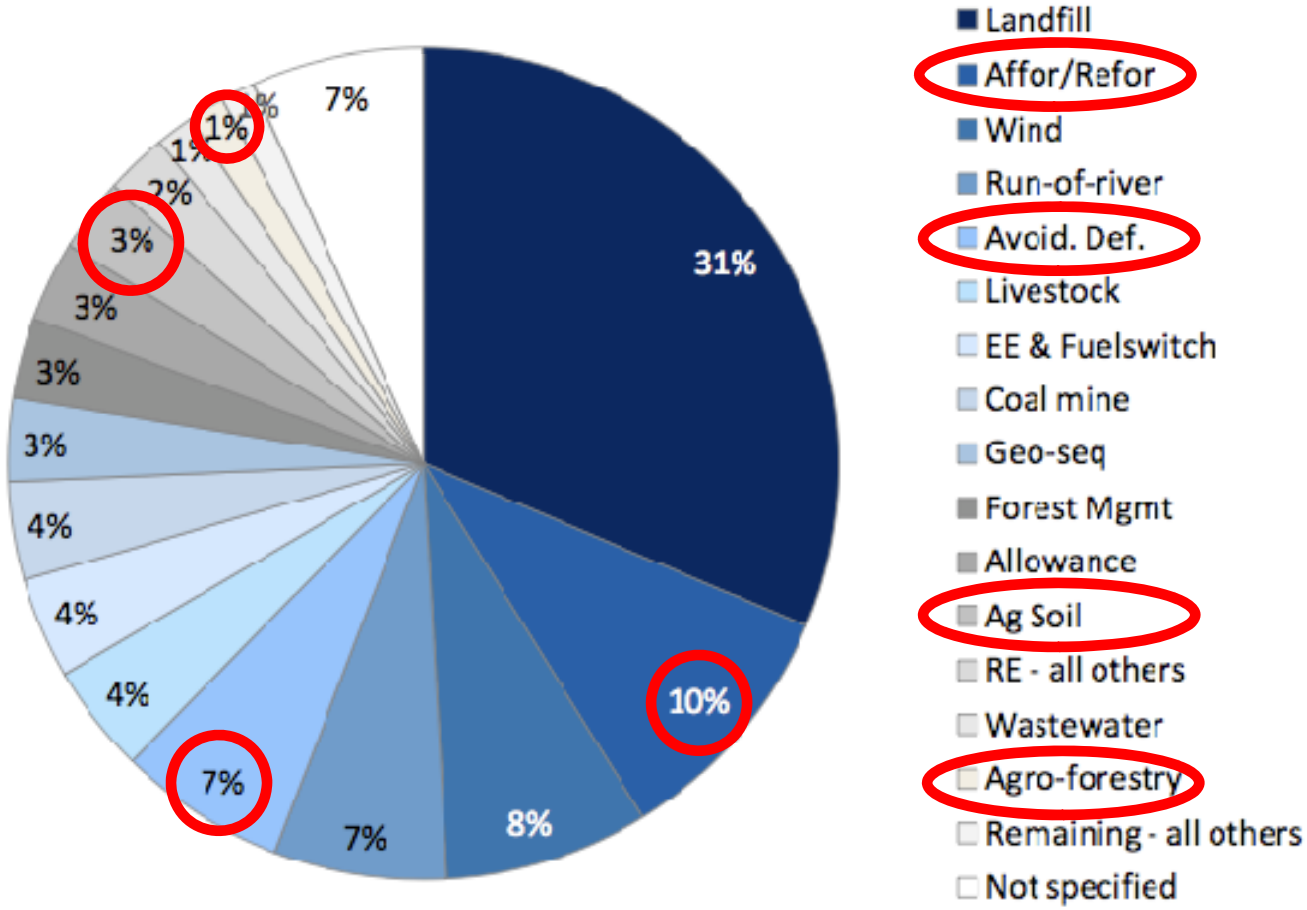
(Total expectation: 2800 Mt CO_2e / 210 Mt traded in 2009)



(Source: CDM pipeline November 1, 2010, UNEP-RISOE)

VCM-OTC project pipeline 2009

(Total: 50 Mt CO_2e – plus 40 Mt CCX)



Source: Ecosystem Marketplace, Bloomberg New Energy Finance.

(Source: State of the Voluntary Carbon Markets 2010, Ecosystem Services)

VCM-OTC project pipeline 2009

Table 4: Land-Based Credits Sold OTC, 2008 vs. 2009				
	Volumes of Land-based Credits ($ktCO_2e$)		Market Share of Land-based Credits Relative to the Total	
Project Type	2008	2009	2008	2009
Afforestation/Reforestation	4,091	4,253	8%	10%
Avoided Deforestation (REDD)	730	2,846	1%	7%
Forest Management	431	1,349	1%	3%
Agricultural Soil	267	1,250	0.5%	3%
Agro-Forestry	--	625	--	1%
Other Land-Based projects	130	109	0.3%	0.3%
Total	**5,650**[28]	**10,432**	**11%**	**24%**

Source: Ecosystem Marketplace and Bloomberg New Energy Finance.

For a list of forestry projects visit Ecosystem Marketplace's Forest Carbon Portal, www.forestcarbonportal.com.

(Source: State of the Voluntary Carbon Markets 2010, Ecosystem Services)

Very few projects in agriculture – reasons:

- Low density/profitability (credit per ha)

- Highly demanding Monitoring – Reporting – Verification (MRV) (high variability of values and data) –> VCM, not CDM

- Non-permanence (soil-C, agroforestry)
- Issuance time (soil-C, agroforestry)

Forestry projects are different: many credits/ha (mainly in VCM, though)

Biogas is different: MRV/credits/ha (CH_4)

Composting as well… (?)

BUT in any case: N_2O remains a big challenge!

Methodologies/Protocols/accounting tools for Soil-C/Soil N_2O

- (CDM AMS-III.A – fertilizer replacement)
- CDM small-scale agroforestry: AR-AMS0004
- NM0046 (rice)
- CCX US soil-carbon protocol
- VCS-SALM
- VCS N_2O methodology
- Canadian fertilizer optimisation/N_2O protocol (EF per 150’000 ha)
- Kenyan soil-carbon project (BioCarbon Fund)

- FAO ExAct

Quantification: default values, models

D) Status/results: New/Revised methodologies

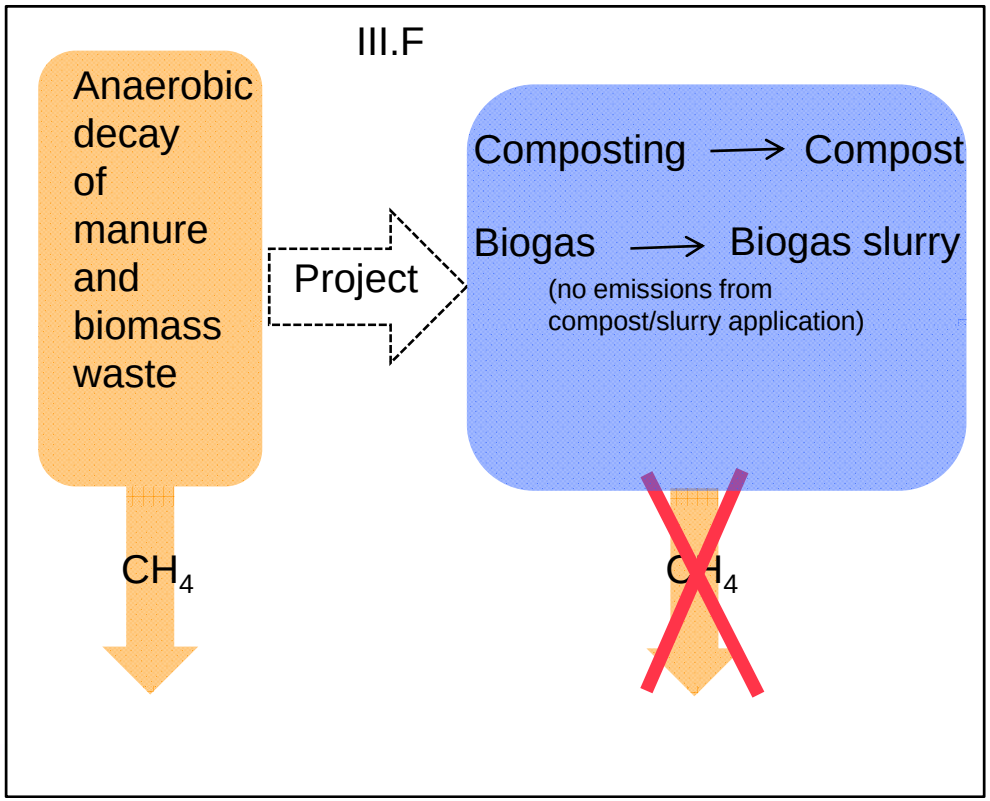
- Add biomass burning to the baseline and mulching and optimal manure management to the project activity of composting and biogas methodologies (AMS-III.F, AMS-III.R)

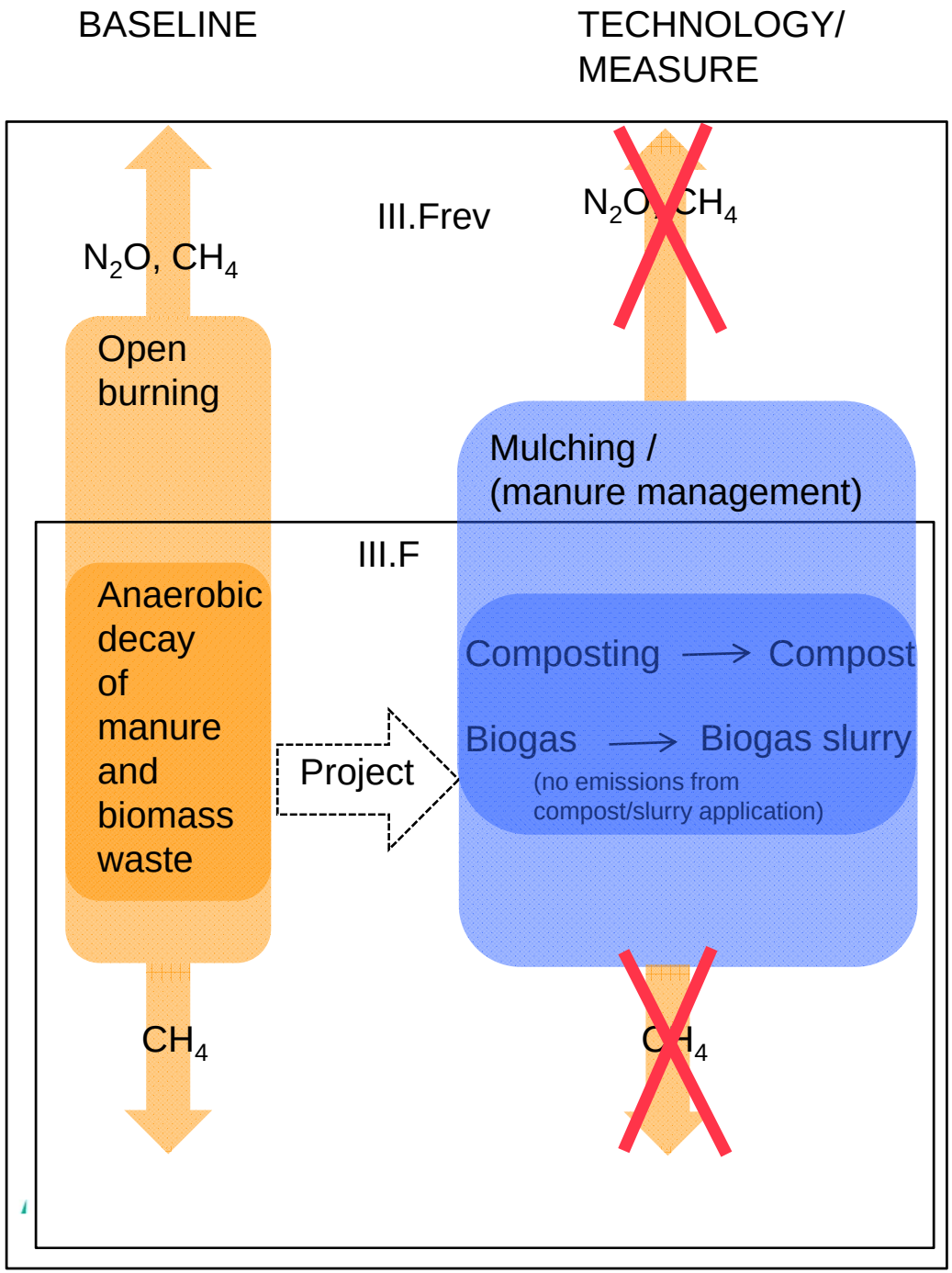
- Develop a new methodology for compost application and replacement of synthetic fertilizer (based on AMS-III.A), including soil carbon sequestration

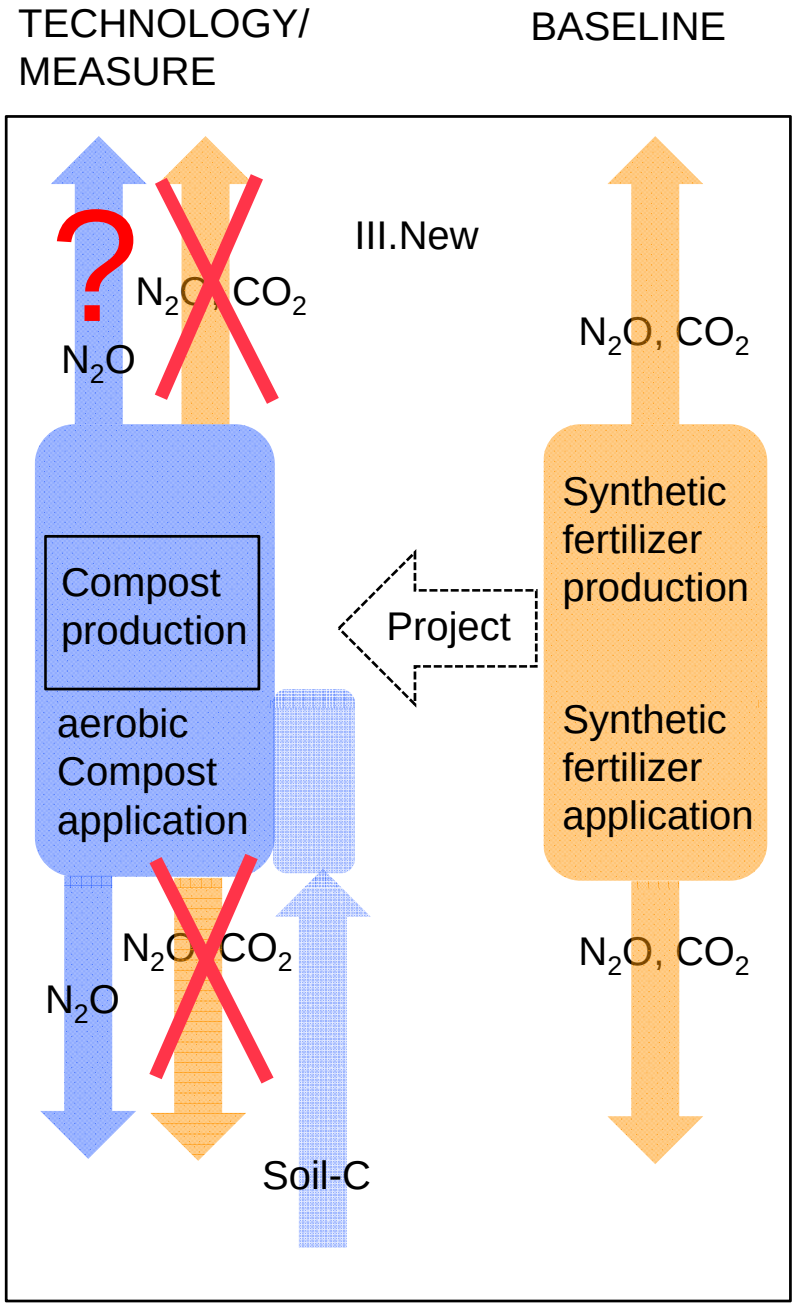
Current status: we have revised versions of III.F and R and we have written a new fertilizer replacement methodology

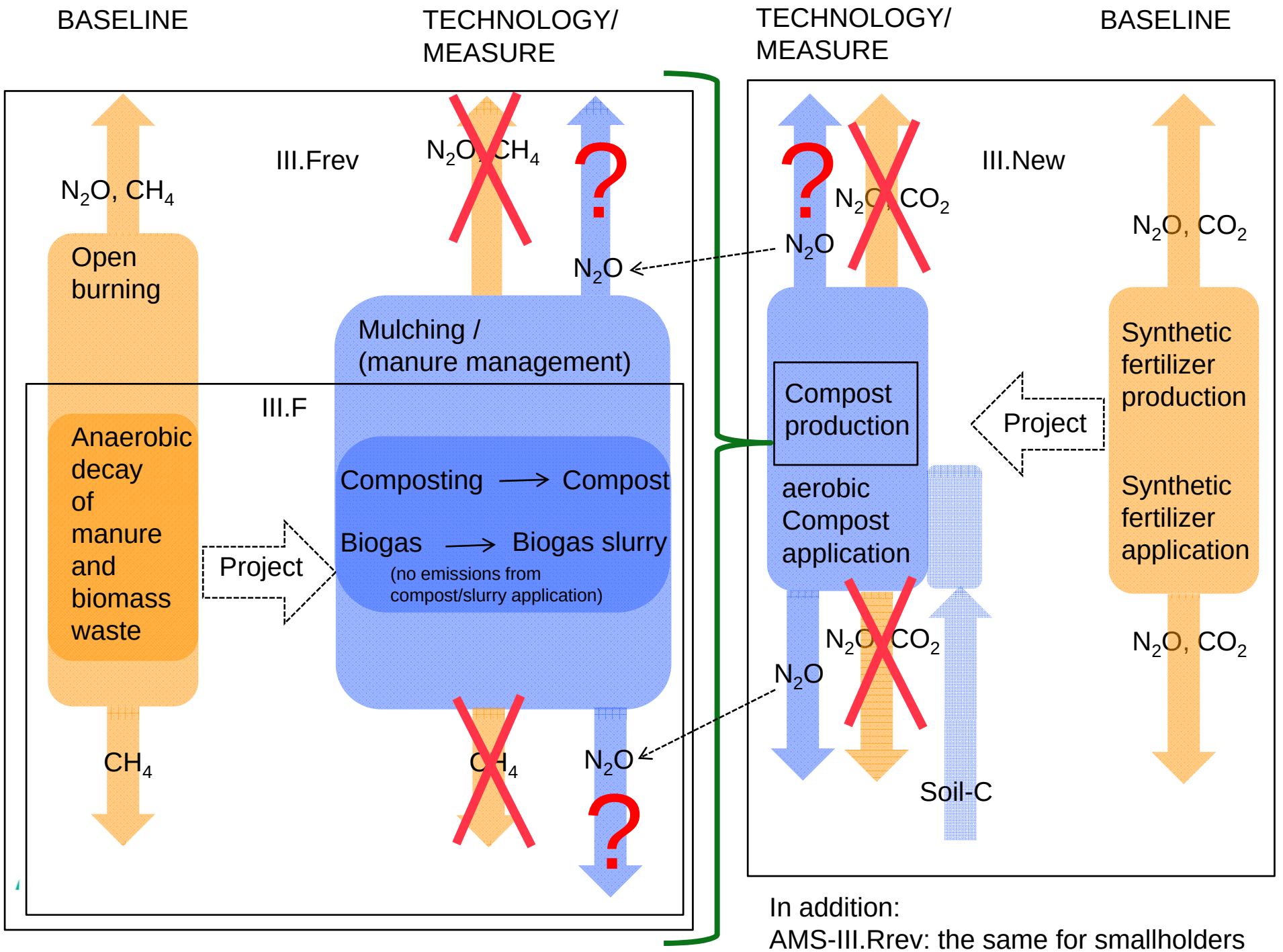
BASELINE

TECHNOLOGY/
MEASURE




BASELINE
TECHNOLOGY/
MEASURE
III.Frev
N_2O, CH_4
N_2O, CH_4
Open
burning
Mulching /
(manure management)
III.F
Anaerobic
decay
of
manure
and
biomass
waste
Project
Composting → Compost
Biogas → Biogas slurry
(no emissions from
compost/slurry application)
CH_4
CH_4


TECHNOLOGY/
MEASURE
BASELINE
III.New
?
N_2O
N_2O, CO_2
N_2O, CO_2
Compost
production
aerobic
Compost
application
Project
Synthetic
fertilizer
production
Synthetic
fertilizer
application
N_2O
N_2O, CO_2
N_2O, CO_2
Soil-C



In addition:
AMS-III.Rrev: the same for smallholders

E) Challenges

- Uncertainty in quantification (Soil-C, N_2O): heterogeneity, variability of data
  - Default values vs. MRV
  - Practicability vs. scientific credibility

- Same level-of-services:
  - Baseline/project output comparability (yields; monetarisation or other aggregation, e.g. via energy contents?)
  - Restrictive applicability conditions (prescribed crop rotations, P/K inputs)
  - May cause leakage

- Business case
  - Profitability (low density: credits per ha)
  - Additionality

E) Strengths

- Covering N_2O dynamics in agriculture in a consistent set of methodologies
- Providing options to similarly consistently add carbon sequestration in agricultural soils to the project activity
- Offering new mitigation options with considerable sustainability side benefits:
  - avoided biomass burning
  - increased compost use / mulching
  - Better resource/nutrient management
  - avoided synthetic fertilizer use
- Offering these opportunities to smallholders via reduced/simplified monitoring requirements

F) Agriculture in the established mitigation institutions

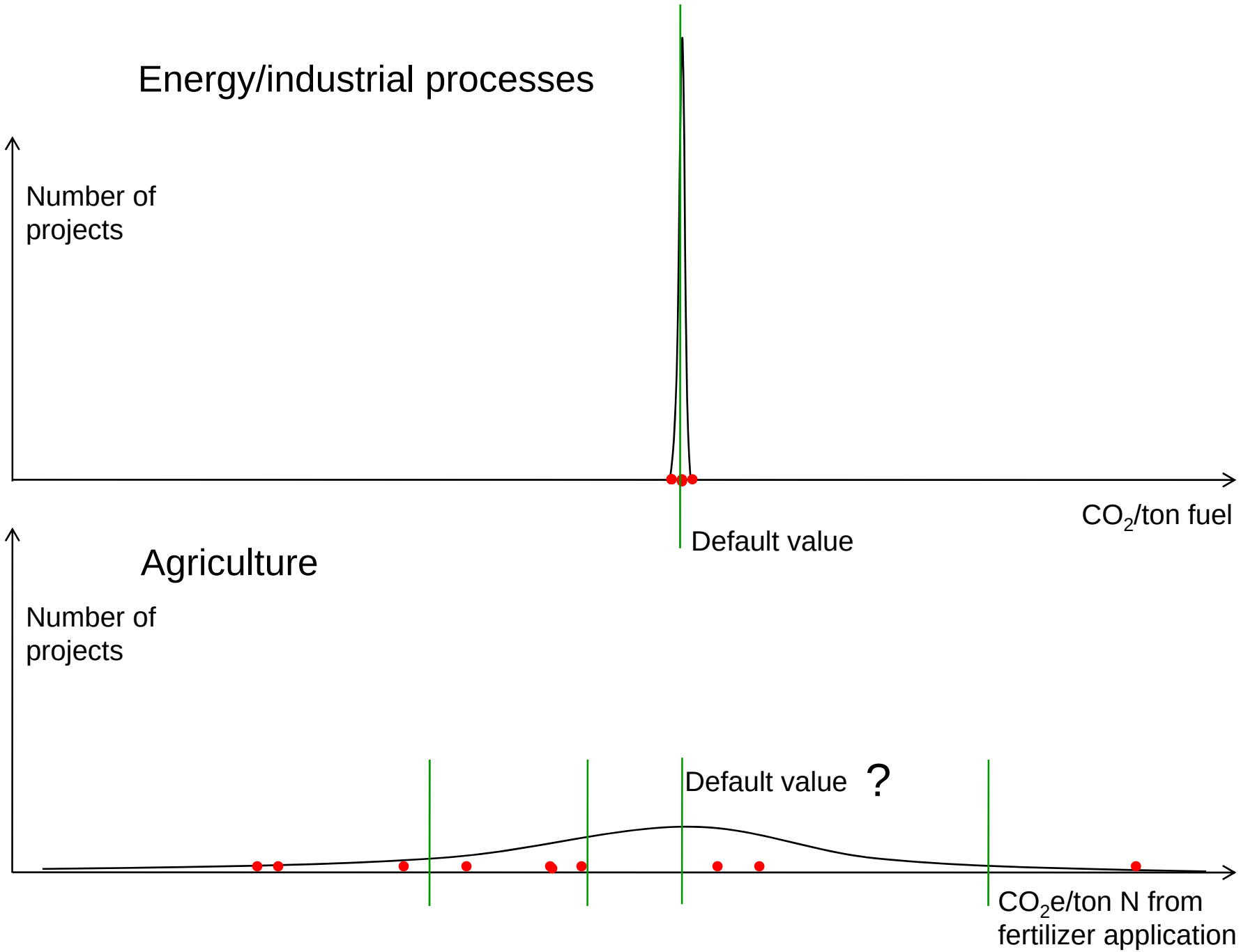
- Energy/industrial processes
  - Simple, separable systems
  - Independent of external influences or the effects of such are controllable
  - Standardised, homogeneous processes / output
  - Built to be quantifiable

- Agriculture
  - Highly complex and inseparable systems (soil, biomass)
  - Highly dependent on external influences (weather/climate/soil…) and the effects of those are not easily controllable
  - Many aspects are not standardised, highly heterogeneous
  - Many aspects are not easily quantifiable

F) Agriculture in the established mitigation institutions

- Energy/industrial processes
  - Emission factors do not vary much – low uncertainties
  - Default, average values make sense project-wise

- Agriculture
  - High variability of emission factors, etc. – huge uncertainties
  - Default, average values make sense for a large amount of projects only, not for single projects


Energy/industrial processes
Number of projects
CO_2/ton fuel
Default value
Agriculture
Number of projects
Default value ?
CO_2e/ton N from fertilizer application

F) Agriculture in the established mitigation institutions

- Energy/industrial processes and agriculture combined
  - Offsetting reliably quantified emissions (energy in Annex I countries) with highly uncertain reductions (agriculture in non-annex I countries) is problematic
  - Relying on aggregate values is possible in agriculture
  - An aggregate level (NAMA, inventories, etc.) is adequate for quantifying mitigation in agriculture while a project based approach is not
- An option for a project-based view:

  View projects as average representatives of an aggregate strategy – then quantification by default values can make sense (if a sufficiently large number of projects in this aggregate strategy are realised!)

G) Further steps

Project based – nevertheless:

- Implement these combined new and revised methodologies in the context of concrete project data. This informs about
  - profitability,

  and helps to resolve the three main challenges we face in a concrete case:
  - MRV
  - Level-of-services
  - additionality

- Generalise the results on MRV/level-of-services to finalise the methodologies, and

- Submit methodologies: Waste management aspects with the CDM, fertilizer replacement, soil, N_2O with the VCM (cross check with existing methodologies: SALM, etc. –)

G) Further steps

- Further possibilities: Improve/develop/apply methodologies for
  - Peatlands (also JI)
  - Agroforestry
  - Various soil-C/N_2O protocols (e.g. regarding compost)
  - Processing steps

Aggregate level:

- Improve the knowledge base and
- develop aggregate quantification approaches and
- institutions to account for the related aggregated mitigation potential
- Address adaptation (research, acknowledge the potential, institutionalisation)

Thank you for your attention!