GLOBAL RESEARCH ALLIANCE
ON AGRICULTURAL GREENHOUSE GASES

Integrative Research Group

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INRA SCIENCE & IMPACT

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Climate negotiations & Agriculture

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Renewed interest in land based mitigation options (ca. 120 countries include the land sector in their INDCs)

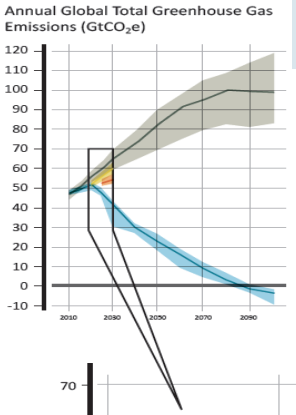
INDCs also include adaptation for developing countries

Soil carbon sequestration initiative (4/1000) within the Lima-Paris Action Agenda of the Paris agreement

A large gap in emissions reduction by 2030 for 2° C

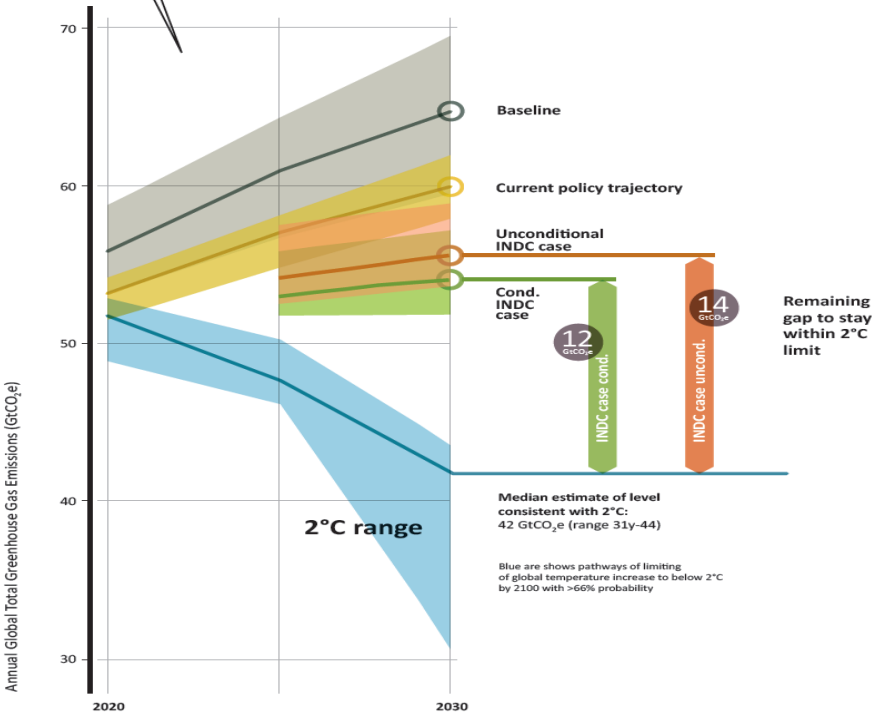
- By 2030, a gap of 12 Gt CO_{2e} with conditional INDCs prevents reaching the targeted +2°C maximum global warming threshold

- 129 countries include the AFOLU sector in their INDCs (Intended Nationally Determined Contributions)
  - **At least 25% of total committed GHG mitigation** ***[as estimated by the International Institute for Applied Systems Analysis, IIASA]***



The Emissions Gap Report 2015 – Executive Summary

[UNEP]



Integrative knowledge required

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Estimating the technical potential for farms, sub-regions, industries to mitigate and adapt?

What is the economic potential for a given CO_2 price?

Which practices can be combined at farm/landscape scales?

How to monitor, report and verify?

How to help countries/industries in developing strategic plans and inventories?

An integrated research and implementation platform

RESEARCH PERSPECTIVE

Science and technology

Basic research on soil–plant processes

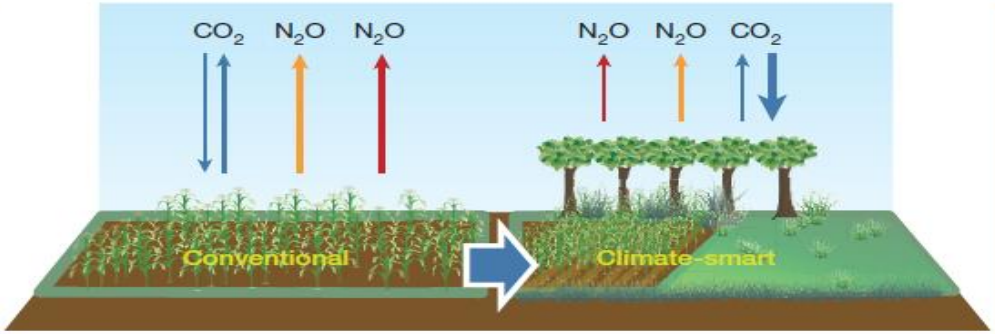
Research measurement networks

Soil monitoring networks

Advanced greenhouse gas networks

Remote sensing

Spatial databases and model integration



Practices

Reduced tillage

Biochar

Land restoration

Improved crop rotations

Organic amendments

Nutrient management

Cover crops

Agroforestry

Implementation

National and international greenhouse gas mitigation programme

Greenhouse gas offset and ecosystem service markets

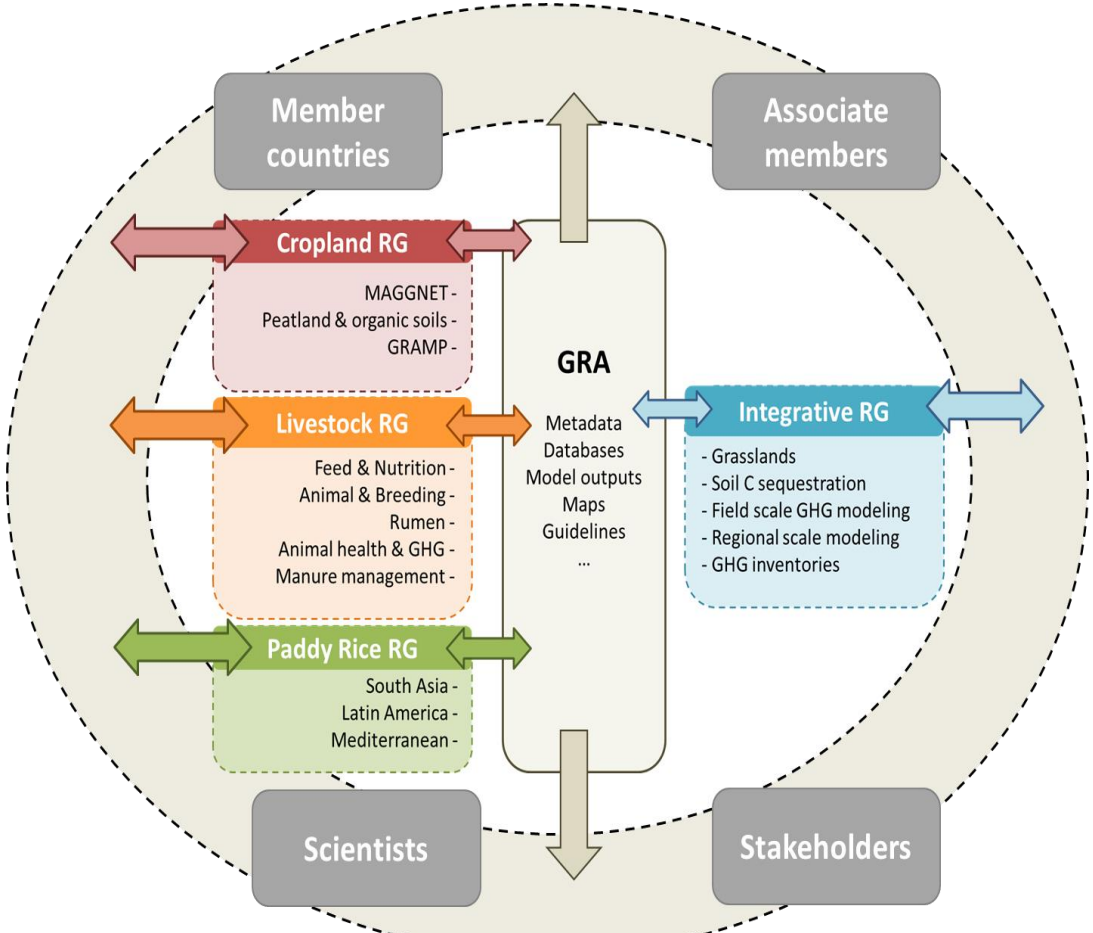
Agricultural product supply chain management

Decision-support systems

Land-user engagement

(Paustian et al., 2016, Nature)

Suggested integration of GRA functioning



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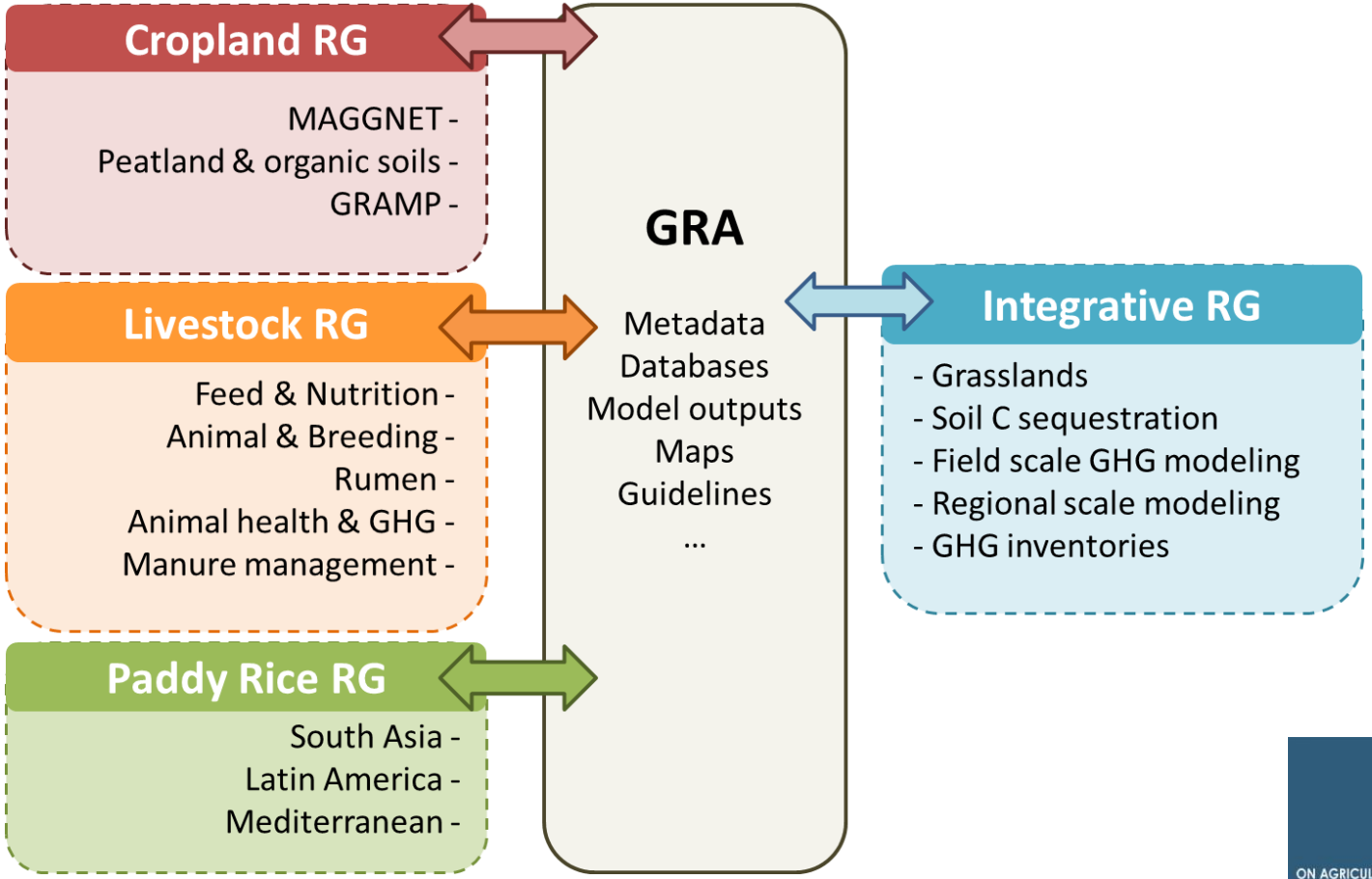
Integration of knowledge within GRA



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IRG vision and scope

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Vision

- Collaborative work to develop the knowledge and capabilities for *estimation*, *monitoring*, and *projection* of GHG emissions within and across agricultural systems

Scope: Address identified ***Research, Development, and Knowledge Transfer*** *(R-D-KT)* opportunities

- Integration of scales (local, subnational, national, and supranational scales)
- Applying, reporting, monitoring, and/or verifying greenhouse gas emission estimates across farming systems
- Communicate and coordinate
- Foster the building of capability of member countries.

Networks within IRG

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1. **Grasslands network** *(transfers and builds on existing Livestock Group network)*

2. **Soil carbon sequestration network** *(**NEW**, but builds on work started across the GRA)*

3. **Field & farm scale network** *(builds on former C&N Cross-Cutting Group work)*

4. **Regional scale network** *(**NEW**, but builds on work started across the GRA)*

5. **GHG inventories network** *(builds on former Inventories and Modelling Cross-Cutting Group work)*

This list is not final, but will be used to start the IRG

Links to other initiatives

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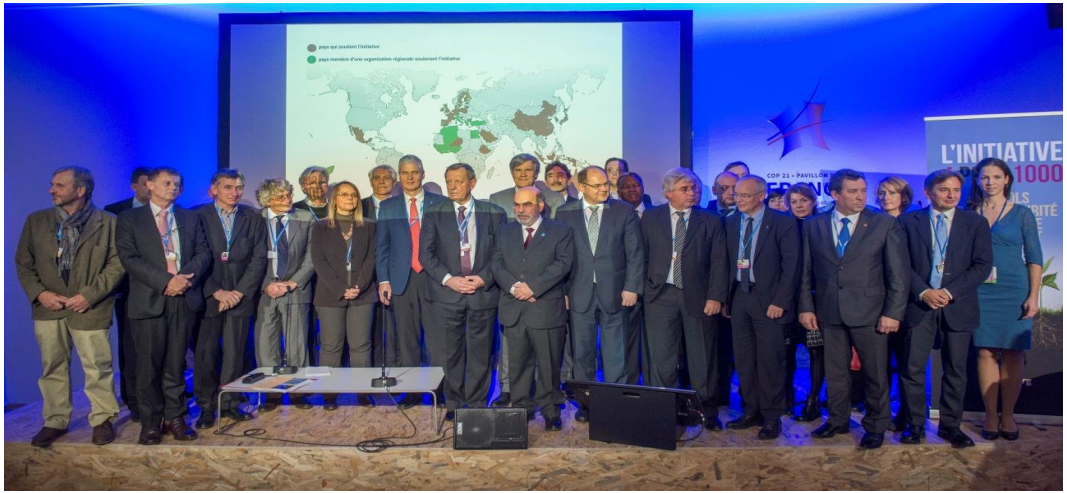
- AgMIP
- 4 per 1000 research program
- FACCE JPI / MACSUR
- IAMC (Integrated Assessment Modeling Consortium)
- GeoGLAM
- FAO (LEAP on soil carbon)
- Global Soil Forum (GSF)

This list is not final

Official launch at the COP 21



- The initiative was officially launched on December 1st at COP21
- More than160 signatories (31 countries) already support the initiative

Integration across scales

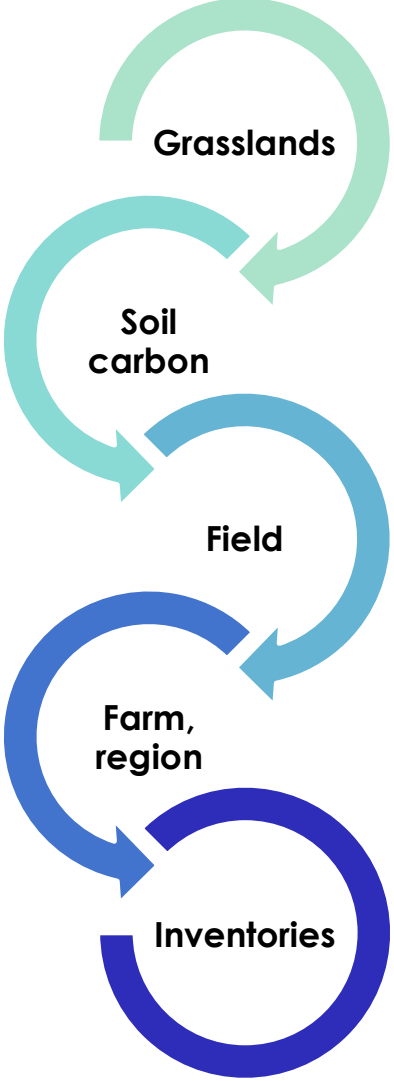
Developing strategies for pastures

Quantifying soil carbon potential

Understanding M&A options at field scale

Improving tests of options at farm and region scale

Improving national inventories



Network leaders

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Grasslands: Fernando Lattanzi (INIA, Uruguay), Karl Richards (Teagasc, Ireland),

Soil carbon sequestration: Claire Chenu (AgroParisTech, France), Denis Angers (AAF, Canada),

Field scale integration: Jean-Francois Soussana (INRA, France), Pete Smith (Aberdeen U., UK),

Farm and regional scale integration: Richard Eckard (Melbourne U., Australia), Petr Havlik (IIASA, Austria),

GHG inventories: Jan Verhagen (WUR, Netherlands), Brian Mc Conkey (AAF, Canada).

Adopt a network

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Country, or associated partners, could adopt a network for one-two years. Fund initial meetings and development of activities

Grasslands (Uruguay, Ireland)
Soil carbon sequestration (Canada, France)
Field scale integration (France, UK)
Farm and regional scale integration (Australia, IIASA Austria)
GHG inventories (Netherlands, Canada)

Priorities for networks

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Grasslands:

- Guidance for SOC measurement/monitoring in grasslands,
- Data base on grazing practices vs. soil C and GHG emissions
- Costing best practices (e.g. for tropical pasture intensification),
- Mixed systems (temporary grasslands, integrated systems)

Soil carbon sequestration:

- Extending systematic review of practices to tropical conditions
- Soil organic carbon dynamics modeling (bare fallow trials)
- Stability, saturation, permanence, erosion

(based on a survey)

Priorities for networks

Field scale integration:

Mitigation and adaptation modeling *(based on SCNC)*

Climate sensitivity of GHG emissions

Statistical emulators for N_2O and soil C

Farm and regional scale integration:

Farm calculators and soil carbon

Demonstration farm network

Pilot region assessment studies

A toolbox for developing regional/national studies

Generate maps of mitigation potentials and co-benefits in terms of yields and adaptation

Provide interested countries with an analytical tool for integrated assessment of their own agricultural mitigation strategies

(based on a survey)

Priorities for networks

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GHG inventories

Guidance on how to improve inventories, including data on activities,

Moving to Tier 2, sharing examples from countries,

Country specific emission factors.

The criteria for improvement are transparency, accuracy, completeness, comparability, and consistency (TACCC) of the national GHG estimates.

(based on a survey)

Stock-take (all networks)

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- of research groups
- of data bases and models
- of key research papers

These would lead to a web site listing

Necessary ingredients for successful national policies development

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- Upscaling of emissions coefficients from field/animal/farm measurements to national level
- Parametrization of mitigation options
- Consistent assessment at the regional scale
- Global consistency of national policies

IRG meetings

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Greenhouse Gas and Animal Agriculture, Melbourne, February 2016. Joined session with the Livestock Research Group.

3rd Workshop on Model inter-comparison, Rome, Italy March 2016 (SCNCC)

Briefing session during Council Meeting in Mexico City

Phoenix Arizona, November 2016, Joined Session with the Cropland Research Group

IRG group meeting in Rome, side by side with FAO/IPCC meeting on soil carbon (January 2017)

A proposed flagship on soil carbon sequestration

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FOCUS: Agricultural practices that sequester carbon and restore soil quality

- Potential and dynamics of carbon sequestration in crop and pasture systems and interactions with N
- Practices for soil C sequestration and carbon calculators
- Co-benefits for yields, water balance, and non-CO_2 greenhouse gases,
- Monitoring, verifying and reporting soil organic carbon stocks,
- Improving national GHG inventories by integrating soil organic carbon stock changes.

Technical tools (e.g. maps) through web-based knowledge hub delivering value and implementation support and targeting national action plans

A proposed flagship on soil carbon sequestration

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GRA VALUE-ADD

Positions GRA as a key player for soil carbon sequestration

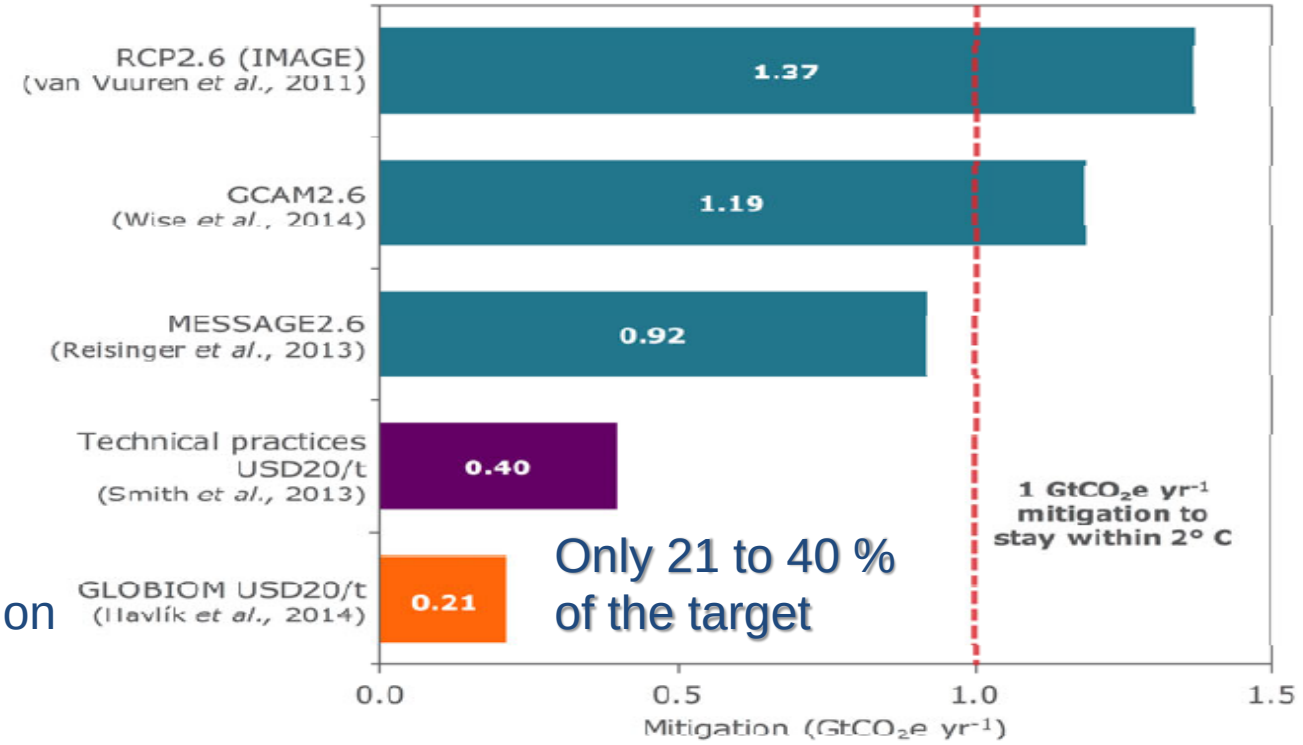
COST:

USD $1,200,000 over 3 years

KEY PARTNERS AND LINKAGES:

research program of the ‘4 per 1000’ initiative
FAO, CCAFS, Land & Water CGIAR
European Commission, the World Bank, GEF.
Dedicated Coordination and Support Action involving the GRA, 4 per 1000 and FACCE JPI that will aim at better aligning international research on soil carbon sequestration.

Plausible pathways for non-CO_2 abatement in the agriculture sector vs. the 1 Gt CO_{2e} annual mitigation target by 2030



N_2O and CH_4 mitigation

Only 21 to 40 % of the target

(Wollenberg et al., 2016, GCB)

Why Soil Carbon?
Co-benefits for adaptation, land degradation and food security

- 2-3 times more carbon in soil organic matter than in atmospheric CO_2 [IPCC, 2013]
- 1.4 billion metric tons carbon could be stored annually in agricultural soils, equivalent to a storage rate of 0.48%/year in top soil [after IPCC, 2007, 2014]
- Half of the agricultural soils are estimated to be degraded [FAO, 2006] The annual cost of fertilizer to replace nutrients lost to erosion is US $ 110 – US $ 200 billion.
- Emissions of 0.3–1.0 Gt C/yr through erosion of agricultural land (Chappell et al., 2015, NCC)
- 24-40 million metric tons additional grains per ton C stored in soils OM in developing countries [Lal , 2006]
- Reduced yield variability after soil restoration leading to increased soil organic matter [Pan et al. , 2009]

Thank you for your attention!