GLOBAL RESEARCH ALLIANCE

ON AGRICULTURAL GREENHOUSE GASES

IRG SOC network

Wageningen, Netherlands, March 2-3, 2020

Jean-François Soussana

Smith et al. (2019) ***How to measure, report and verify soil carbon change to realise the potential of soil carbon sequestration for atmospheric greenhouse gas removal. Global Change Biology***

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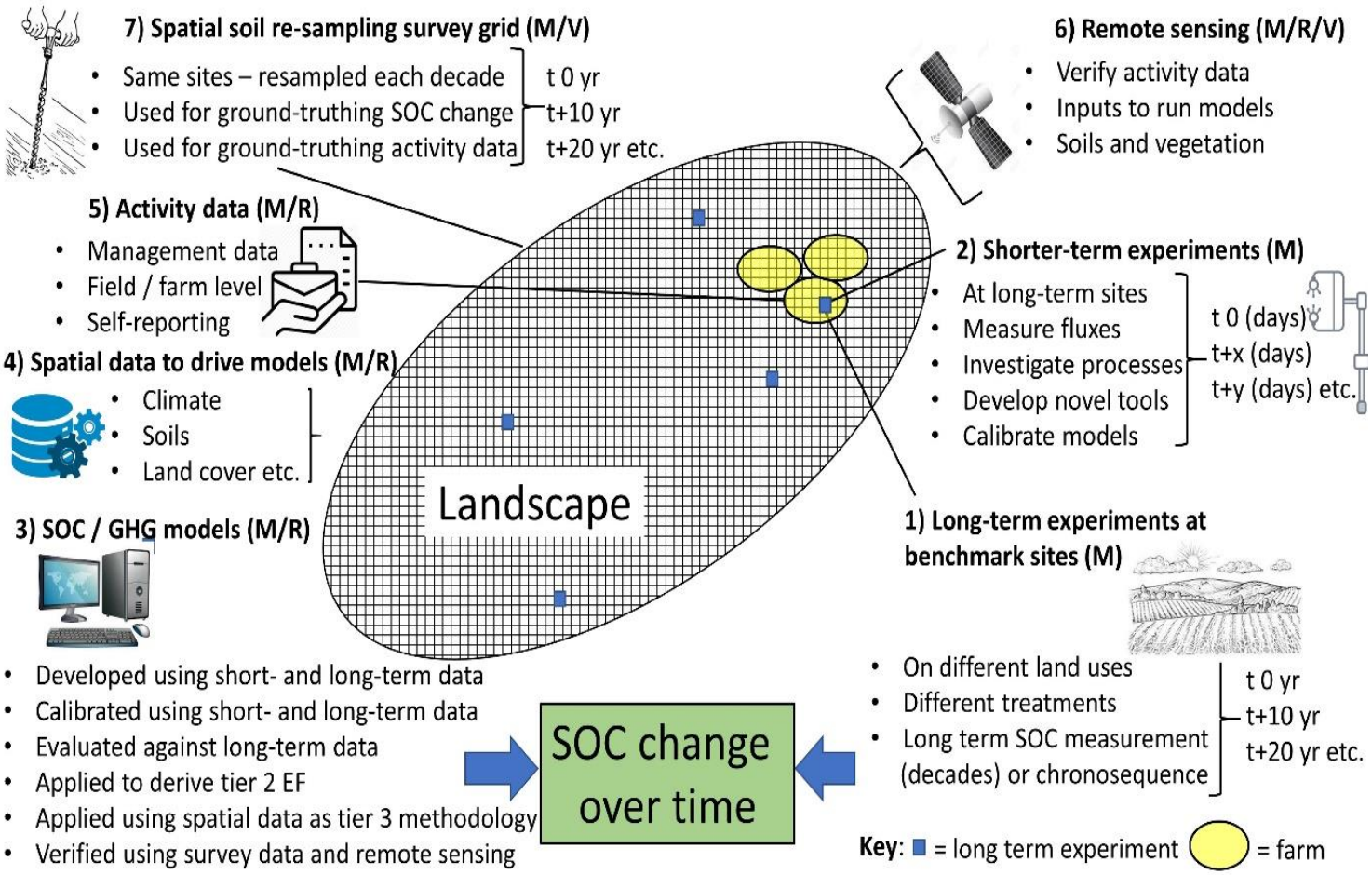

Components of a Monitoring, Reporting and Verification system for soil organic carbon

TABLE 4 Models used to estimate carbon dioxide emissions and removals from the cropland remaining cropland soils component (Tier 3 method) in GRA countries

GRA country	Model		Reference
Australia	The Full Carbon Accounting Model (FullCAM)	Estimates emissions from soil through a process involving all on-site carbon pools (living biomass, dead organic matter and soil) on a pixel by pixel (25 m × 25 m) level	Richards (2001)
Canada	CENTURY	Process model used for estimating CO_2 emissions and removals as influenced by management activities, based on the National Soil Database of the Canadian Soil Information System	Parton, Schimel, Cole, and Ojima (1987), Parton, Stewart, and Cole (1988)
Denmark	C-TOOL	3-Pool dynamic soil model parameterized and validated against long-term field experiments (100–150 years) conducted in Denmark, United Kingdom (Rothamsted) and Sweden and is 'State-of-the-art'	Taghizadeh-Toosi, Christensen, et al. (2014)
Finland	Yasso07 soil carbon model	The parameterization of Yasso07 used in cropland was the one reported in Tuomi, Rasinmäki, Repo, Vanhala, and Liski (2011)	Palosuo, Heikkinen, and Regina (2015)
Japan	Soil Carbon RothC model	In order to apply the model to Japanese agricultural conditions, the model was tested against long-term experimental data sets in Japanese agricultural lands (Shirato & Taniyama, 2003)	Coleman et al. (1997), Coleman, and Jenkinson (1987)
Sweden	Soil Carbon model ICBM-region	Calculate annual C balance of the soil based on national agricultural crop yield and manure statistics, and uses allometric functions to estimate the annual C inputs to soil from crop residues	Andrén and Kätterer (2001)
Switzerland	Soil Carbon RothC model	The implementation of RothC in the Swiss GHG inventory is described in detail in Wüst-Galley, Keel, and Leifeld (2019)	Coleman et al. (1997), Coleman and Jenkinson (1987)
United Kingdom	CARBINE Soil Carbon Accounting model (CARBINE-SCA)	Simplified version of the ECOSSE model (Smith, Gottschalk et al., 2010), coupled with a litter decomposition model derived from the ForClim-D model (Liski, Perruchoud, & Karjalainen, 2002; Perruchoud, Joos, Fischlin, Hajdas, & Bonani, 1999)	Matthews et al. (2014)
United States	DAYCENT biogeochemical model	Utilizes the soil C modelling framework developed in the Century model (Parton et al., 1987, 1988, 1994; Metherell, 1993), but has been refined to simulate dynamics at a daily time step	Parton, Hartman, Ojima, and Schimel (1998), Del Grosso et al. (2001), Del Grosso and Parton (2011)

Abbreviation: GRA, Global Research Alliance of Agricultural Greenhouse Gases.

Ensemble modelling, uncertainty and robust predictions of organic carbon in long-term bare fallow soils

(Farina et al., in revision)

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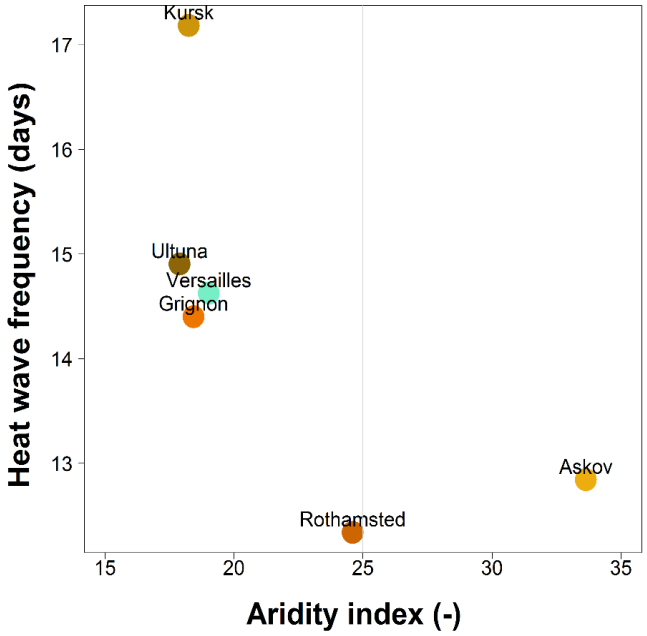
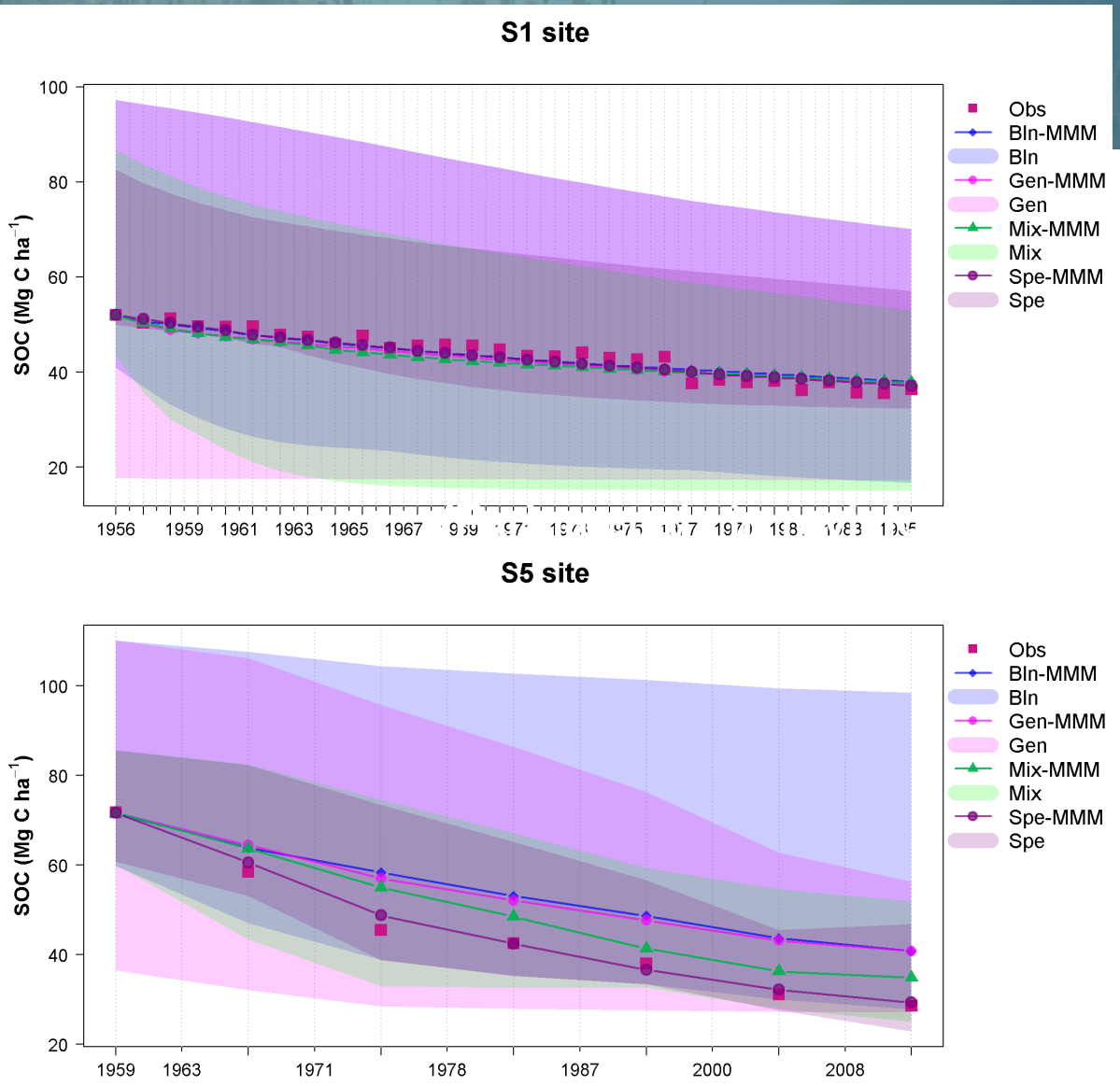


Classification of long-term bare fallow sites for model inter-comparison

Farina et al., in revision



Multiple models (n=25) simulations of SOC for long-term bare fallow sites
OBS: observed, BIN: Blind; MIX, SPE, GEN: calibrated models

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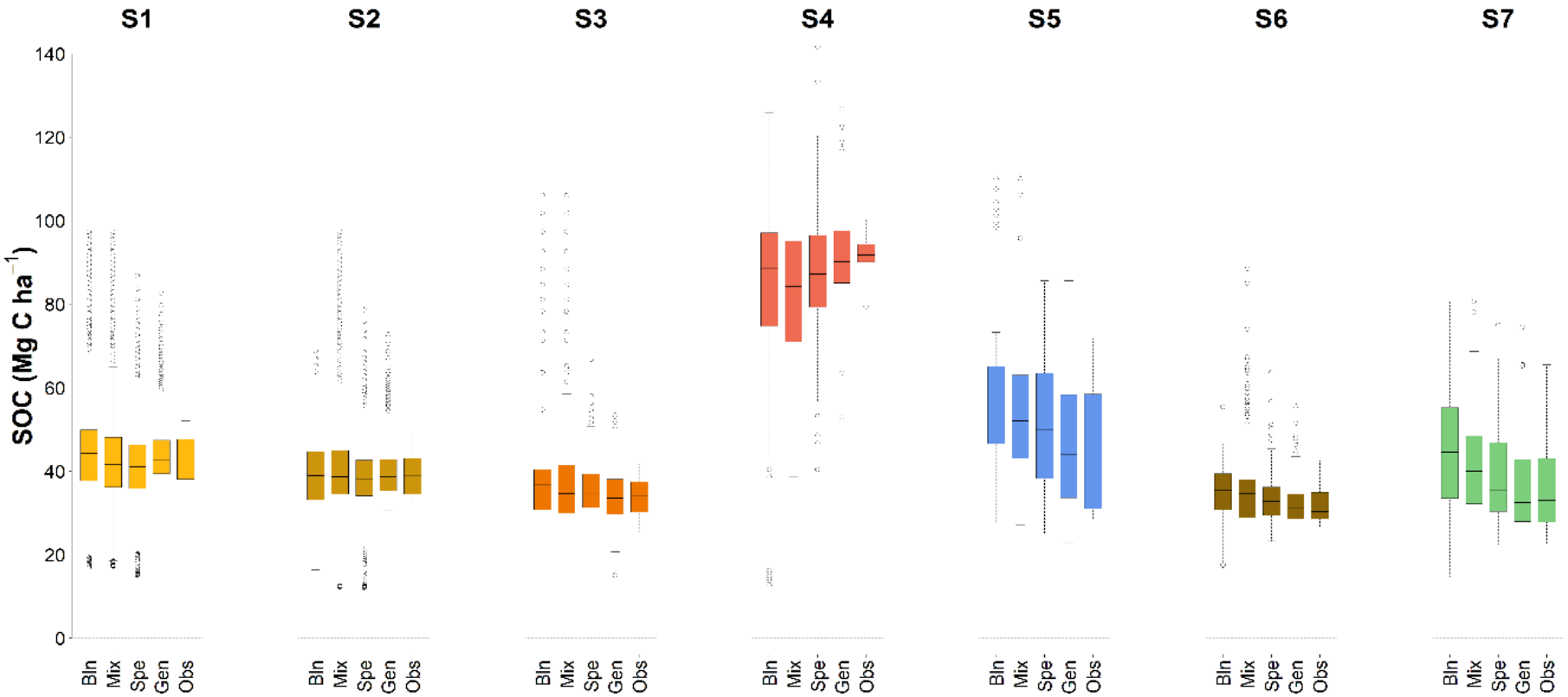

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Ensemble modelling of carbon fluxes in grasslands and croplands
Sandor et al.

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Sites, country (latitude, longitude, elevation)	Years of available data	Evaluated variables	References
C1: Ottawa, Canada (45.29, -75.77, 94 m a.s.l.)	2007-2012	GPP, RECO, NEE	Pattey et al. (2006); Jégo et al. (2012); Sansoulet et al. (2014)
C2: Grignon, France (48.85, 1.95, 125 m a.s.l.)	2008-2012	GPP, RECO, NEE	Laville et al. (2011); Loubet et al. (2011)
C3: Dehli, India (28.6, 78.22, 233 m a.s.l.)	2006-2009	RECO	Bhatia et al. (2012)
G3: Laqueuille, France (45.64, 2.74, 1040 m a.s.l.)	2003-2012	GPP, RECO, NEE	Allard et al. (2007); Klumpp et al. (2011)
G4: Easter Bush, United Kingdom (55.52, -3.33, 190 m a.s.l.)	2002-2010	GPP, RECO, NEE	Skiba et al. (2013), Jones et al. (2017c)

Crop and grassland sites for model intercomparison

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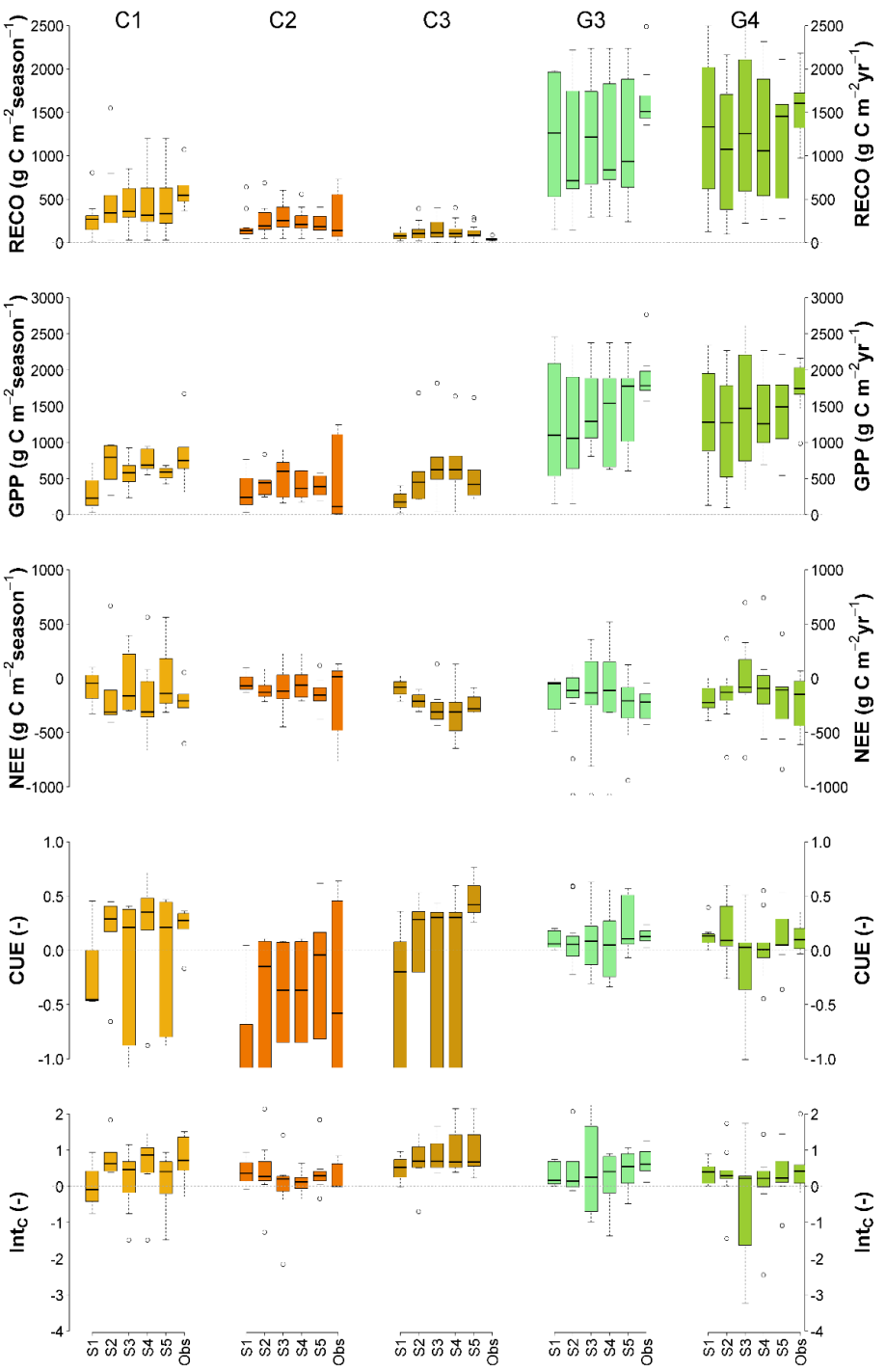

Seasonal changes in ecosystem respiration (RECO), gross primary production (GPP), net ecosystem exchange (NEE), carbon use efficiency (CUE) and C intensity (Int_C) calculated over multiple years at C1, C2 and C3 crop, and G3 and G4 grassland sites, for five calibration stages (S1 to S5) and the observation (Obs). Number of crop seasons/grassland years: soybean: 1; triticale: 1; phacelia: 1; spring wheat: 2; rice: 2; maize: 3; rapeseeds: 4; winter wheat: 5; fallow: 9; grasslands: 19.

Integrative Research Group: Recent achievements (3)

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SOIL CARBON SEQUESTRATION NETWORK

- GRA activities related to soil carbon sequestration presented at:
  - KJWA workshop in Bonn (June 2019) and at COP25 (Madrid)
  - Forum Planet A (June 2019)
  - Finnish presidency of the EU
- Linked with CIRCASA:
  - Contribution to H2020 NIVA project introducing an agri-environmental indicator on soil carbon in the context of CAP monitoring
  - EIT Climate KIC project on soil carbon farming, with first transition cases studied in SW France and in Flaachtal, Switzerland
  - Launch of European Joint Program on soils, coordinated by Claire Chenu

More to be presented with CIRCASA

Thank you for your attention!