This project has received funding from **the European Union's Horizon 2020** research and innovation programme under grant agreement No **774378**

CIRCASA

Coordination of International Research Cooperation on soil CArbon Sequestration in Agriculture

Towards an International Research Consortium on Soil Carbon

www.circasa-project.eu

Open Collaborative Platform: https://www.ocp.circasa-project.eul

@CIRCASAproject

CIRCASA in context

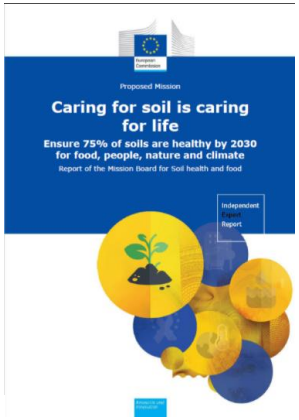
Large interest on agricultural soil carbon both at global and EU scales

- At global scale, the **RECSOIL project** (Recarbonizing soils) by FAO and GSP with support of GEF and UNCCD
- The **UNFCCC Koronivia** workshop on soil carbon
- A number of **private sector initiatives** (linked to regenerative agriculture), e.g. Terraton challenge,
- The development of **certification schemes** for agricultural soil carbon, including national **low carbon labels** (e.g. in France)
- In the EU, the **Mission Board on Soil Health and Food** that recommends to increase arable soil organic carbon stocks, in line with EU commitment to land degradation neutrality
- Conserving and increasing soil carbon contributes to several **EU Green Deal strategies**
- Also in the EU, the launch of the **European Joint Program on soils**

RECSOIL:
Recarbonización de los suelos mundiales

indigo

LABEL BAS CARBONE



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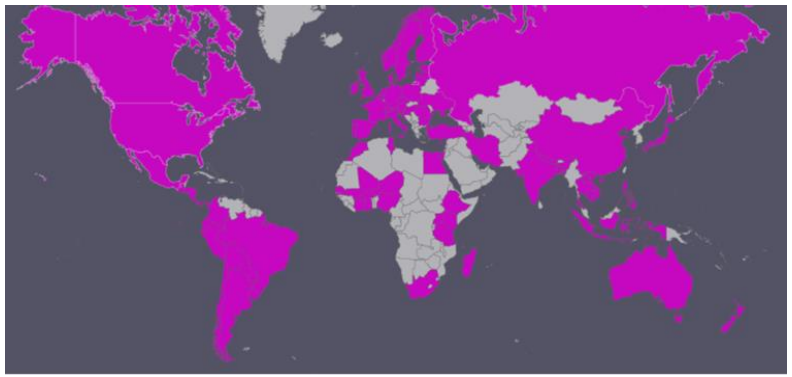
EJP SOIL
European Joint Programme

CIRCASA Project



Countries partners of CIRCASA, 4p1000, GRA, FACCE-JPI and CCAFS

- H2020 CIRCASA has **22 partners (17 countries)** including the research secretariats of **4p1000**, **GRA**, **FACCE-JPI and collaborations with the Global Soil Partnership (GSP)**
- Started Nov. 2017 for a duration of three years (Covid-19, delayed to Feb. 2021)
- Aimed at developing international synergies concerning research and knowledge exchange in the field of carbon sequestration in agricultural soils at European Union and global levels, with the active engagement of all relevant stakeholders.

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WORK PLAN

WP5 Coordination (INRAE)

WP4 Communications (WUR)

WP1(ABDN)

Review Scientific & Technical Evidence

WP2 (EI)

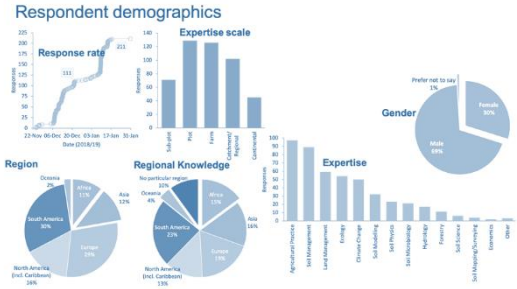
Stakeholder's views: Knowledge & Research needs

Co-design a Strategic Research Agenda (SRA)

Facilitating the establishment of an **International Research Consortium (IRC)**

WP3 (INRAE)

Review Scientific & Technical Evidence



- 211 responses
- Responses from all continents
- Strong representation of Agricultural Practice, Soil and Land Management researchers
- Poor representation Social Science disciplines

14 Research Challenges to SOC in agriculture

Theme 1 — Processes

1. Stabilisation of soil carbon
2. Soil C saturation
3. Role of Microorganisms in soil C dynamics
4. SOC and greenhouse gas emissions

Theme 2 — Management & Monitoring

5. Deep soil stabilisation
6. Measuring and Monitoring
7. Vegetation management
8. Organic amendment management
9. Mixed agricultural practices

Theme 3 — Barriers

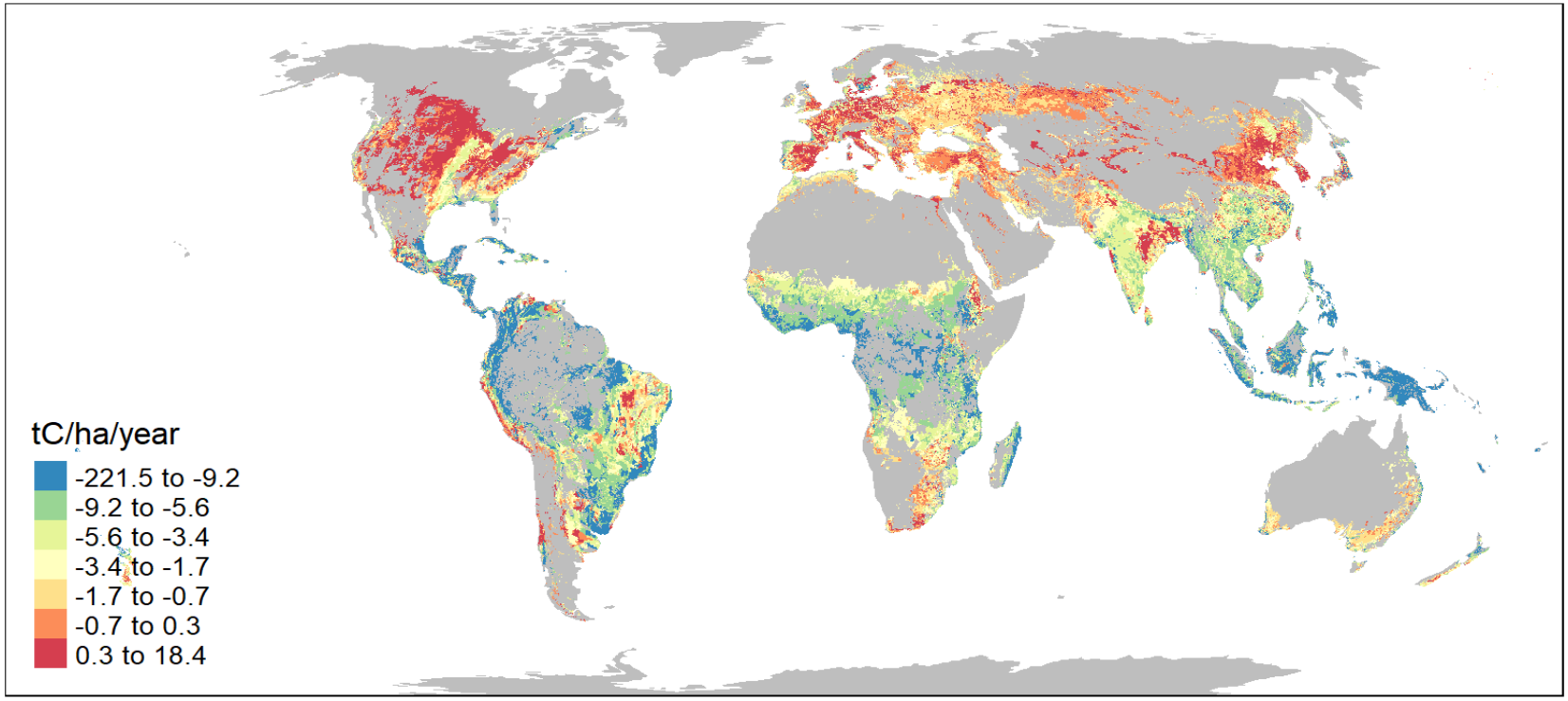
10. Preventing soil organic loss
11. Economic
12. Socio-cultural barriers
13. Institutional/legal barriers
14. Technological readiness for SCS

[CIRCASA, 2019. The science base of a strategic research agenda]

Review Scientific & Technical Evidence

Reaching the 4 per 1000 aspirational target in global croplands?

Simulated balance between crop residue inputs (Global EPIC) and soil organic carbon decomposition (RothC)



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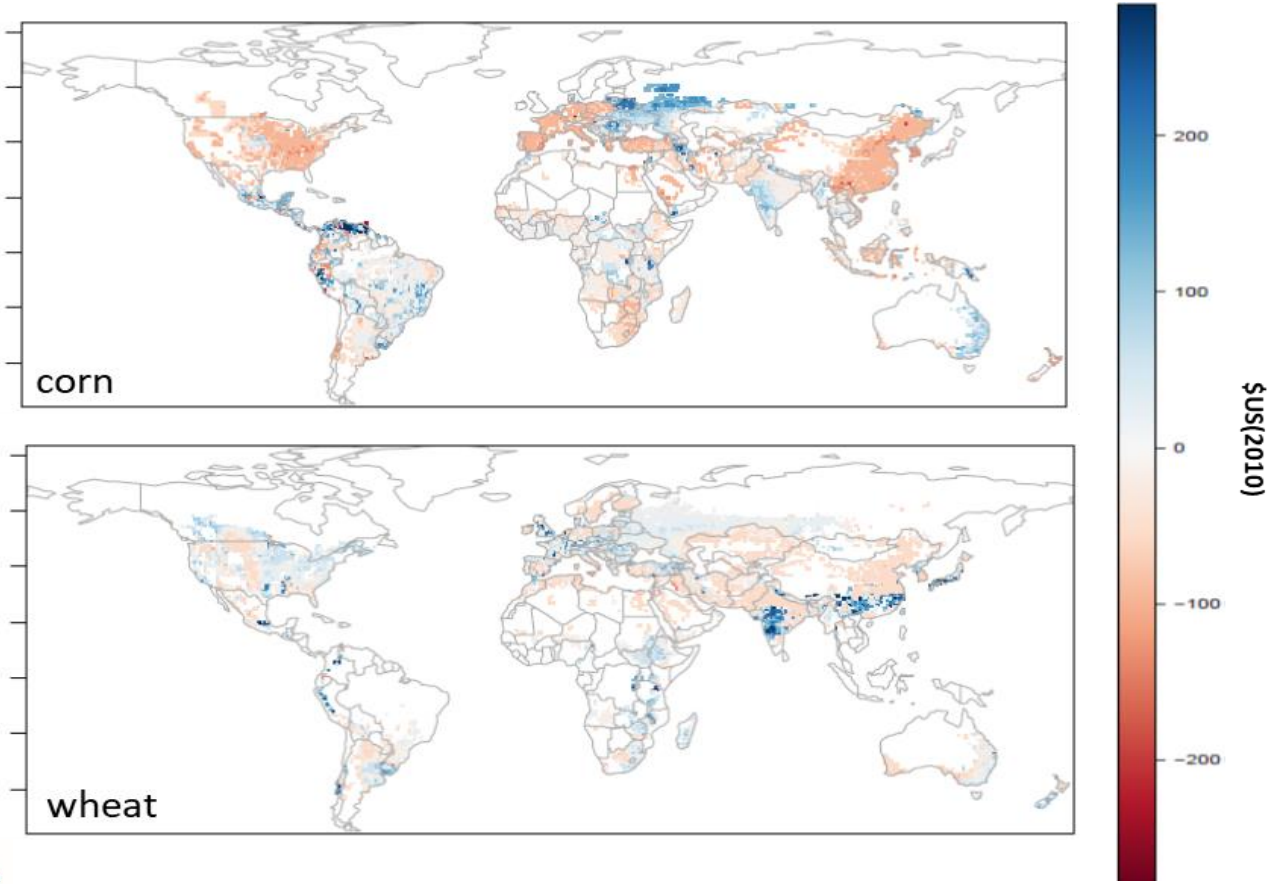
Note: soil decomposition may be overestimated in some hot and wet tropical environments

Review Scientific & Technical Evidence

International Knowledge Synthesis activities

Costing the change from conventional tillage to no-till in global croplands (US$2010 per hectare)



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Stakeholder Consultation

Online Survey

7 languages (English, French, German, Danish, Portuguese, Spanish, Russian)

Knowledge needed by farmers / other stakeholders

Knowledge available but not accessible

New research needed

1369 respondents

\+ 1807 Danish farmers

10 Regional Workshops

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Research Needs

Farmers / Farm Advisors

- Costs and benefits of SOC management
  - Productivity / yields / water
  - Financial returns / net income
  - Risks / trade-offs, time and effort involved
- Crop choice and combinations, interactions among practices, role of microorganisms

Other Stakeholders

- **Demonstrate societal and environmental benefits**
- **Develop policy mechanisms to better incentivize SOC management (targeting, tailoring)**
- **Improve reliability & standardisation of MRV at a reasonable cost (including farm level sampling, crowd sourcing)**
- **Agri-food system transformations (cost of food, external costs …)**

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Strategic Research Agenda

SRA supporting the alignment of research into an International Research Consortium

Research Priorities

Pillar 1 – Frontiers research: unlocking the potential of soil carbon

=> International research calls with EJP Soil

Pillar 2 – Soil carbon stock change MRV: international standard

=> International innovation project

Pillar 3 – Agro-ecological and technological innovations

=> Private-Public innovation projects

Pillar 4 – Enabling environment and knowledge co-creation

=> Open online collaborative platforms

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Pillar 1 - Frontiers research: unlocking the potential of soil C

International calls: Frontiers Research

- Deep soil carbon dynamics
- Soil biota diversity and SOC stock change
- Overcoming N_2O – SOC trade-offs
- SOC stabilisation and saturation
- Climate proofed SOC sequestration

WHO?

National research agencies
Research organizations and Universities

HOW?

- Research calls based on shared research priorities
- Each agency pays for national research teams
- Project evaluation is delegated to an international review panel with observers from each agency
- Open to private sector research

WHEN?

- International dimension for second external call of EJP Soil in 2022

Other opportunities for international research calls to be explored

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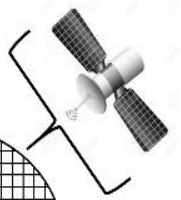
Pillar 2: Vision for a global framework for Monitoring, Reporting and Verification of SOC change (Smith, Soussana et al. 2019, Global Change Biology)

7) Spatial soil re-sampling survey grid (M/V)

- Same sites – resampled each decade — t 0 yr
- Used for ground-truthing SOC change — t+10 yr
- Used for ground-truthing activity data — t+20 yr etc.



6) Remote sensing (M/R/V)

- Verify activity data
- Inputs to run models
- Soils and vegetation

5) Activity data (M/R)

- Management data
- Field / farm level
- Self-reporting

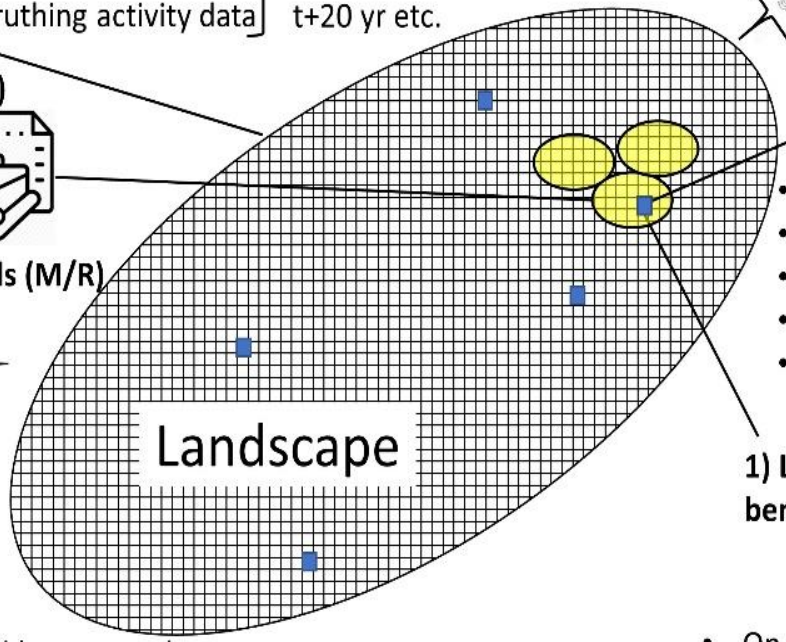
2) Shorter-term experiments (M)

- At long-term sites
- Measure fluxes
- Investigate processes
- Develop novel tools
- Calibrate models

t 0 (days)
t+x (days)
t+y (days) etc.

4) Spatial data to drive models (M/R)

- Climate
- Soils
- Land cover etc.



3) SOC / GHG models (M/R)

- Developed using short- and long-term data
- Calibrated using short- and long-term data
- Evaluated against long-term data
- Applied to derive tier 2 EF
- Applied using spatial data as tier 3 methodology
- Verified using survey data and remote sensing

SOC change over time

1) Long-term experiments at benchmark sites (M)

- On different land uses
- Different treatments
- Long term SOC measurement (decades) or chronosequence

t 0 yr
t+10 yr
t+20 yr etc.

Key: ■ = long term experiment ● = farm

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Pillar 2 - Soil carbon stock change. Towards an international MRV standard

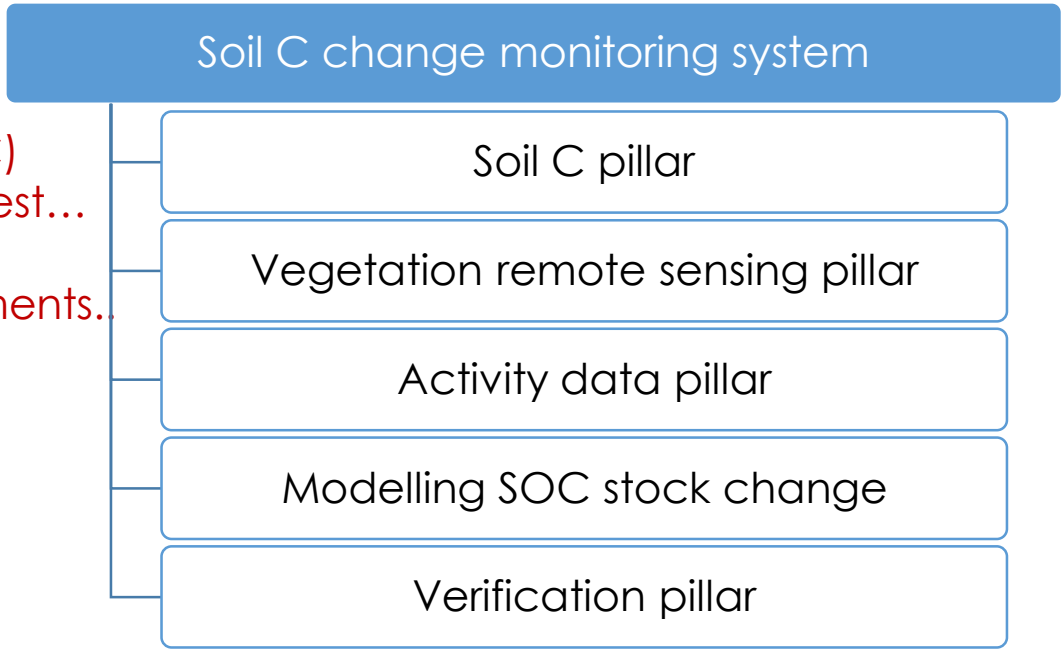
=> International projects with space and innovation agencies

WHO?

GSP, EJP soil, EU Soil Observatory (JRC)
COPERNICUS, GEOS, ESA, NASA Harvest…
NIVA project (IAVS)
ICOS, Fluxnet, Long-term field experiments..

HOW?

- A design study (stage 1)
- Two implementation stages
- Private-Public consortium



WHEN?

- Private funding in 2020 for a proxy (change in annual duration of vegetation cover in global croplands)
- Create consortium in 2021, funding and work plan, start with launch of IRC

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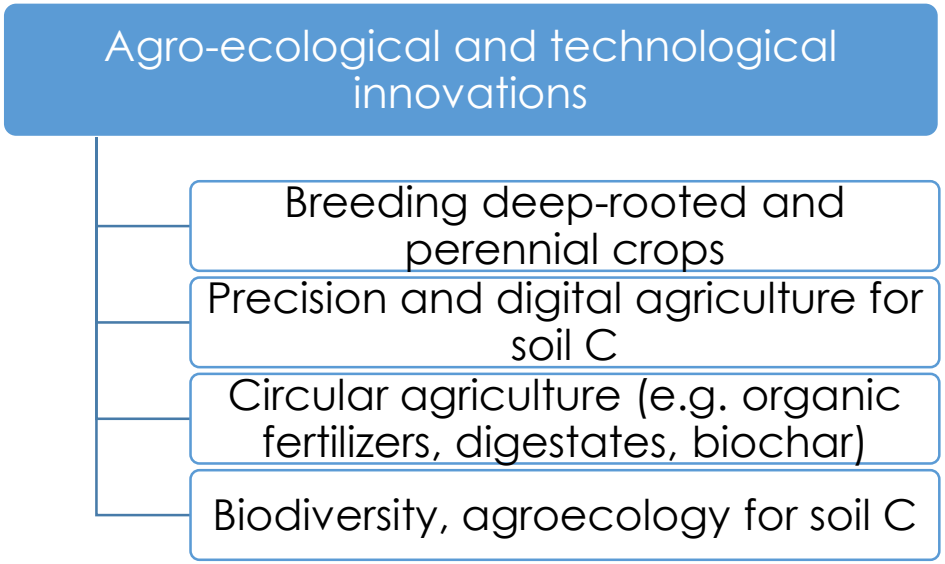
Pillar 3 - Agro-ecological and technological innovations



WHO?

Public – Private partnerships by sub-topic
e.g. plant breeding sector,
digital agriculture,
agri-food, organic wastes,
bioenergy sector

HOW?

- Portfolio of projects by topics
- Pre-competitive innovation

WHEN?

- Seek engagement in 2021
- Design stage for each sub-topic
- Pipeline of innovation projects

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D3.2 IRC Work Programme Report presenting recommendations for the set-up of an IRC on soil carbon sequestration in agriculture

PILLAR III Work Program - Agro-ecological and technological innovations

Plant breeding. The phenotyping of root systems is still largely to be achieved. The technological challenge is to develop this phenotyping, supplemented by omics, and thus to promote the adaptation of plant material.

Biochar and organic amendments. From a circular economy perspective, various technologies exist today to use the potential of wastes (agricultural, industrial or urban) and functionalize them to enrich the soil and promote the storage of carbon. Further innovation is required for composting, anaerobic digestion, pyrolysis (biochar), hydrothermal carbonisation ... These processes generate bioenergy (bio-methane, hydrogen, heat) and their optimization must be designed for both the energy transition and the agricultural transition, including by considering the role of BECCS (bioenergy with carbon capture and sequestration).

Precision agriculture and machinery. Digital agriculture, sensors (e.g. spectrometry for soil organic matter), novel machinery for green tilling, cover crops, crop mixtures and long crop rotations, pasture renovation etc.. needs to be developed and could provide data that could also contribute to the traceability of soil carbon storing practices and to carbon certification by low carbon labels. Moreover, the use of block chain technologies could be combined with precision agriculture to support this certification process.

Business plan

Public – Private partnerships by sub-topic (e.g. plant breeding sector, digital agriculture, agri-food, organic wastes, bioenergy sector): Design stage for each sub-topic; Portfolio of projects by topics; Pre-competitive innovation Pipeline of innovation projects

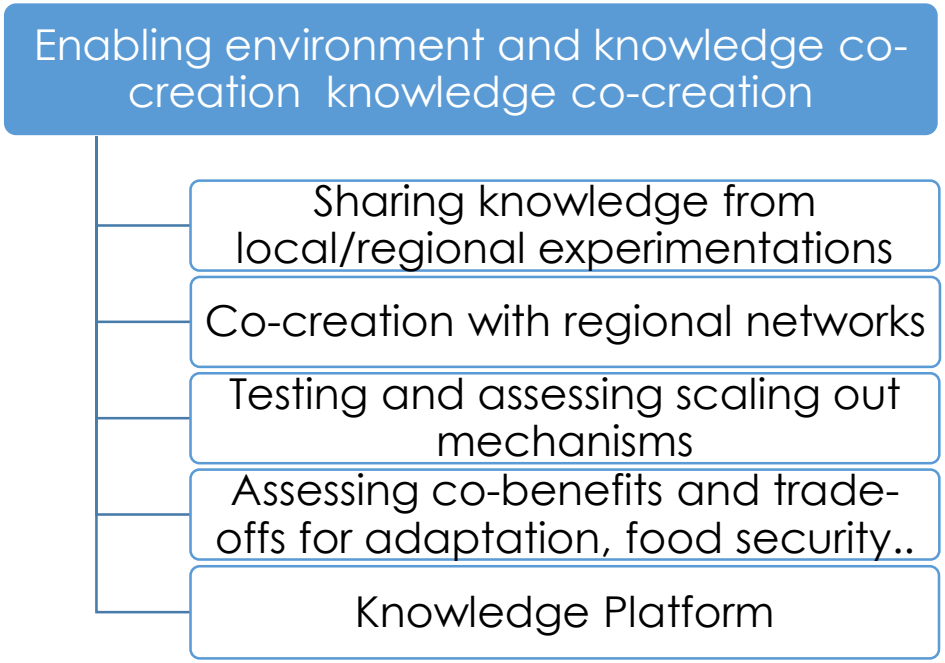
Timeline

Seek engagement in 2021

Budget

To be estimated

Pillar 4 - Enabling environment and knowledge co-creation



WHO?

Knowledge platform: upgrade CIRCASA OCP together with EJP SOIL

HOW?

- Crowdsourcing with knowledge platforms,
- Regional networks
- Language and cultural diversity

WHEN?

- Seek engagement in 2021
- Design stage for each sub-topic
- Pipeline of regional knowledge co-creation projects

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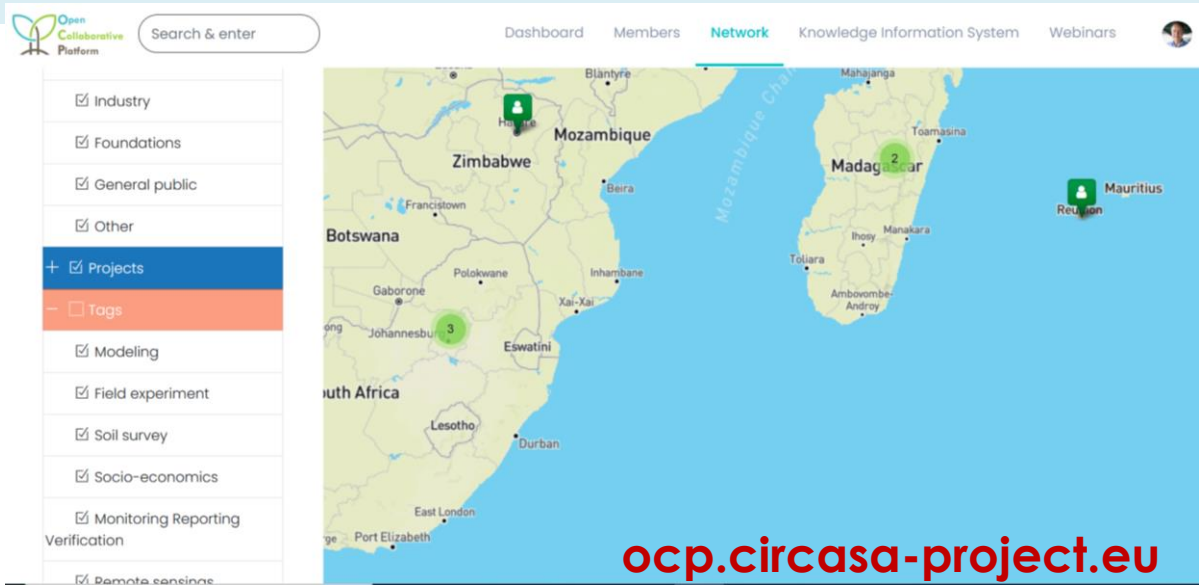
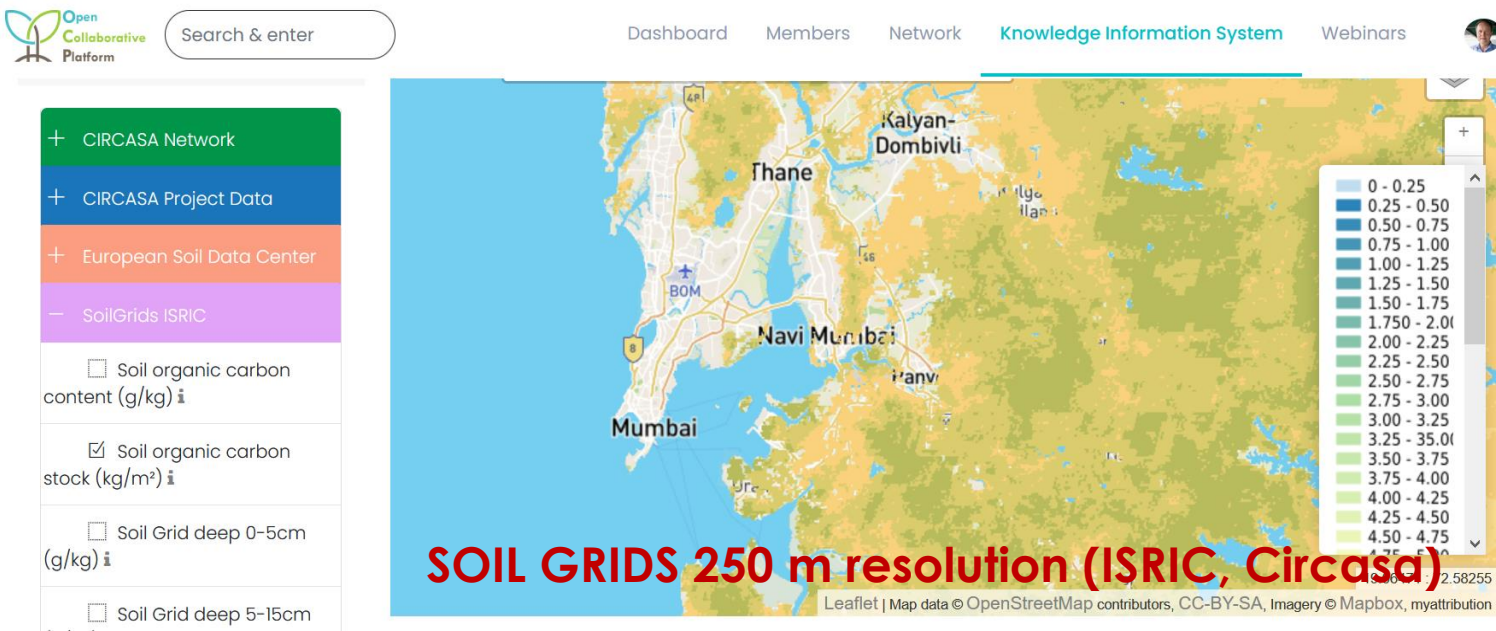
CIRCASA Open Collaborative Platform services: matchmaking, knowledge sharing, information system (data and maps)

An open data repository (Data Verse) with geospatial and modelling data





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Governance & funding of the IRC

INTERNATIONAL RESEARCH CONSORTIUM ON Soil Organic Carbon

- **CIRCASA's preparatory work** underlines the need to develop an international research consortium (IRC) on soil organic carbon in agriculture and the **large benefits of international research cooperation in this field for stakeholders both in the EU and in other world regions.**

- **Goal**: align R&I activities in order to create breakthroughs, avoid duplication of activities and develop innovation on a large scale

- **No single country and no single corporate can develop alone R&I activities at scale**.

- Moreover, as shown by the SRA of CIRCASA and by the EC Mission Board on Soil Health and Food, R&I activities in this field need to be highly interdisciplinary and to be guided by stakeholder's demands. This **requires a dedicated tool to carry ambitious international R&I programs.**

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VISION OF THE INTERNATIONAL RESEARCH CONSORTIUM

Strategic Research Agenda

- PILLAR 4: Enabling environmental and knowledge co-creation
- PILLAR 3: Agro-ecological & technological innovations
- PILLAR 2: Monitoring Reporting and Verification (MRV) system
- PILLAR 1: Frontier Science

International Research Consortium

- Collaborative Knowledge
- Capacity Building
- Coordination
- Governance

Research	• Universities • National and International Institutes
Private sector	• Corporates, SME's, Startups • Consultancies, extension services, • Associations of farmers, foresters, land owners, etc. • NGOs, Foundations • Financial sector
Public	• Research agencies, • Development and Environment agencies • Space agencies • International partnerships and initiatives

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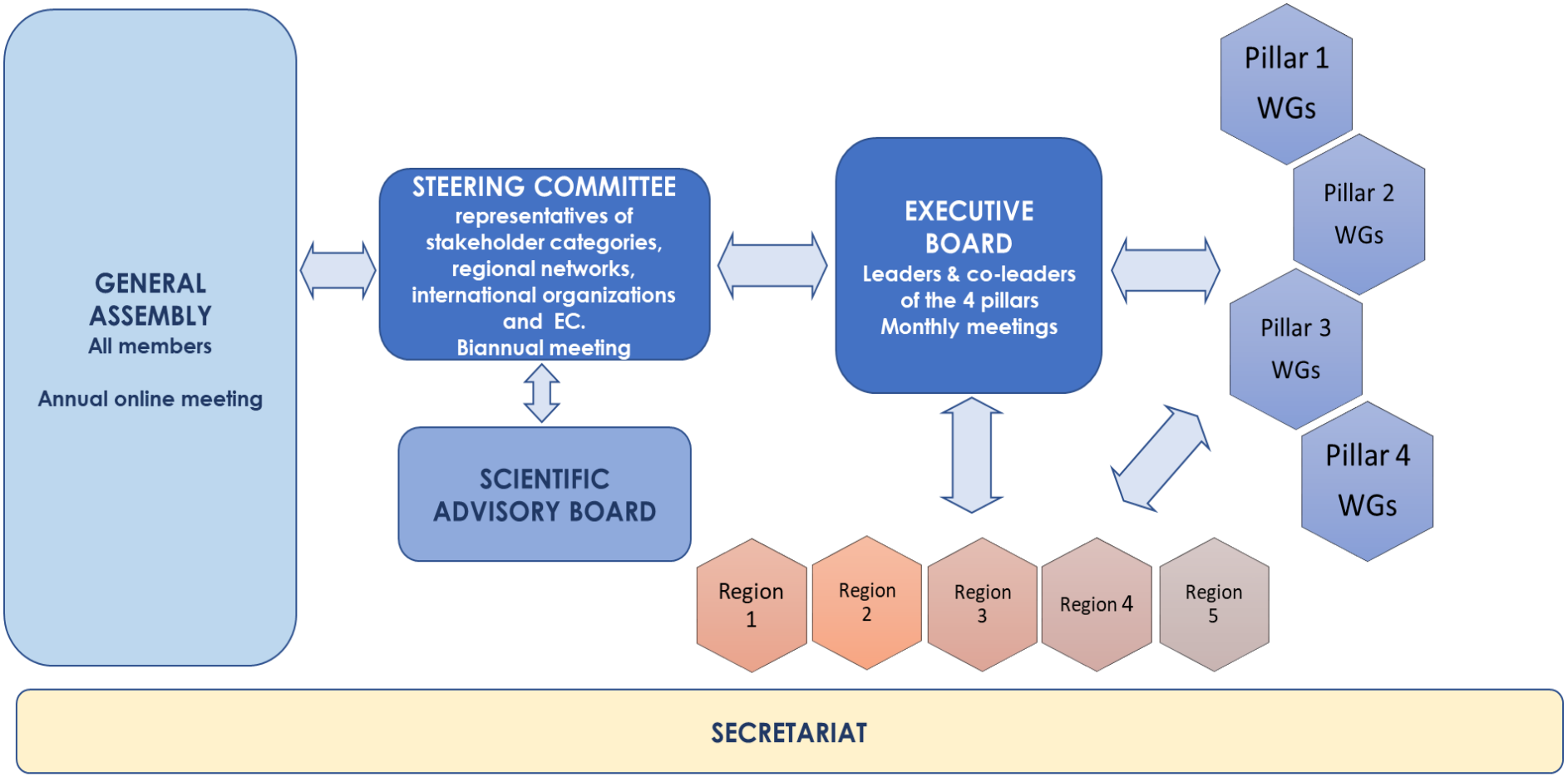
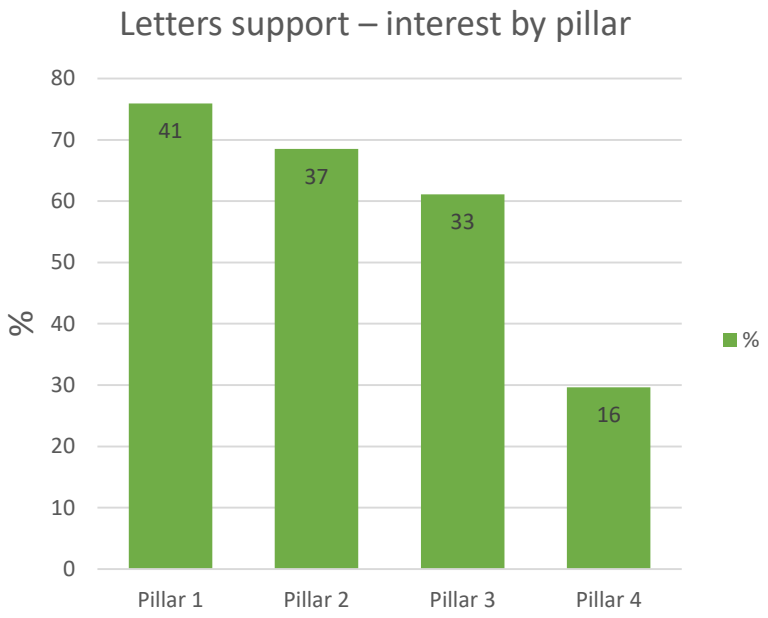
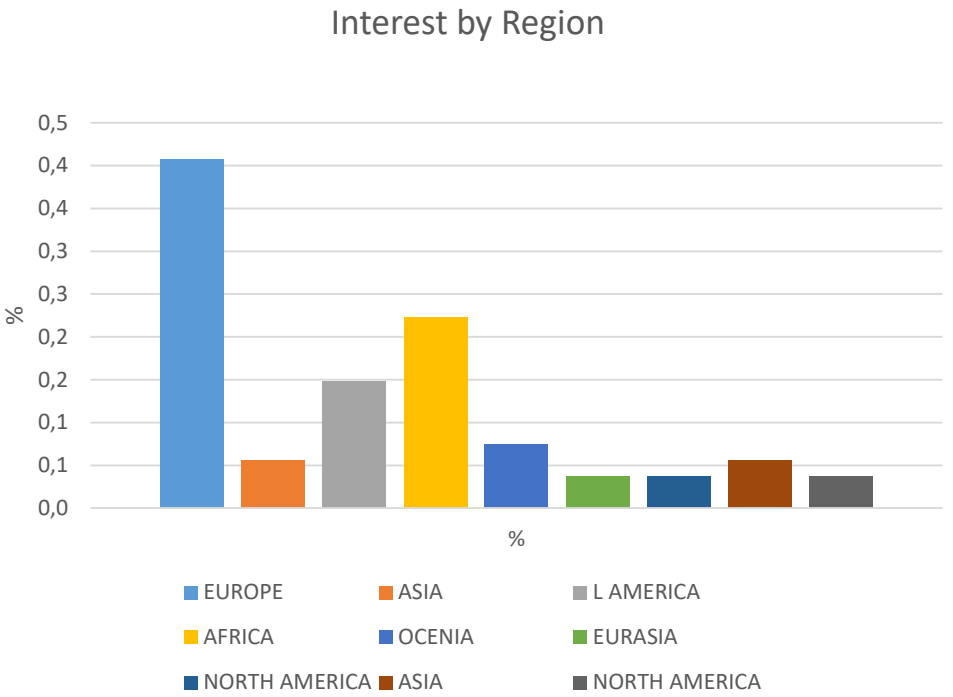
Proposed International Research Consortium structure and governance

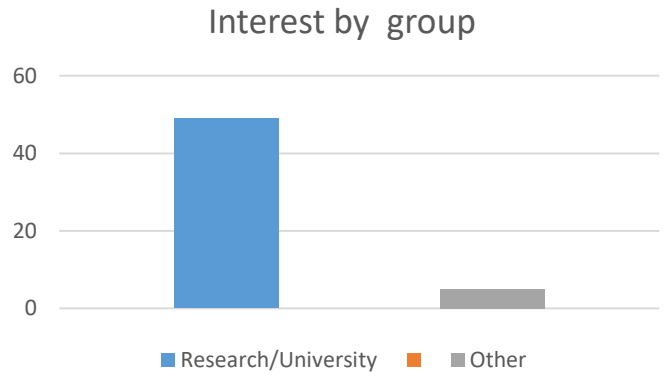


(See Deliverable 3.2)

Letters of support – 54







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