CIRCASA

Coordination of International Research Cooperation on soil CArbon Sequestration in Agriculture

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

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

- Half of the agricultural soils are estimated to be degraded *[FAO, 2006, 2011].*

  The annual cost of fertilizer to replace nutrients lost to erosion is US $110 – US $ 200 billion *[ITPS FAO, 2016].*

- Annual losses of 0.3–1.0 billions tons C through erosion of agricultural land *[Chappell et al., 2015, NCC].*

- 24-40 million metric tons additional grains can be produced in developing countries per additional ton C per hectare stored in soils organic matter *[Lal , 2006]*

- Reduced yield variability after soil restoration leading to increased soil organic matter *[Pan et al. , 2009]*

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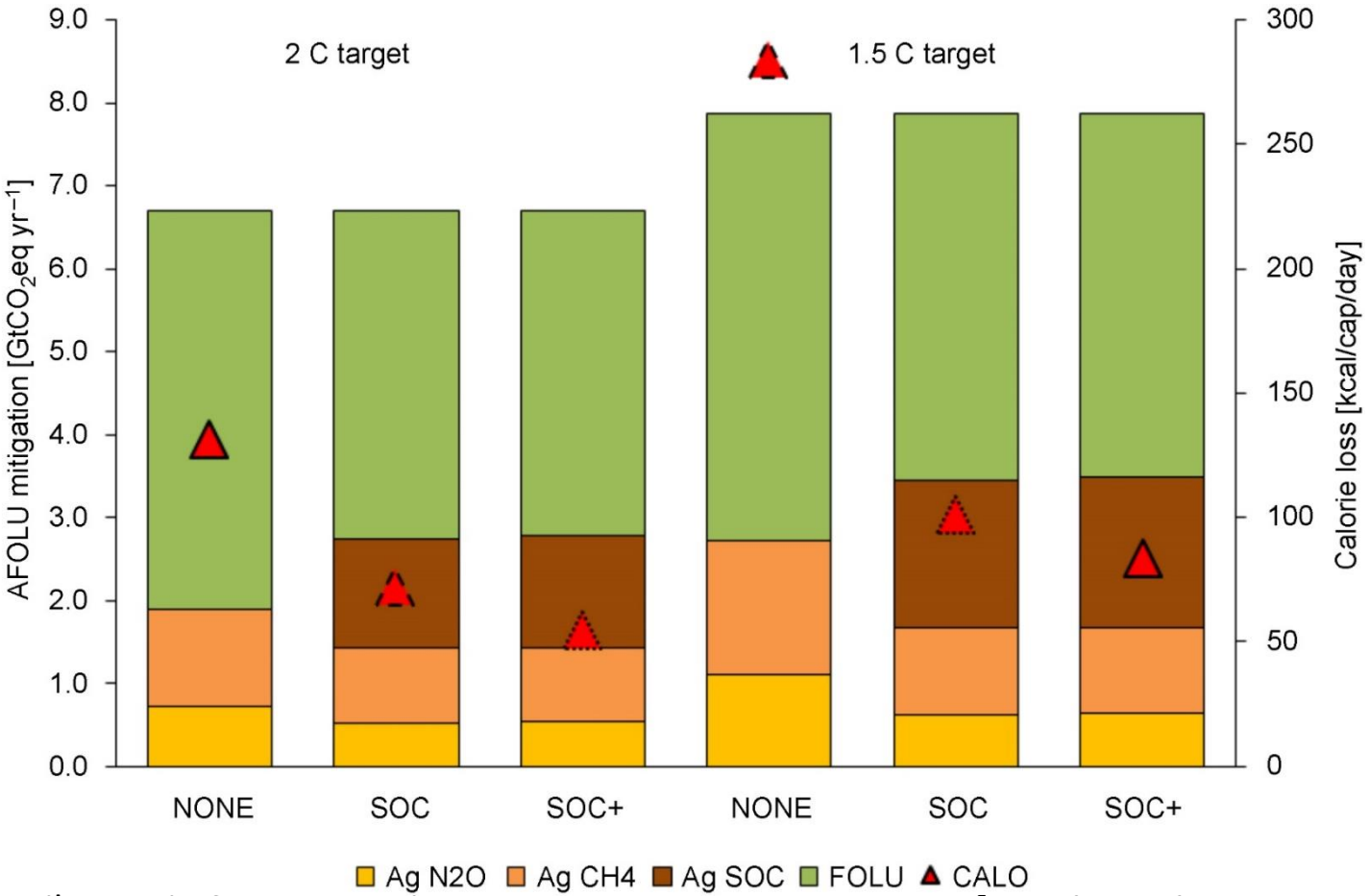
With soil carbon sequestration, food security is not threatened, even for a 1.5°C global warming target



SOC— soil organic C sequestration

SOC+— including its benefits for yields

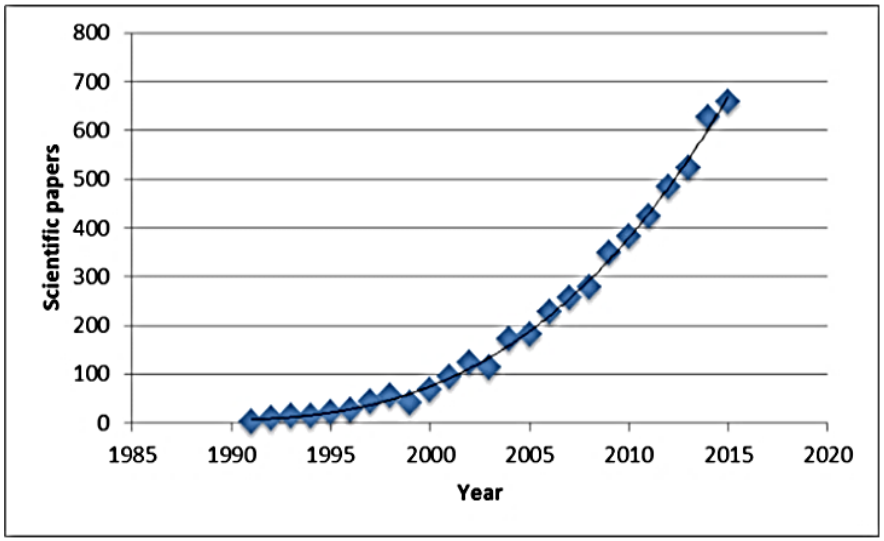
Ag N2O—N_2O mitigation from agriculture; Ag CH4—CH_4 mitigation from agriculture;

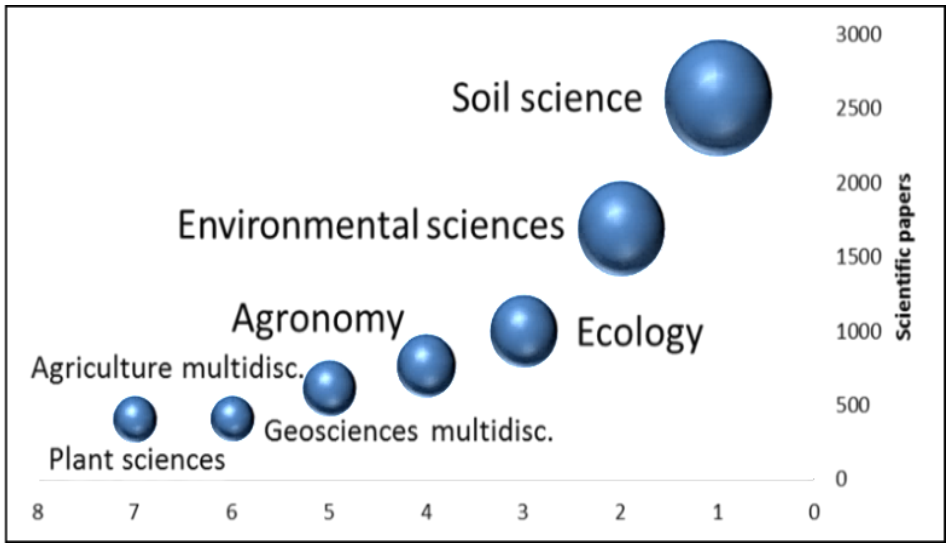
Ag SOC—CO_2 sequestration from agriculture, FOLU—CO_2 mitigation from forestry and other land use

[Frank et al., Env. Res. Lett., 2017]

Research trends

- Research on soil organic carbon sequestration in agriculture is rapidly increasing, interdisciplinary and international.





Exponential growth in annual number of scientific papers on soil carbon sequestration in agriculture over 1991-2015 (Left) and distribution by scientific discipline (Right).

(CIRCASA Project, Soussana et al.)

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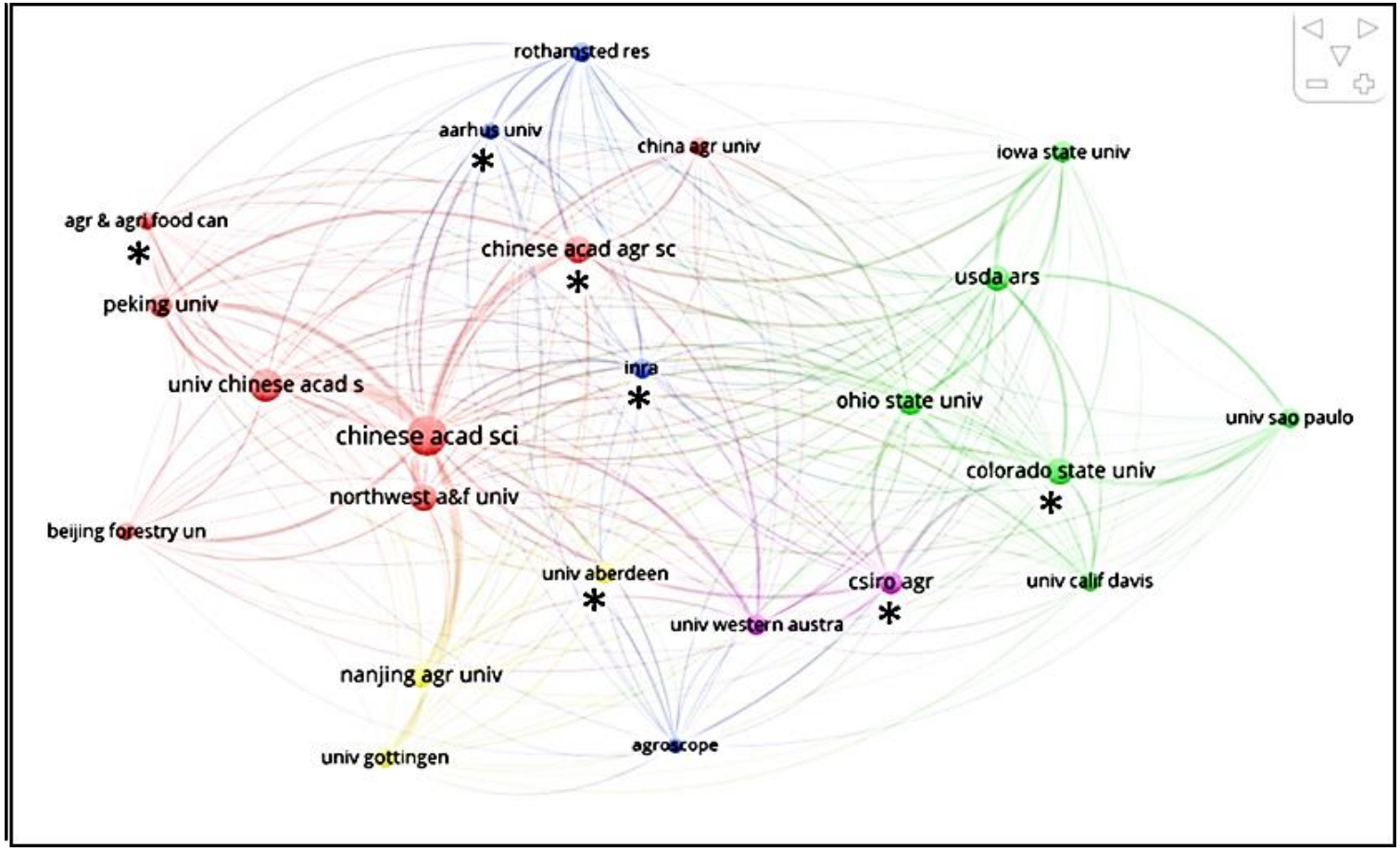
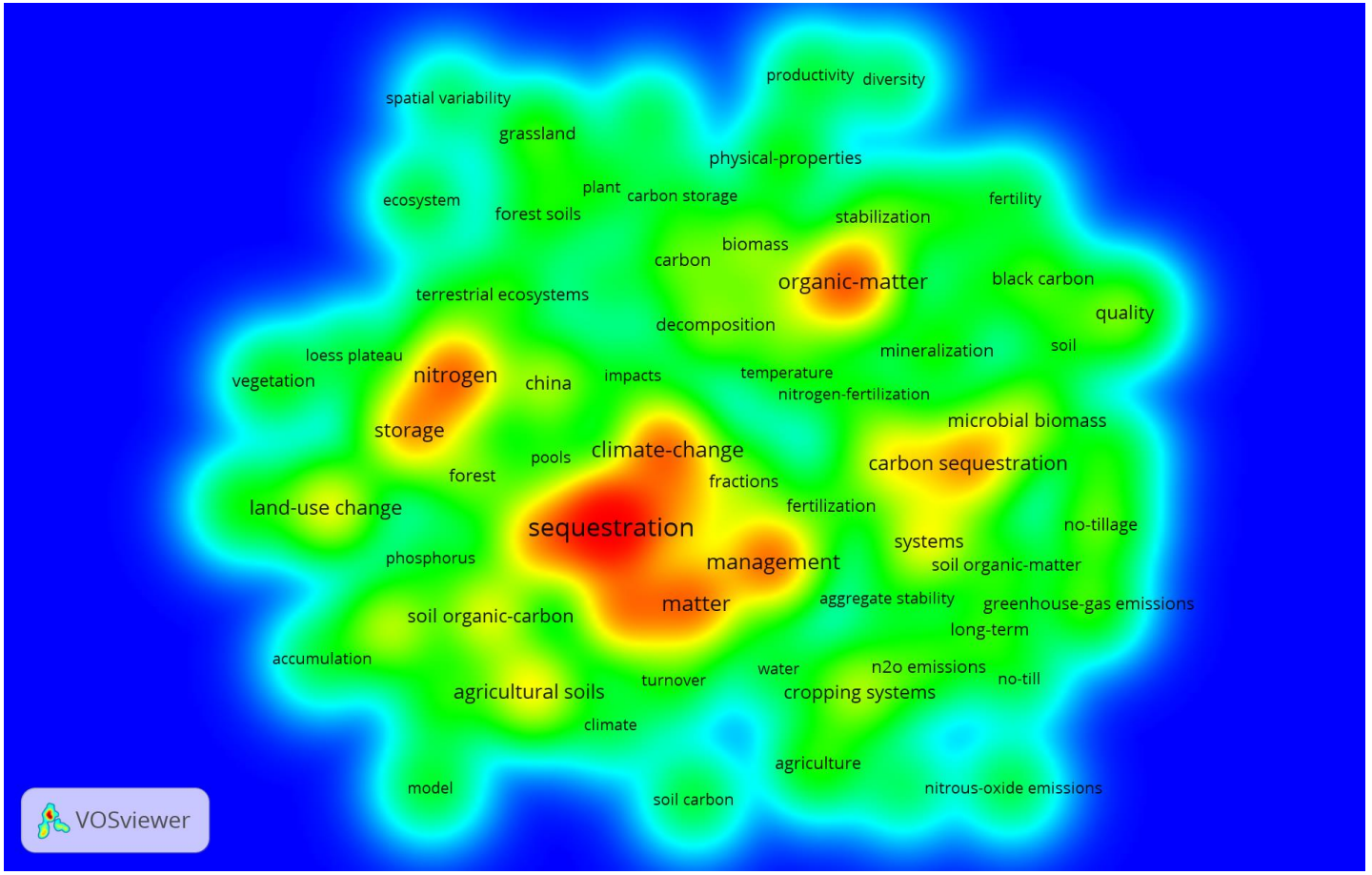
Research trends (cont.)



Main international research networks on agricultural soil carbon sequestration (2016)

(CIRCASA Project, Soussana et al.)

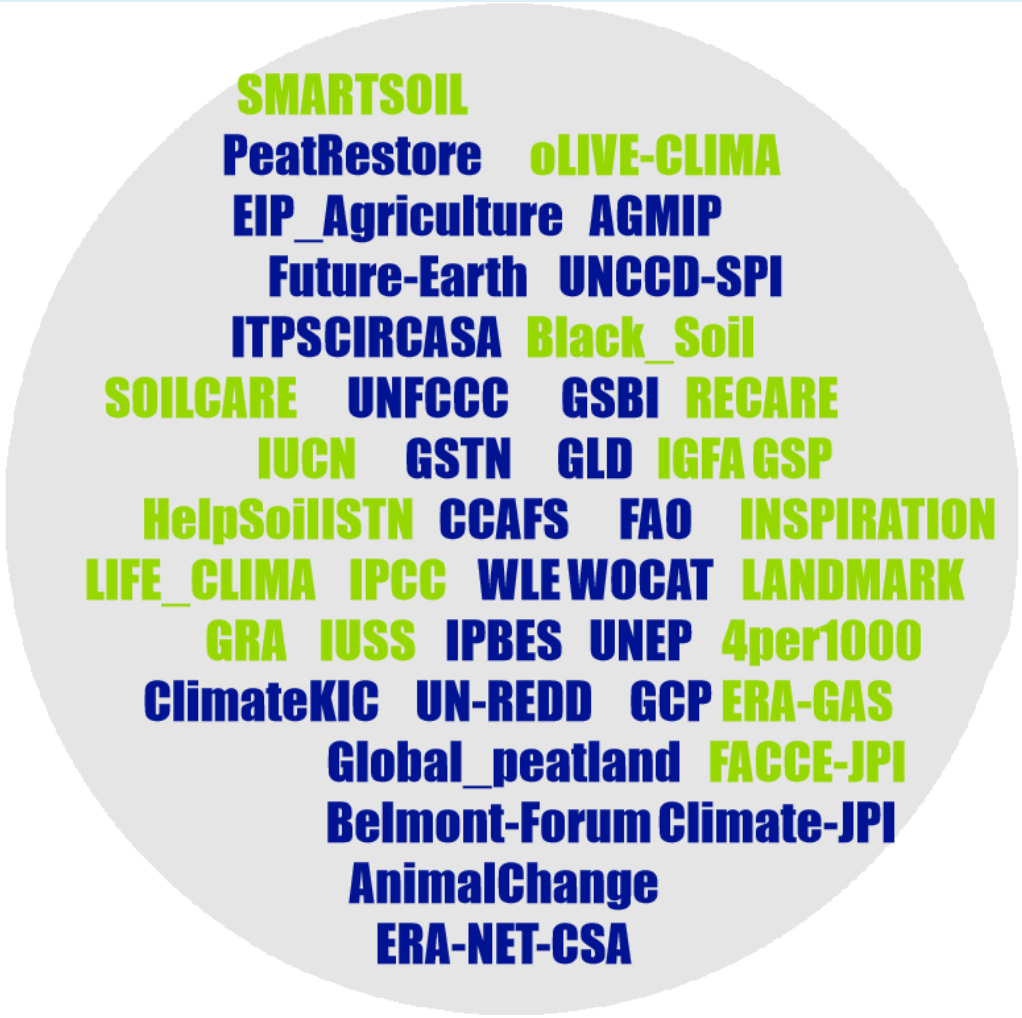
Research trends (cont.)



Main research topics (key-words) concerning soil organic carbon sequestration in agriculture (2016)

(CIRCASA Project, Soussana et al.)

Research trends (cont.)



Many ongoing initiatives and research projects dealing (in part) with soils, agriculture and climate change

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CIRCASA consortium

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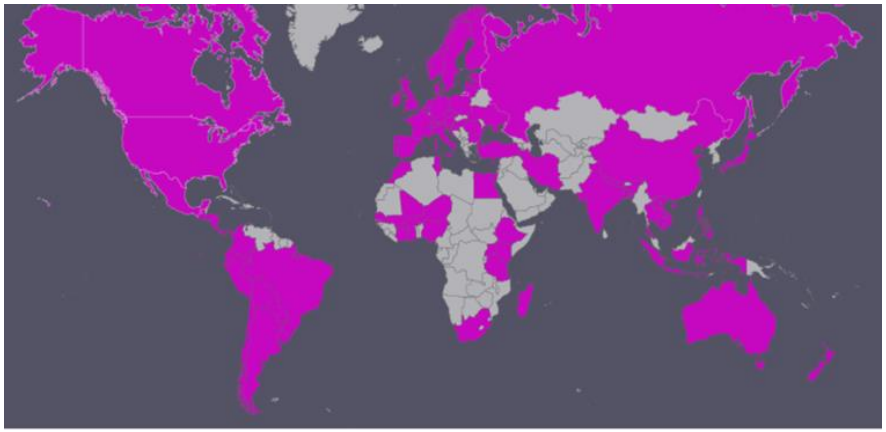
- CIRCASA has **22 partners** including the research secretariats of **4p1000**, **GRA** and **FACCE-JPI**
- Together with these initiatives and with CCAFS-CGIAR, it has direct outreach to a total of **82 countries** accounting for **85% of the world's total research on soil C sequestration in agriculture**



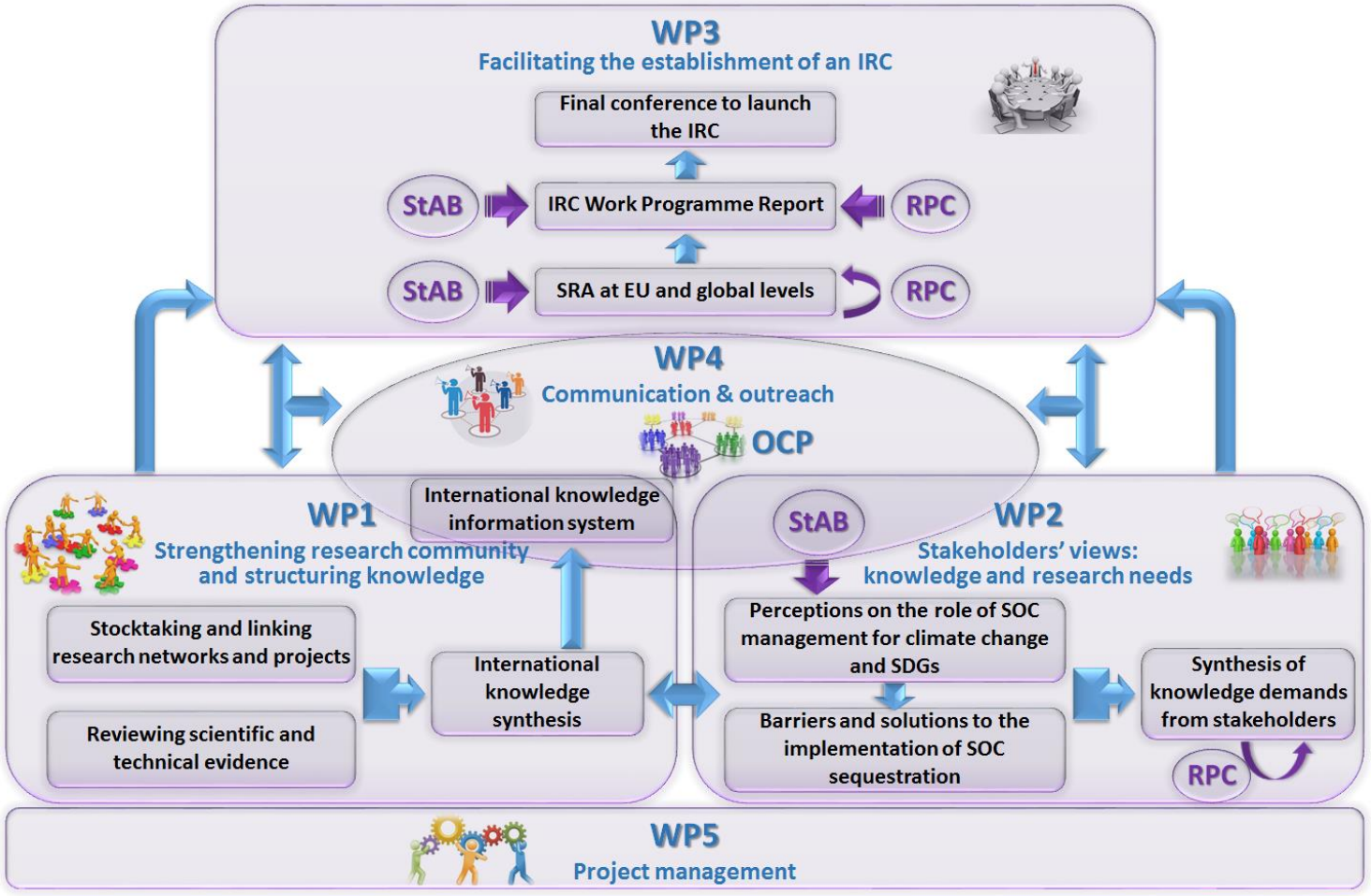
Countries partners of CIRCASA, 4p1000, GRA, FACCE-JPI and CCAFS

CIRCASA Goals

Develop **international synergies concerning research and knowledge transfer** on agricultural soil C sequestration at European Union (EU) and global levels.

1. Strengthen the international research community
2. Improve our understanding
3. Co-design a strategic research agenda with stakeholders
4. Create an International Research Consortium

Work plan



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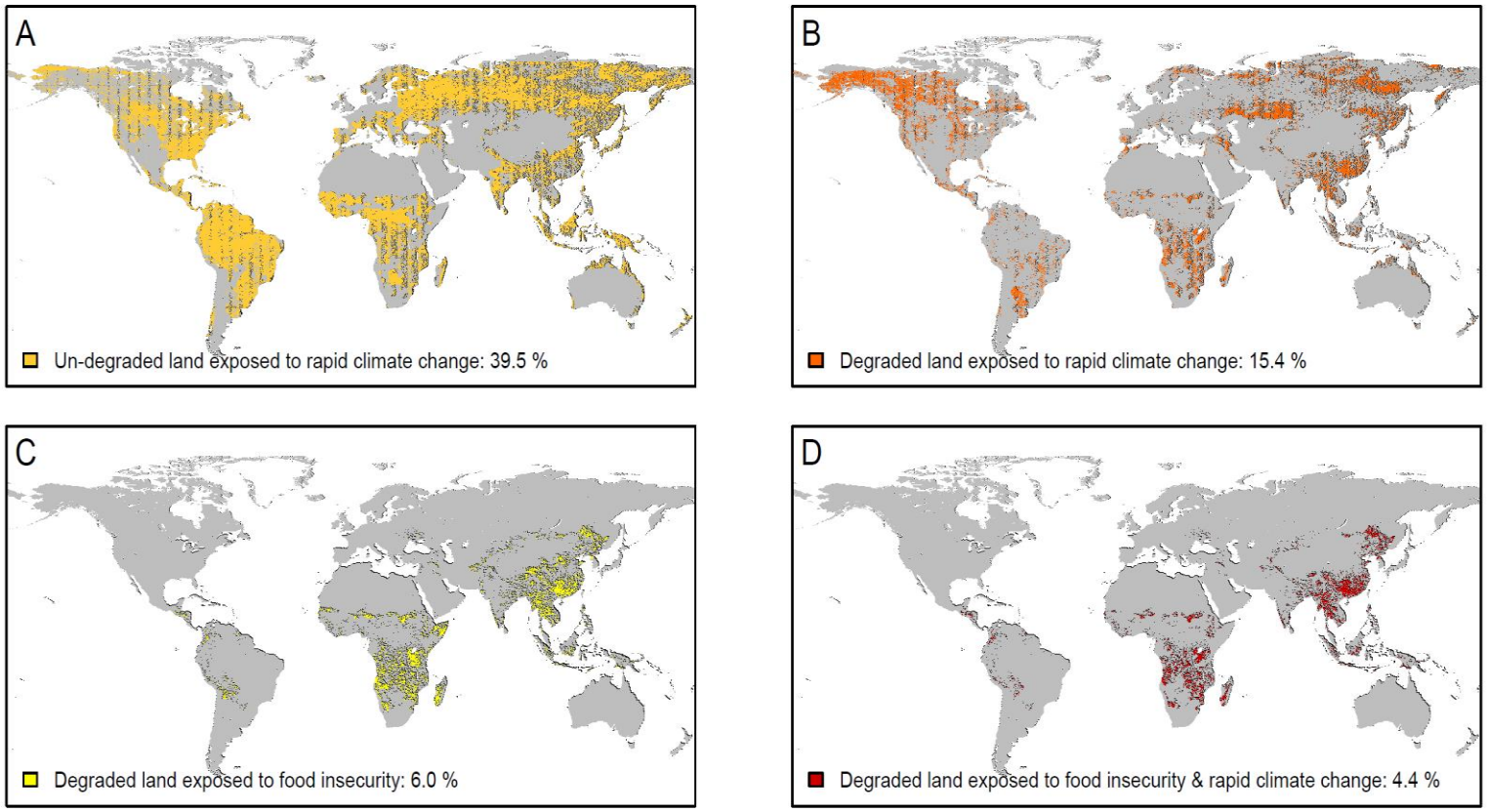
Structuring knowledge (WP1)

=> An open data repository with geospatial and modelling data



Spatial distribution of exposure to selected multiple land challenges. A. Un-degraded land exposed to rapid climate change; B, Degraded land exposed to rapid climate change; C, Degraded land exposed to food insecurity; D, Degraded land exposed to rapid climate change and food insecurity

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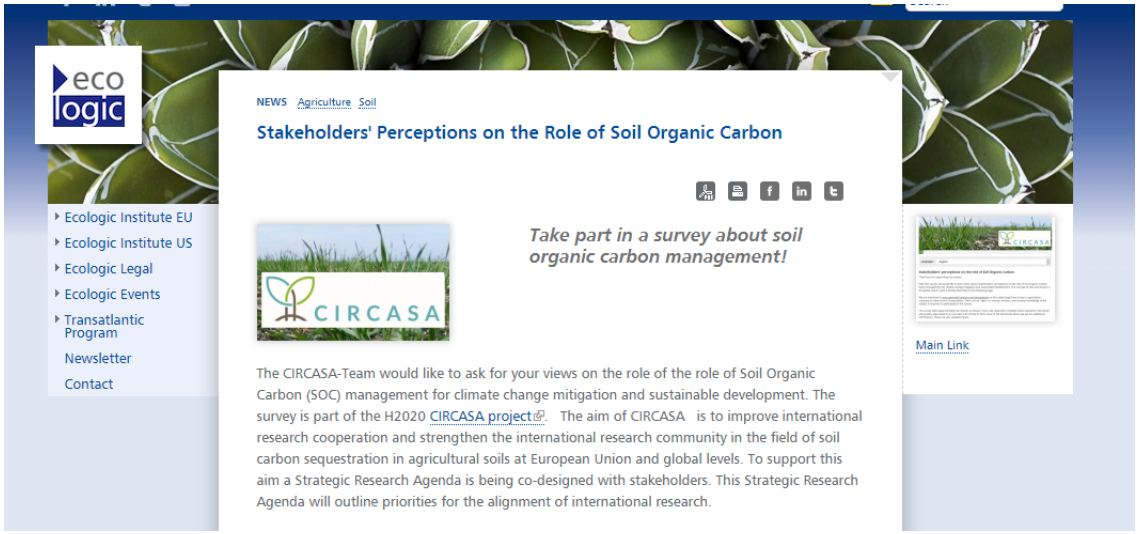
Stakeholder Engagement (WP2)



Online Survey – 7 languages

Workshops on 5 continents

Stakeholder Advisory Board

=> Strategic Research Agenda

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Create an International Research Consortium on SOC (WP3)

- Belmont forum pre-program on 'Soil Health'
- European Joint Program, Agricultural Soils, with International calls
- EC Horizon Europe **Mission** planned on Land degradation and Soil Health

=> CIRCASA Research Policy Committee: Explore activities, resources and governance for an International Research Consortium (IRC) on agricultural soil carbon and draft a work plan.

The Global Soil Partnership (GSP), the GRA, FACCE-JPI and the 4 per 1000 initiative will greatly facilitate this task, allowing the CIRCASA IRC to be embedded into a broader soil and agricultural research context.

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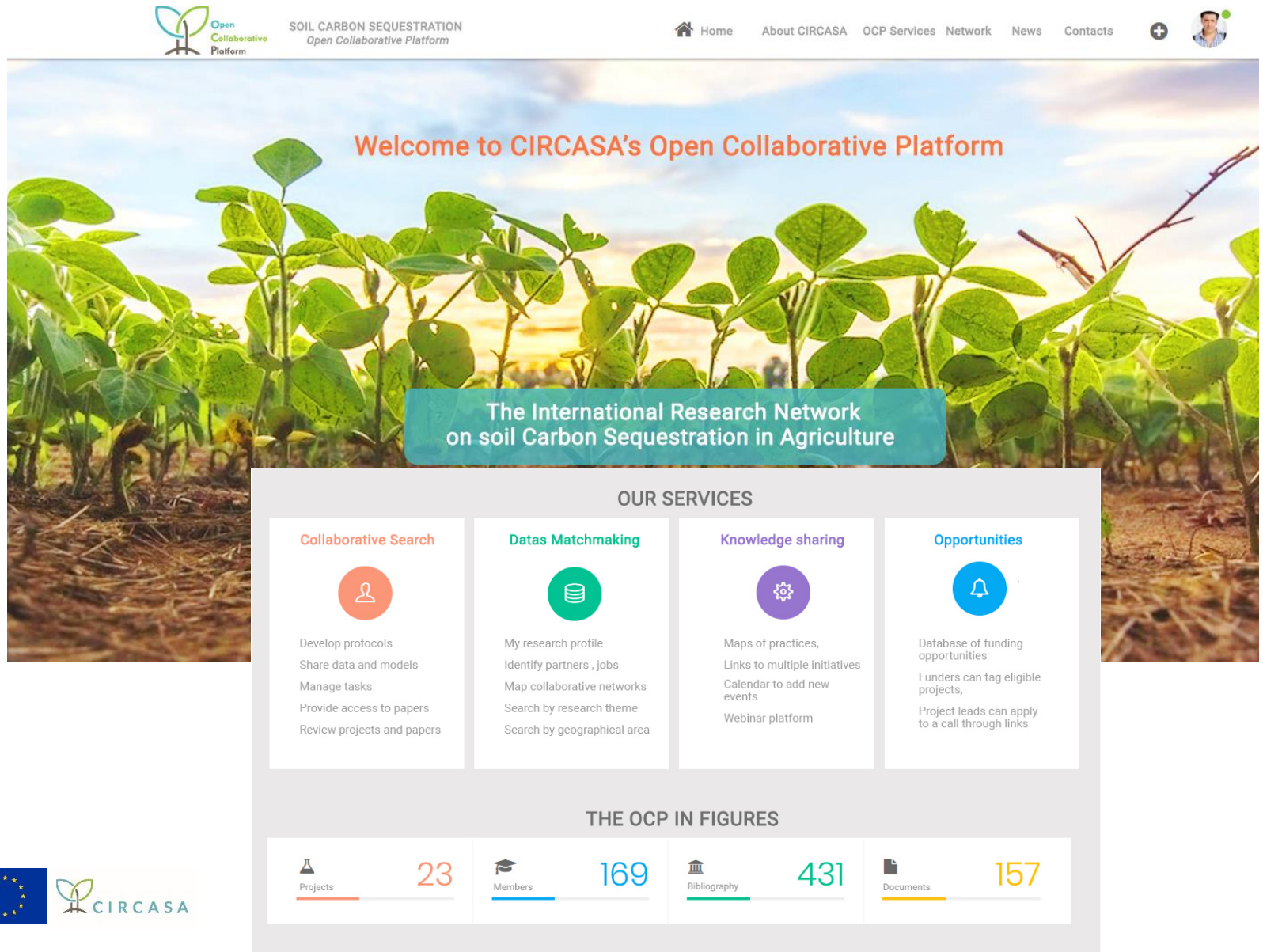
Communication and Outreach (WP4)



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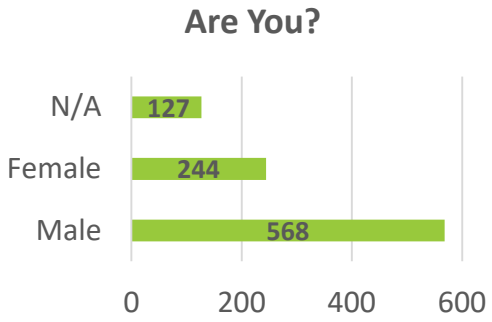
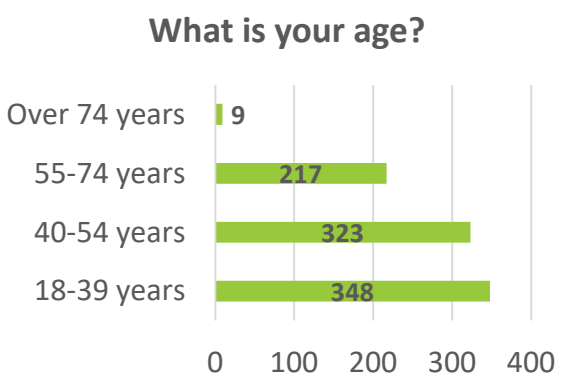
CIRCASA Online Survey – Preliminary Results Perspectives on SOC management

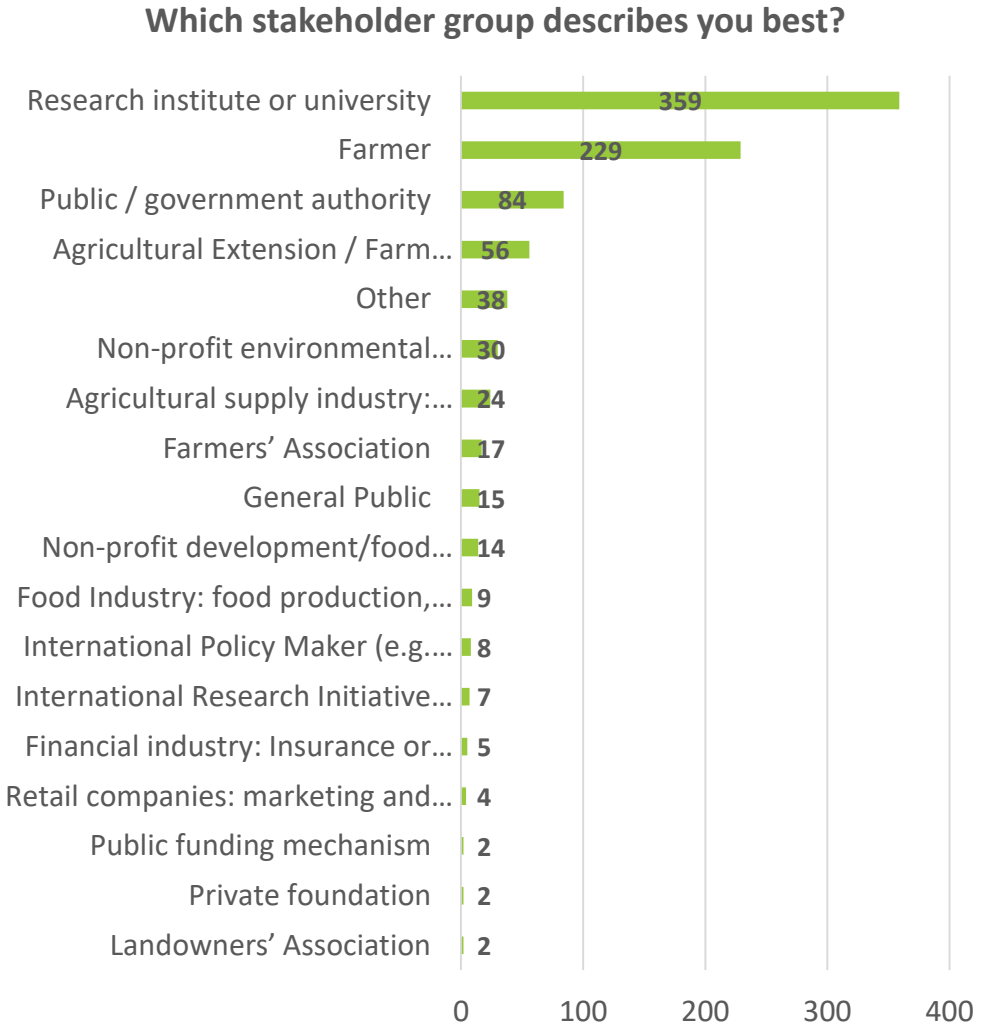
Berlin, 16 January 2019

Survey – 939 respondents globally

+ 1757 Danish farmers







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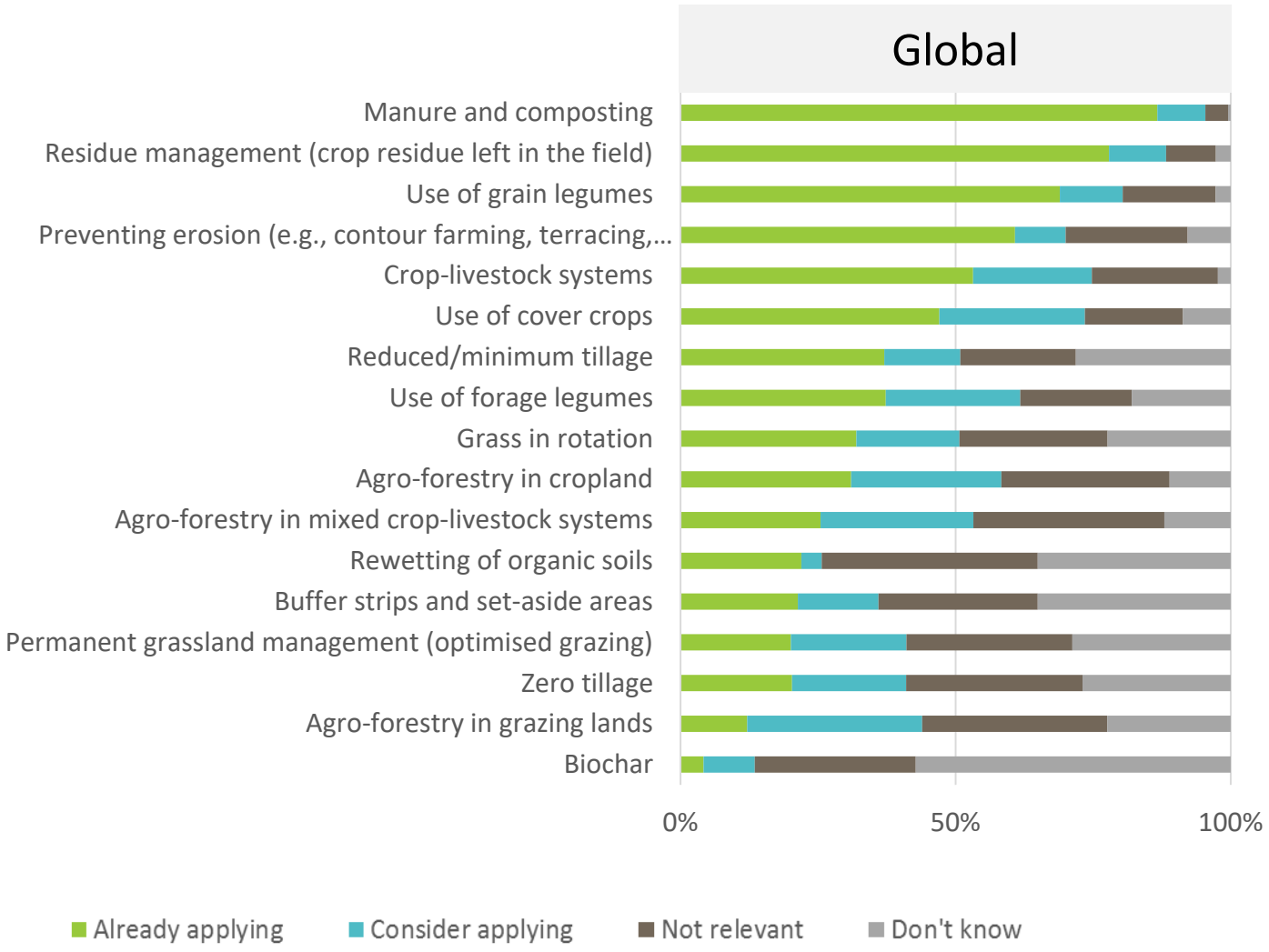
SOC management options

Residue management (crop residue left in the field)
Reduced/minimum tillage
Zero tillage
Manure and composting (applying livestock manure and/or compost on fields)
Grass in rotation
Use of cover crops
Use of grain legumes
Use of forage legumes

Permanent grassland management (optimised grazing)
Buffer strips and set-aside areas
Crop-livestock systems
Agro-forestry in cropland
Agro-forestry in grazing lands
Agro-forestry in mixed crop-livestock systems
Biochar
Rewetting of organic soils
Preventing erosion (e.g., contour farming, terracing, windbreaks)

Which management options do you apply or consider applying? - Farmers



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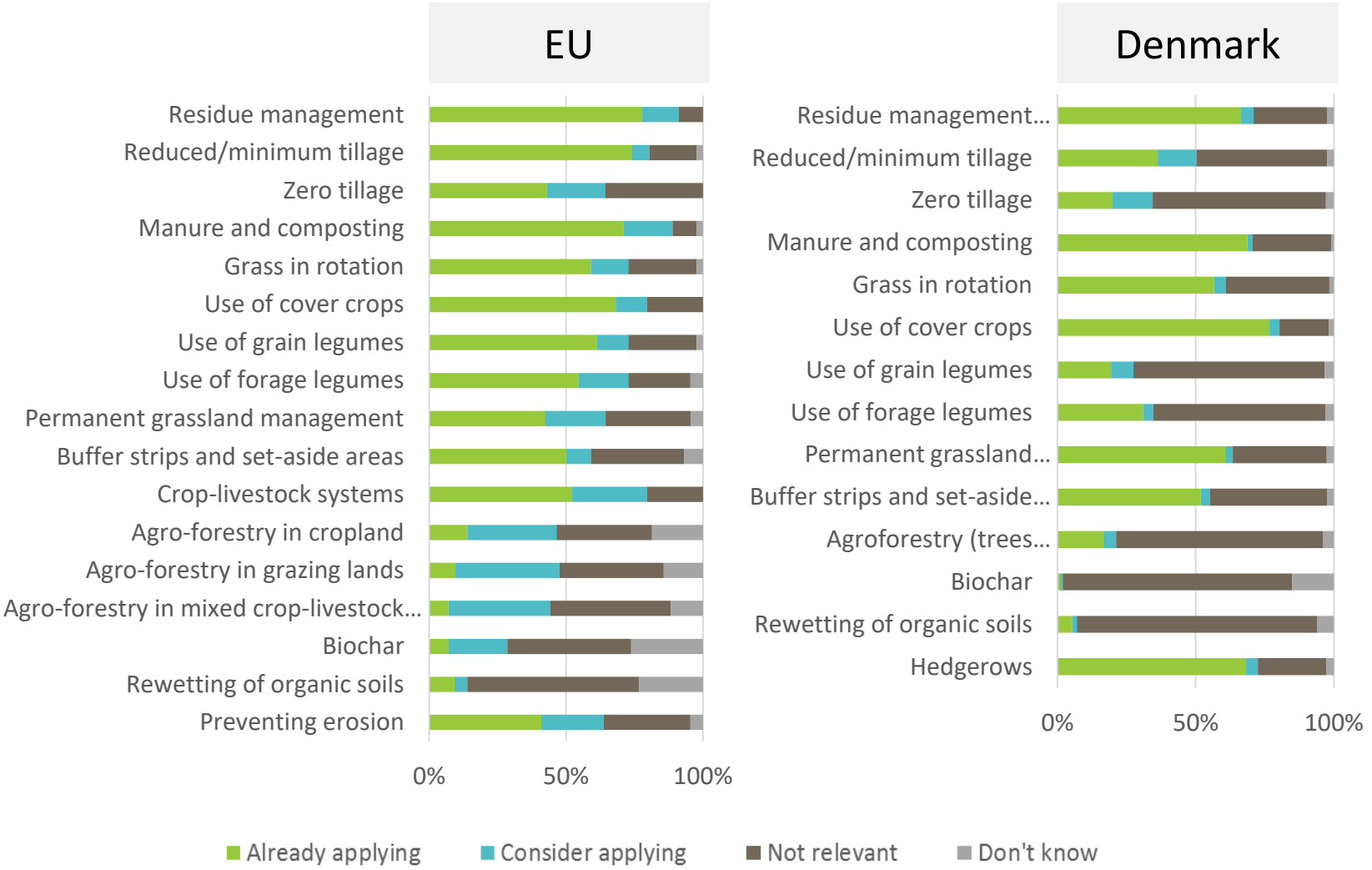

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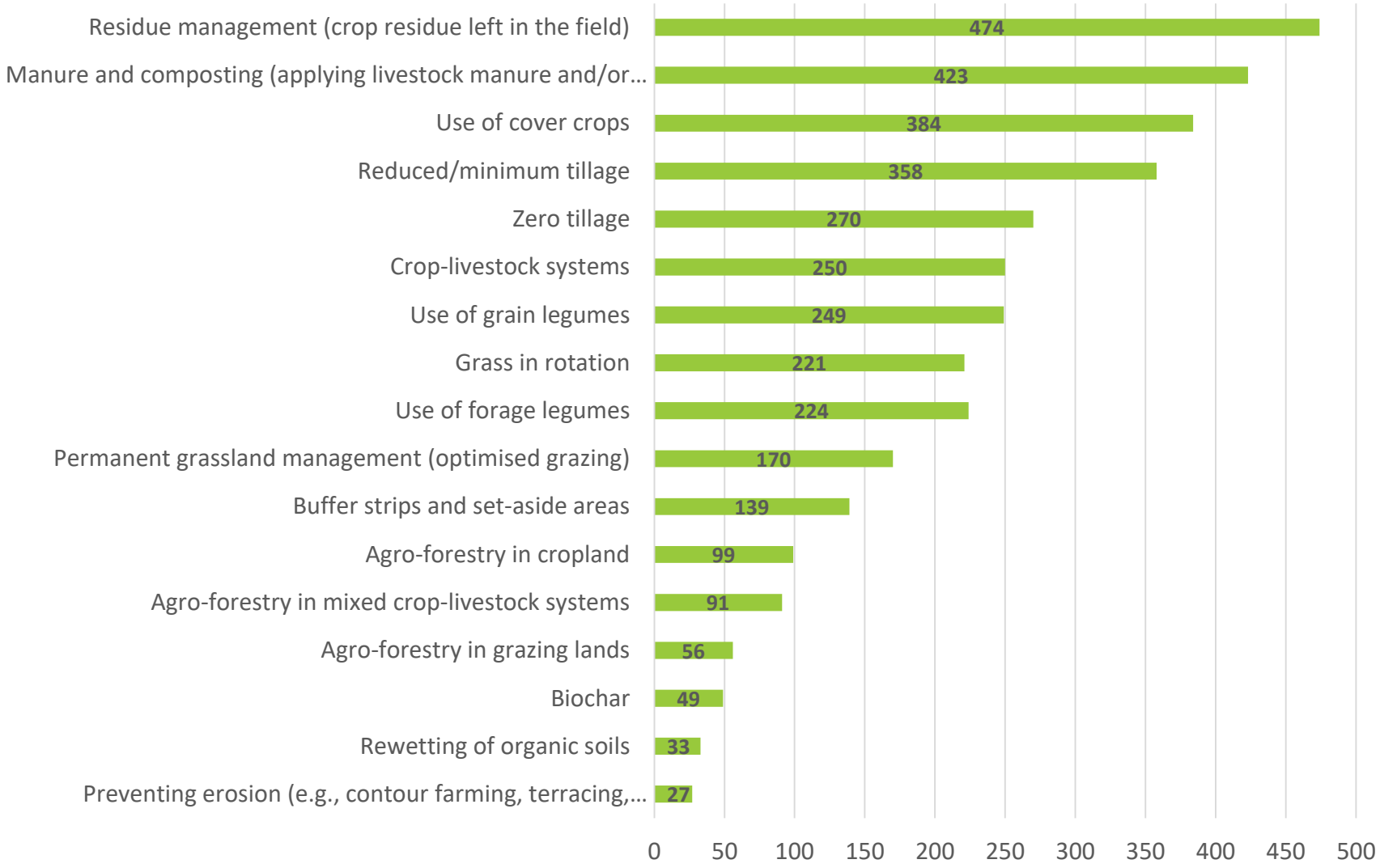
Which options do you think farmers are using for SOC management in your region at present? (Global)



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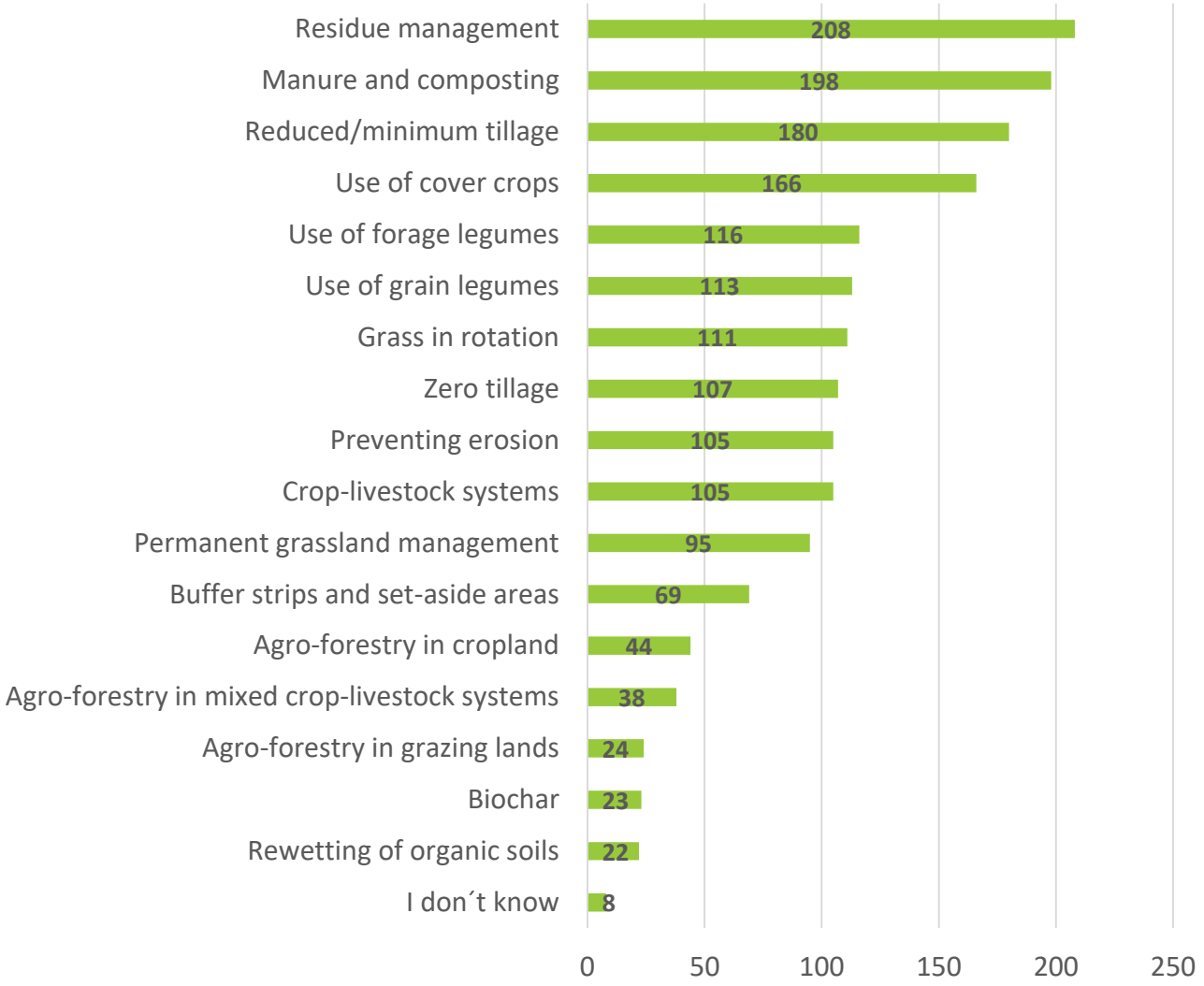
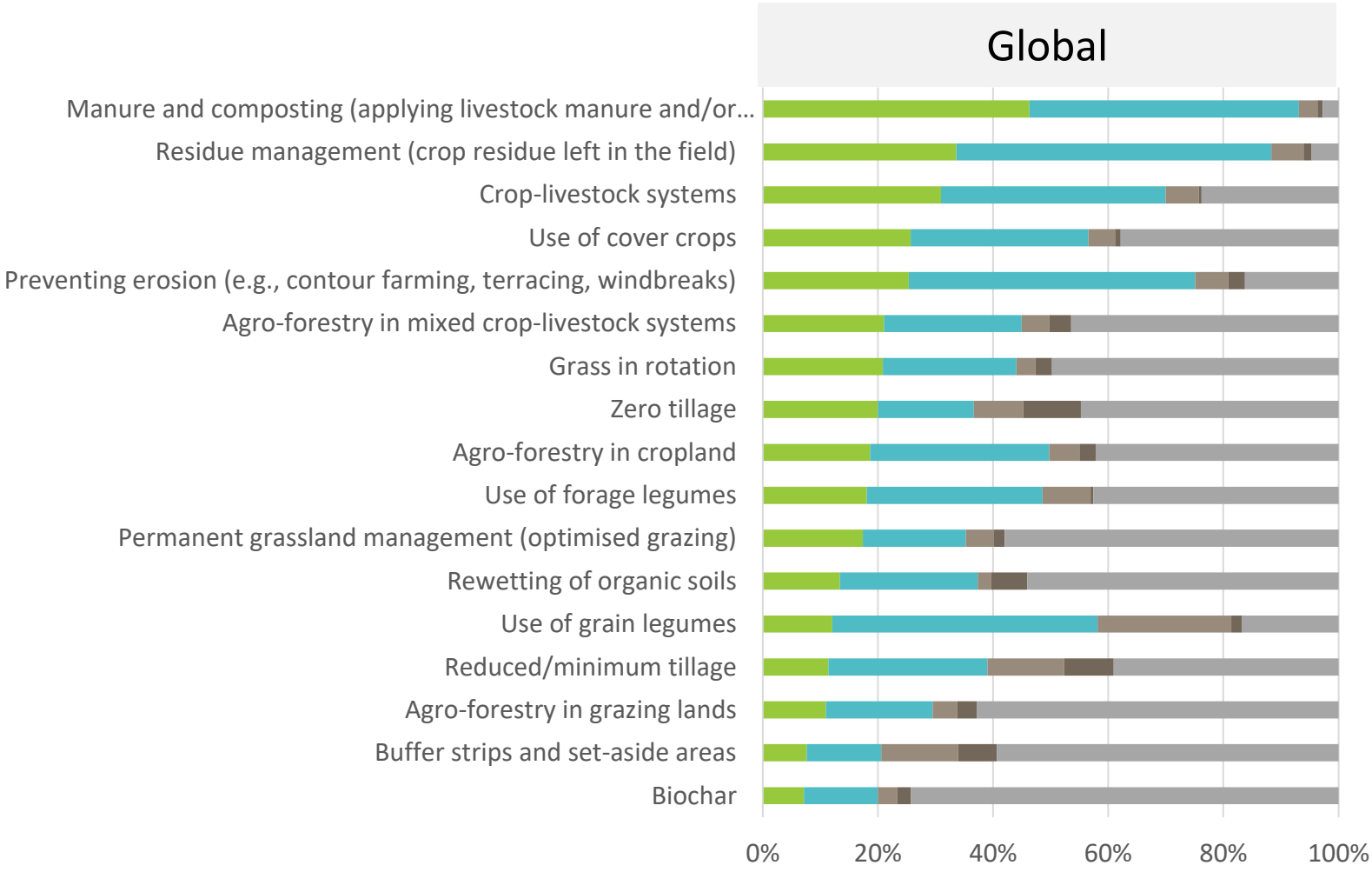
Which options do you think farmers are using for SOC management in Europe at present?



Farmers' views on effectiveness of SOC management options



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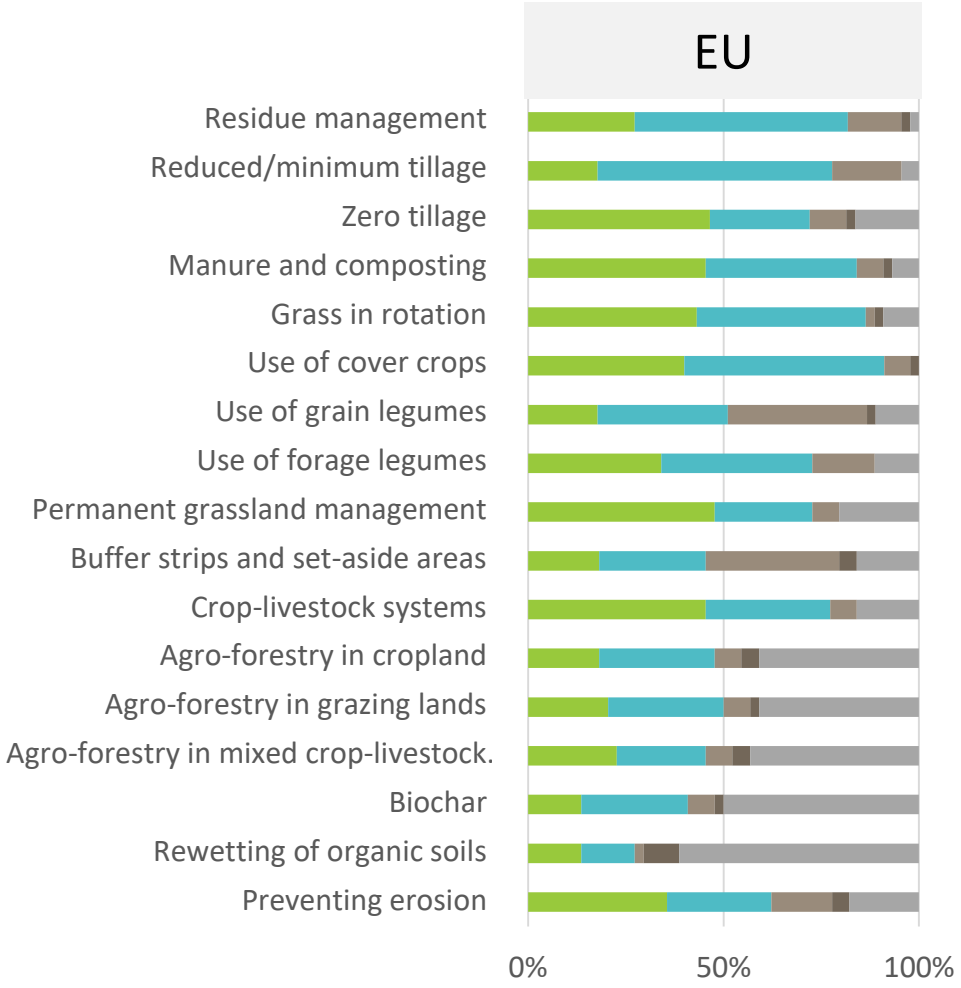

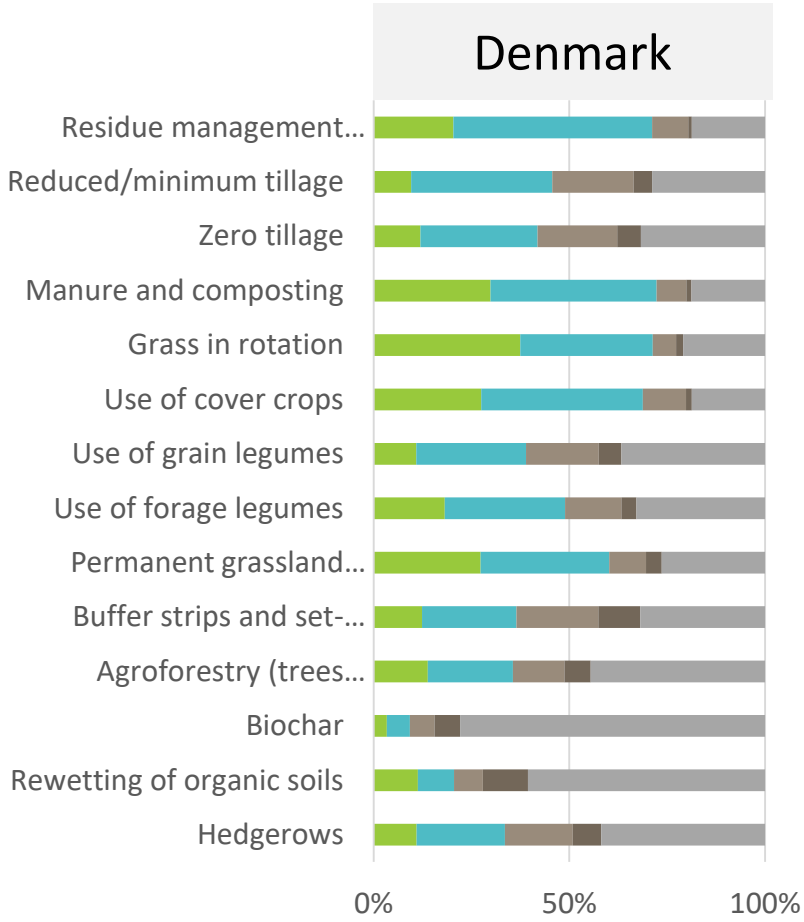

Very effective | Effective | Less effective | Not effective | Don't know

SOC management options

Residue management (crop residue left in the field)	Permanent grassland management (optimised grazing)
Reduced/minimum tillage	Buffer strips and set-aside areas
Zero tillage	Crop-livestock systems
Manure and composting (applying livestock manure and/or compost on fields)	Agro-forestry in cropland
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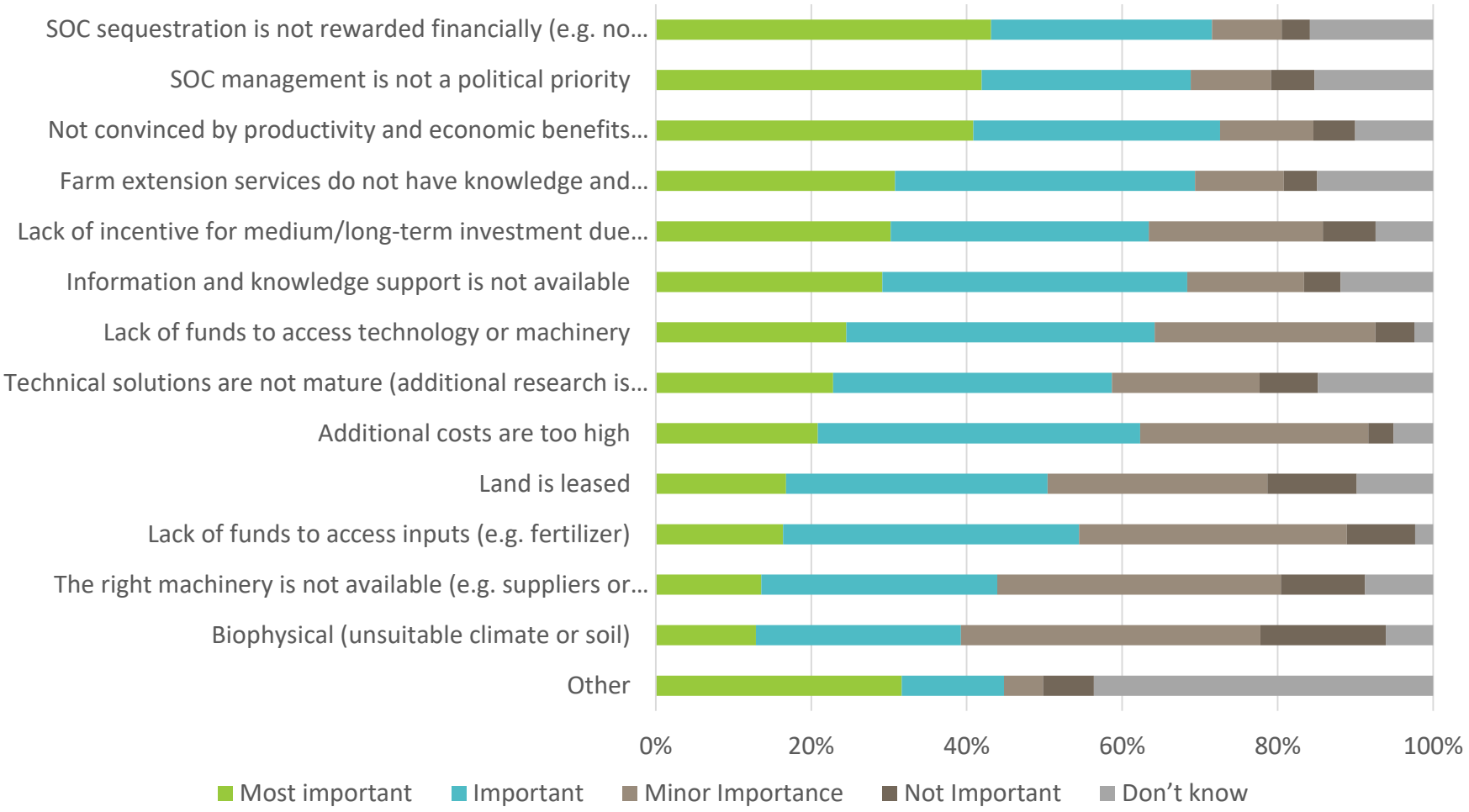
Use of cover crops	Agro-forestry in mixed crop-livestock systems
Use of grain legumes	Biochar
Use of forage legumes	Rewetting of organic soils
	Preventing erosion (e.g., contour farming, terracing, windbreaks)

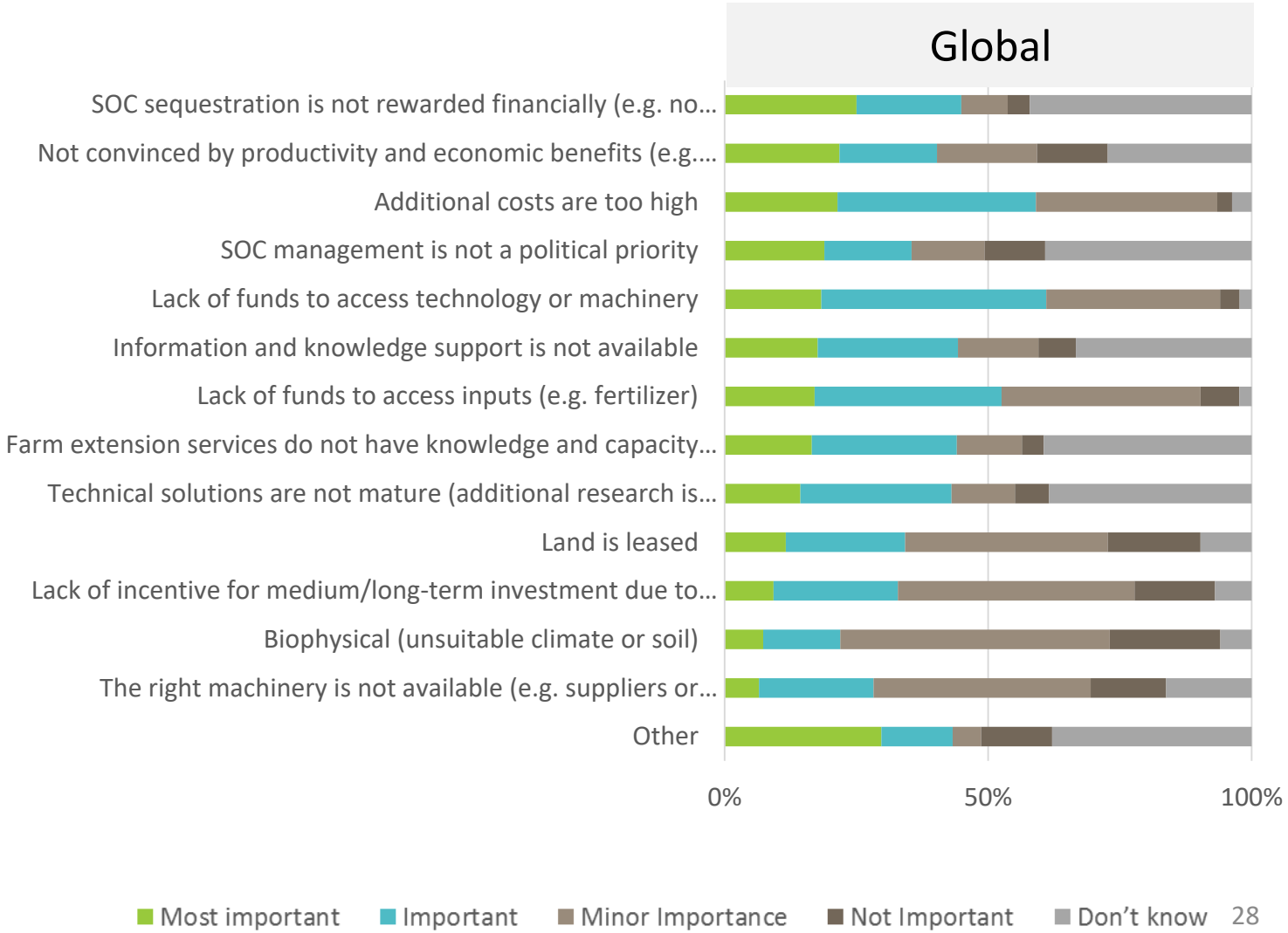
Barriers to uptake of management options

- Lack of funds to access inputs (e.g. fertilizer)
- Additional costs are too high
- The right machinery is not available (e.g. suppliers or contractors do not have equipment)
- Not convinced by productivity and economic benefits (e.g. concern about yields)
- SOC sequestration is not rewarded financially (e.g. no subsidies or carbon credits)
- Technical solutions are not mature (additional research is required)
- Information and knowledge support is not available
- Farm extension services do not have knowledge and capacity to train farmers on technical solutions
- Biophysical (unsuitable climate or soil)
- SOC management is not a political priority
- Other

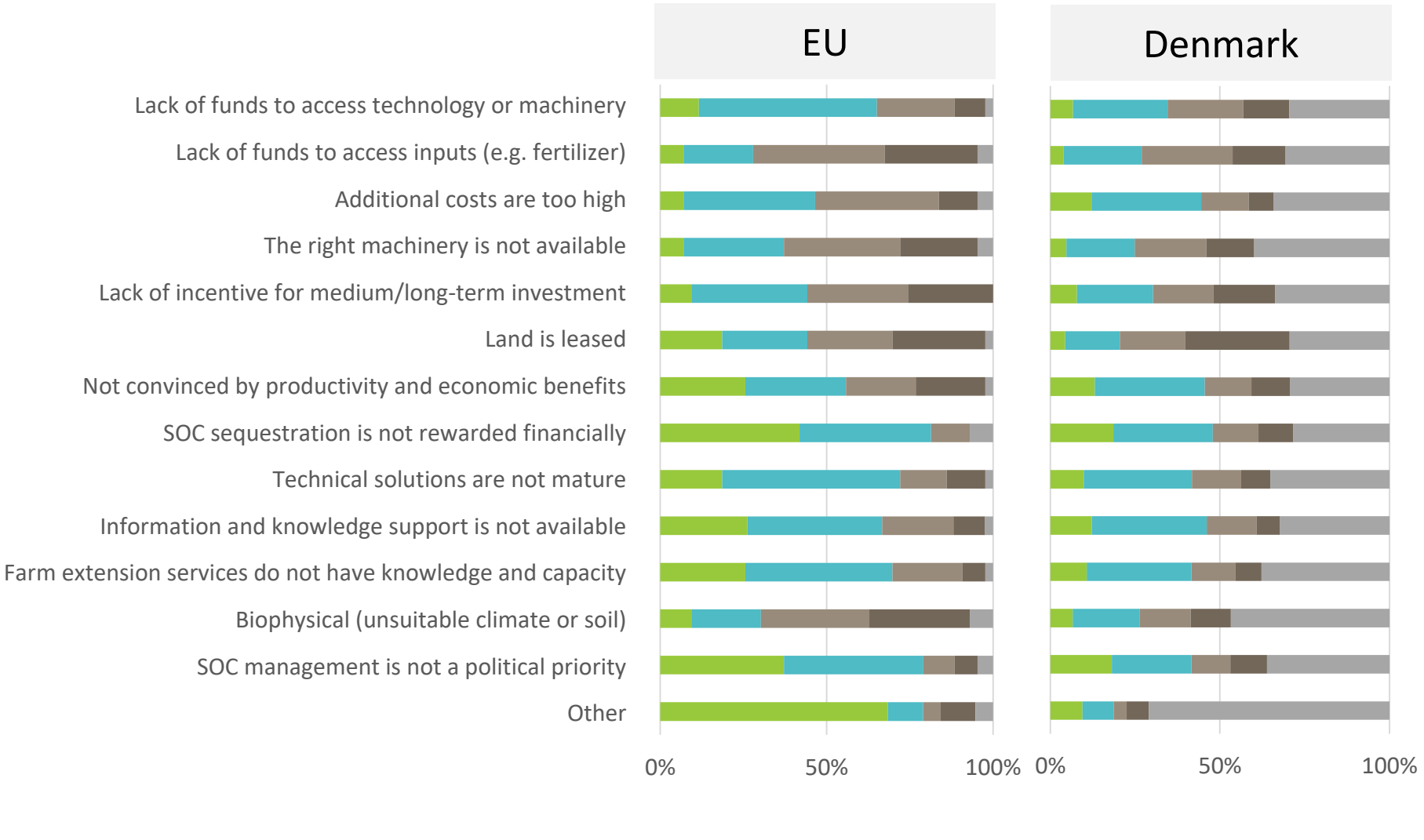
Views on barriers to uptake – Global



Farmers' views on barriers to uptake



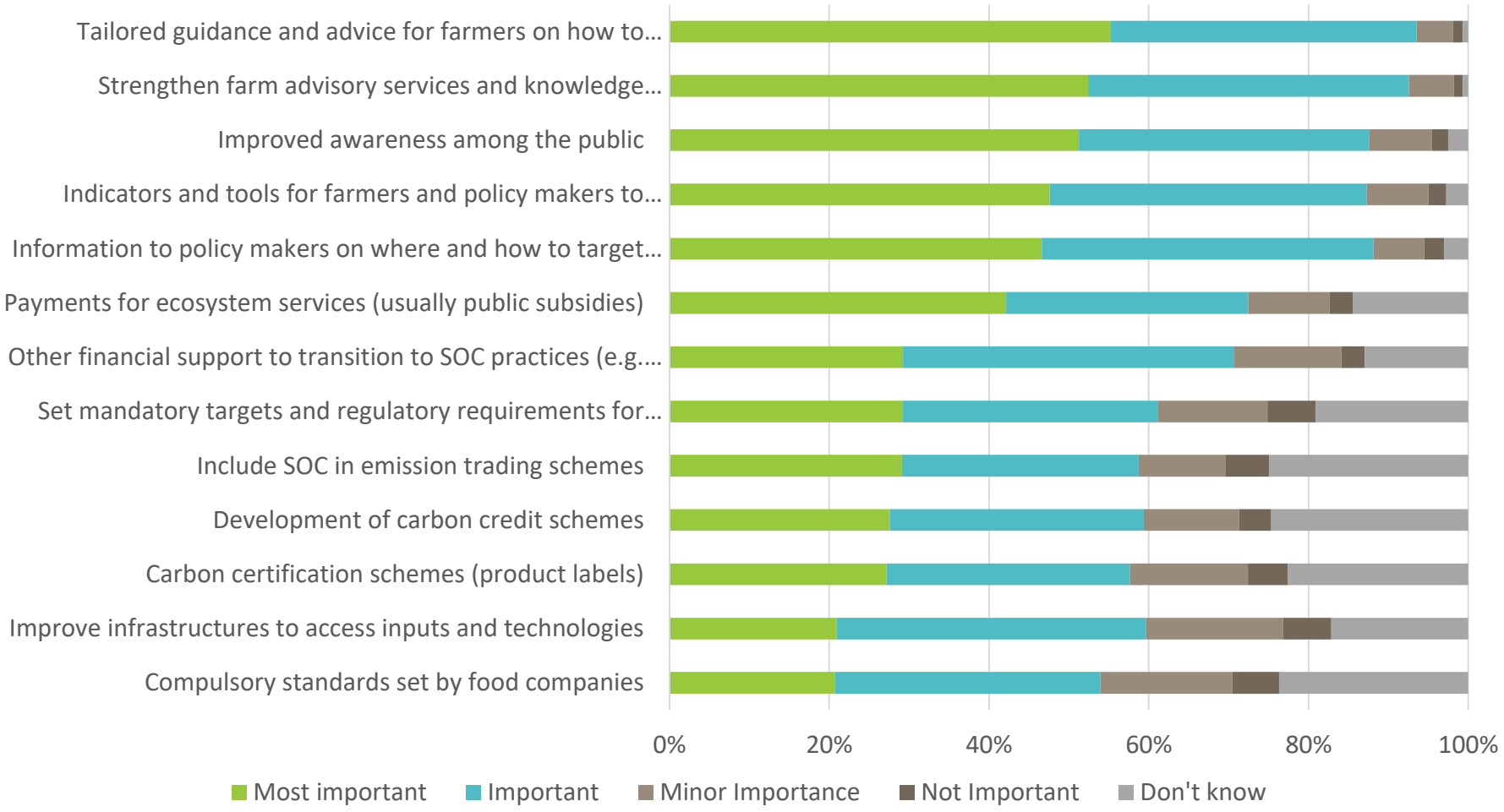
Farmers' views on barriers to uptake



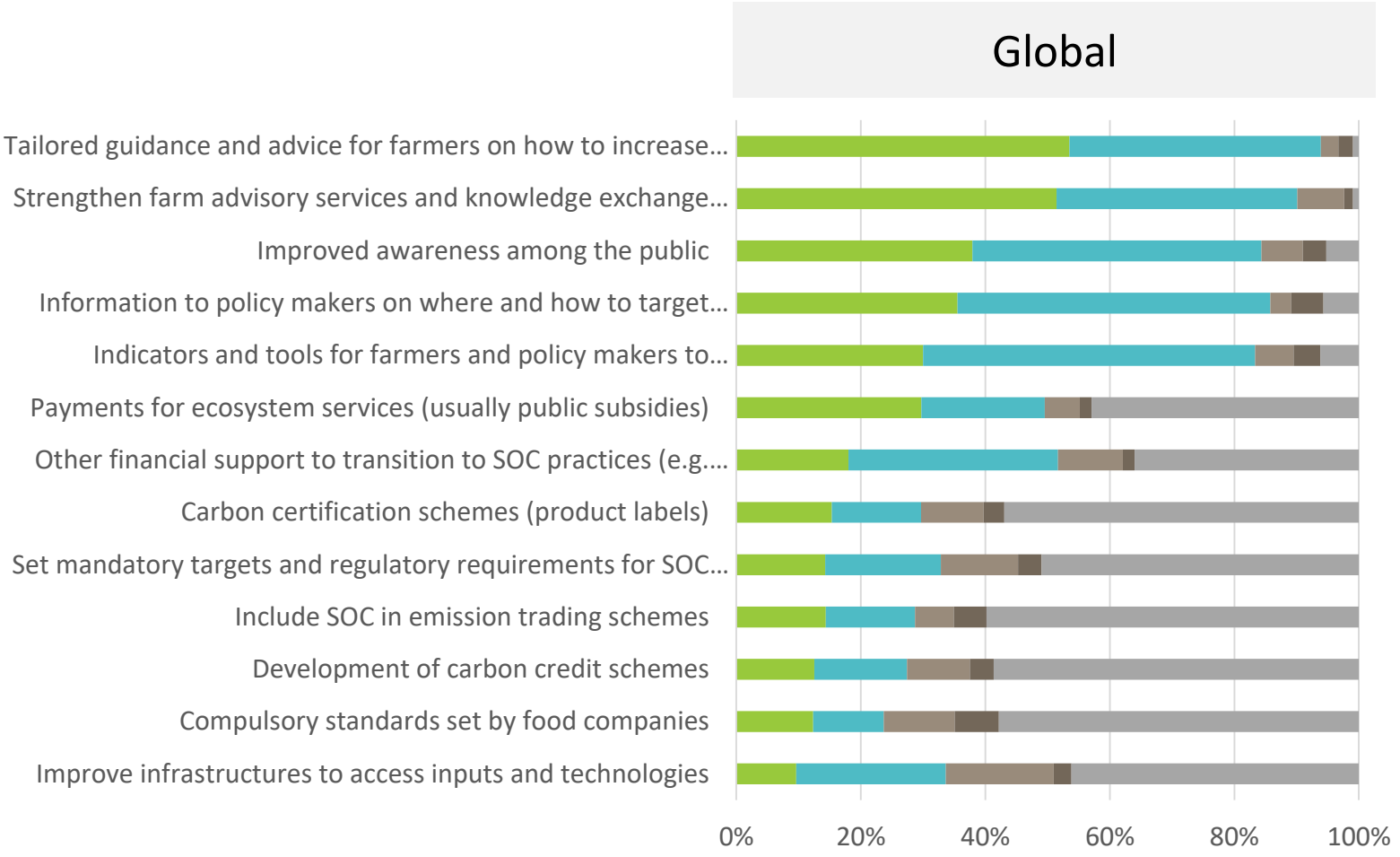
Solutions for increasing uptake

- Tailored guidance and advice for farmers
- Payments for ecosystem services (usually public subsidies) or other financial support to transition to SOC practices (e.g. loans or grants for investments)
- Carbon certification schemes (product labels)
- Compulsory standards set by food companies
- Development of carbon credit schemes
- Include SOC in emission trading schemes
- Improve infrastructures to access inputs and technologies
- Set mandatory targets and regulatory requirements for SOC sequestration
- Information to policy makers on where and how to target SOC sequestration policy
- Indicators and tools for farmers and policy makers to measure progress in improving carbon storage in soils
- Improved awareness among the public
- Other

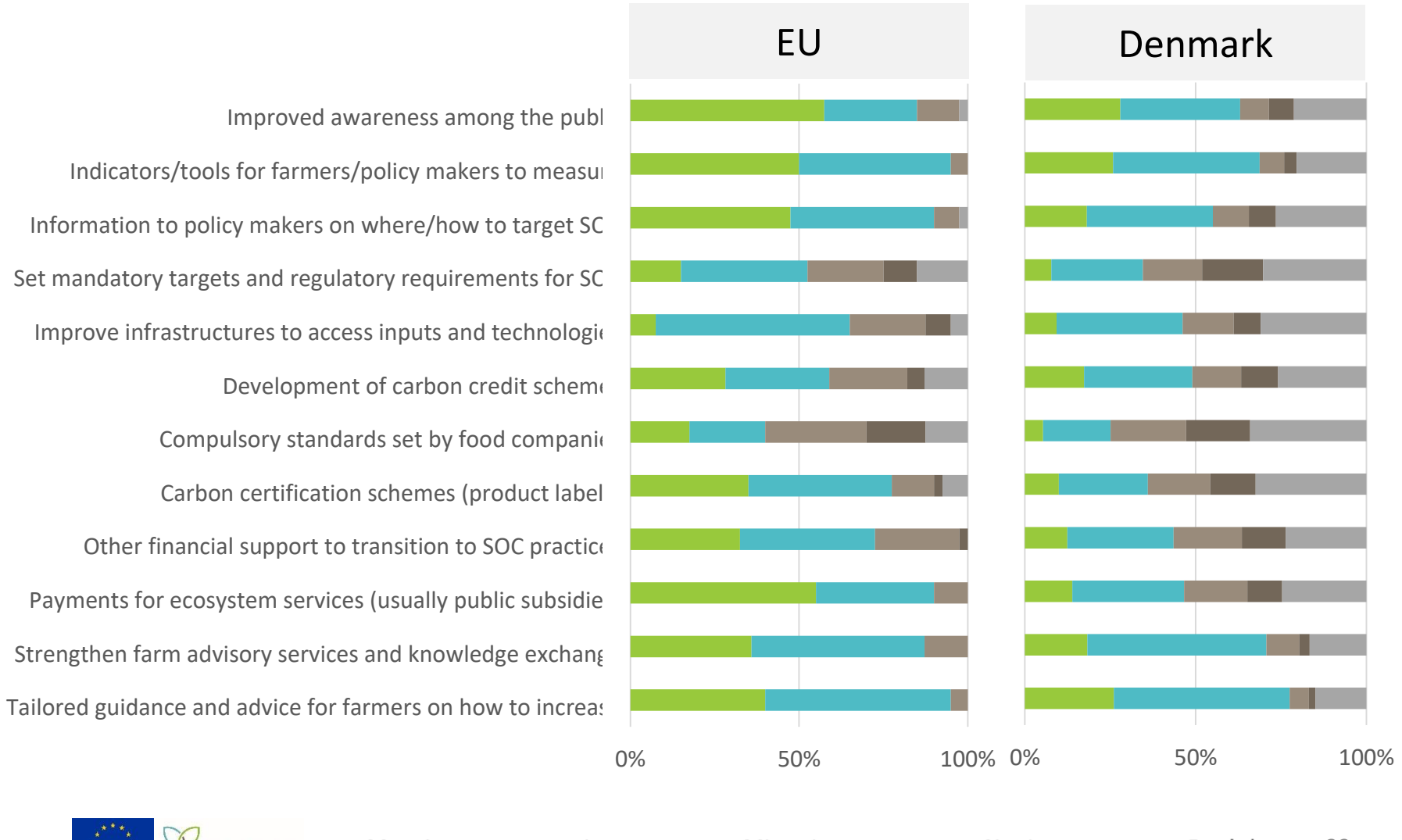
Views on solutions to increase adoption – Global



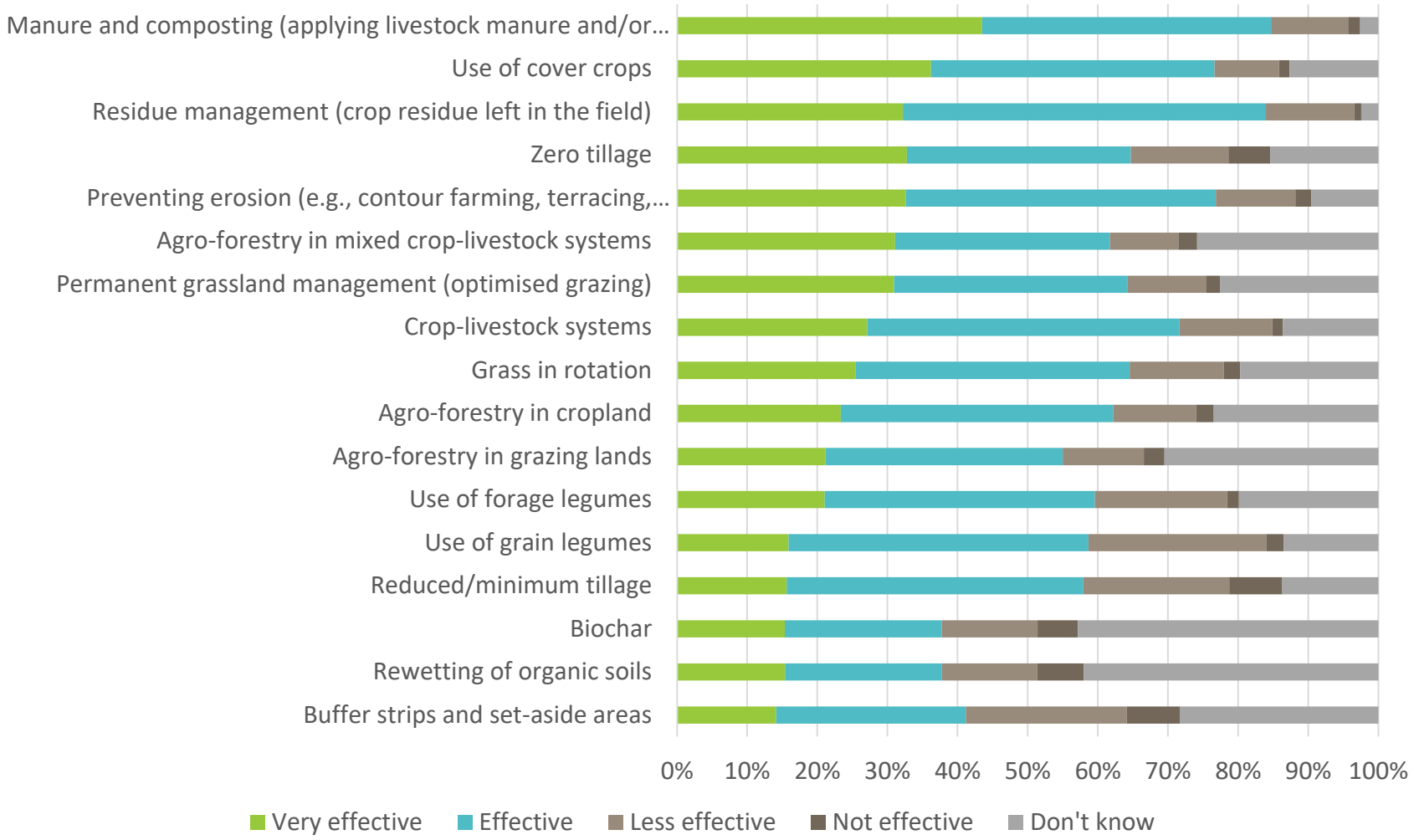
Farmers' views on solutions to increase adoption



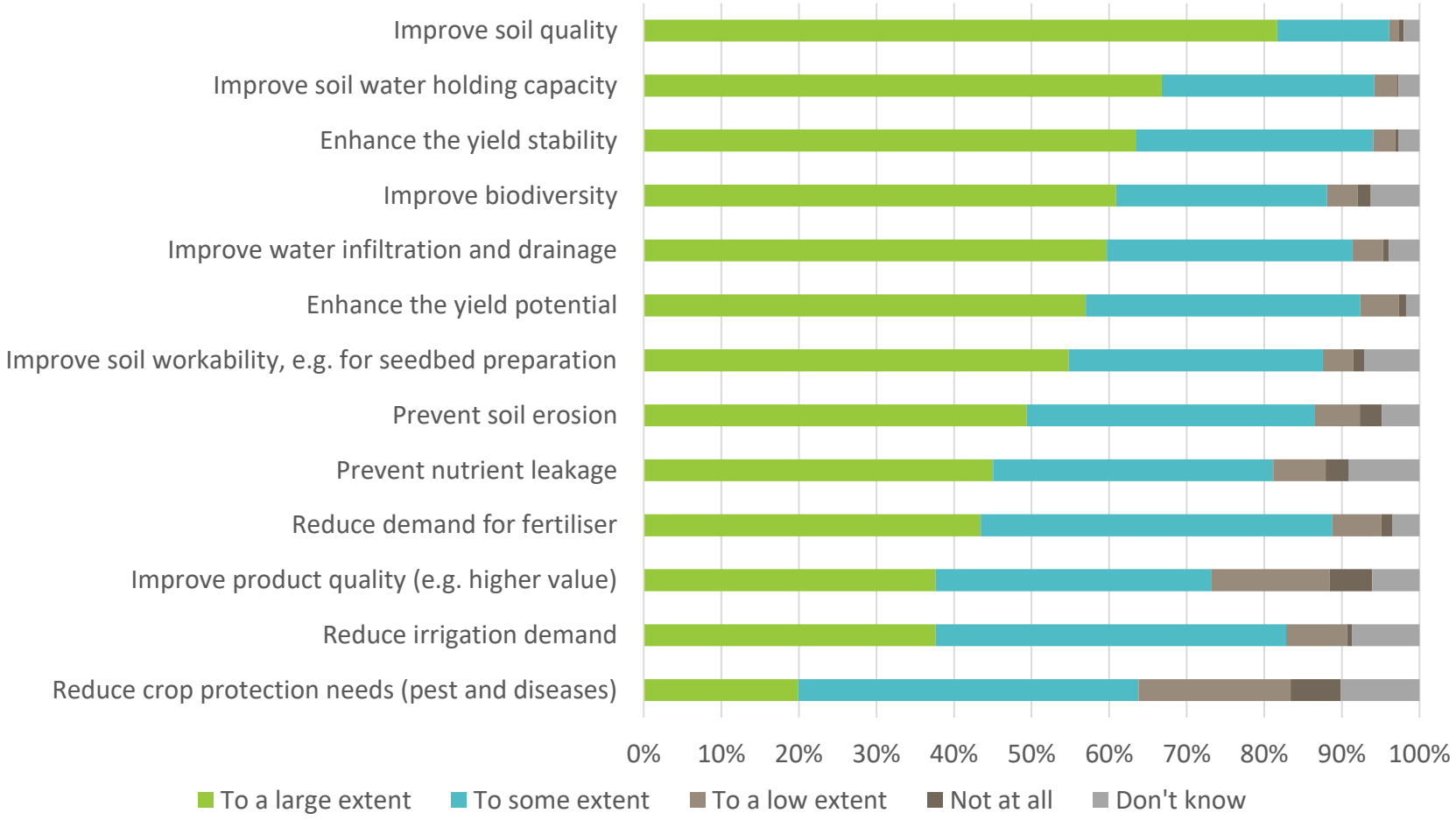
Farmers' views on solutions to increase uptake



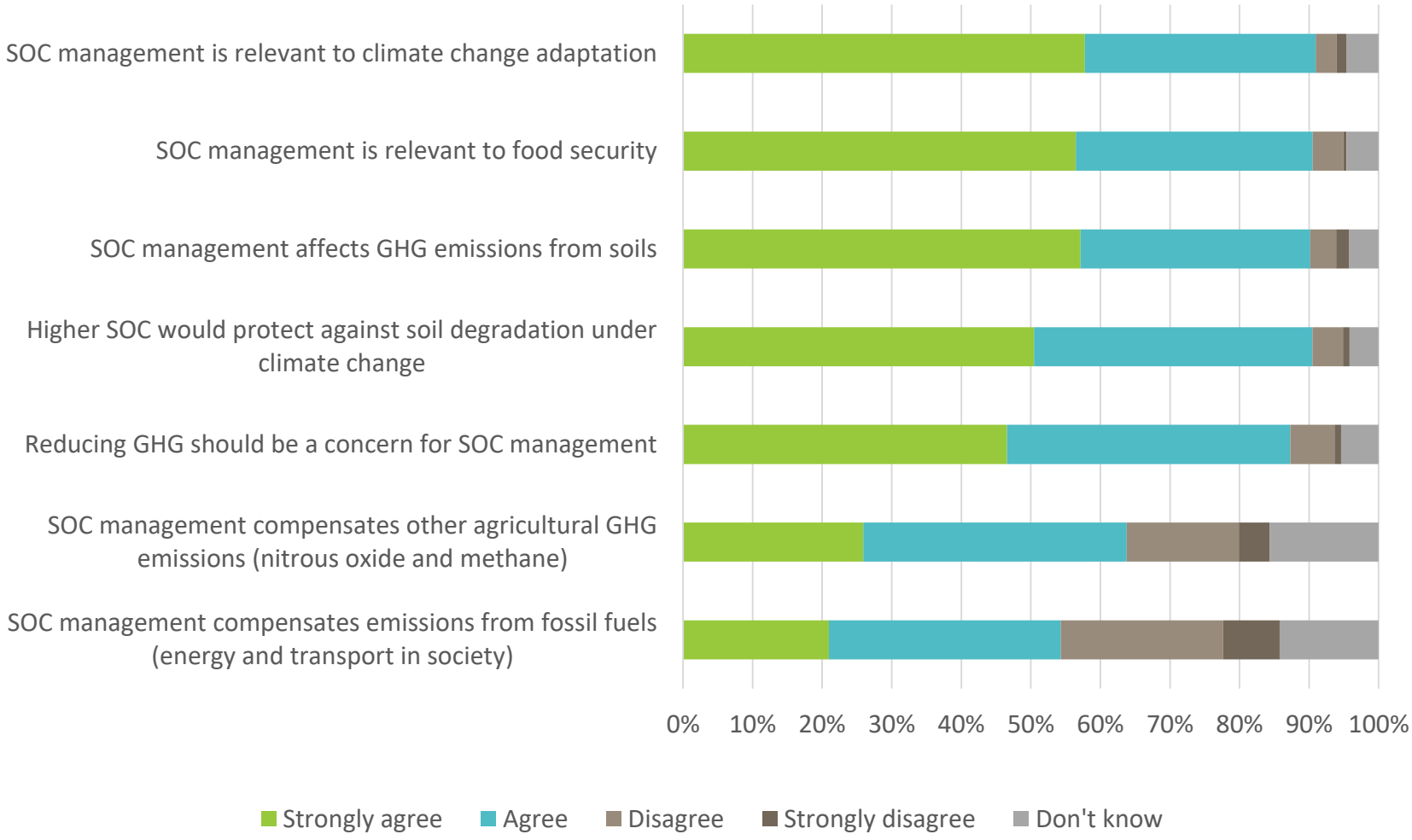
Effectiveness of SOC management options – Global



Contribution of SOC management – Production & Ecosystem Service (Global)



Contribution of SOC management – climate and sustainable development (Global)



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CIRCASA StAB Meeting Berlin

Lunch

CIRCASA

CIRCASA StAB Meeting Berlin

Thank You!