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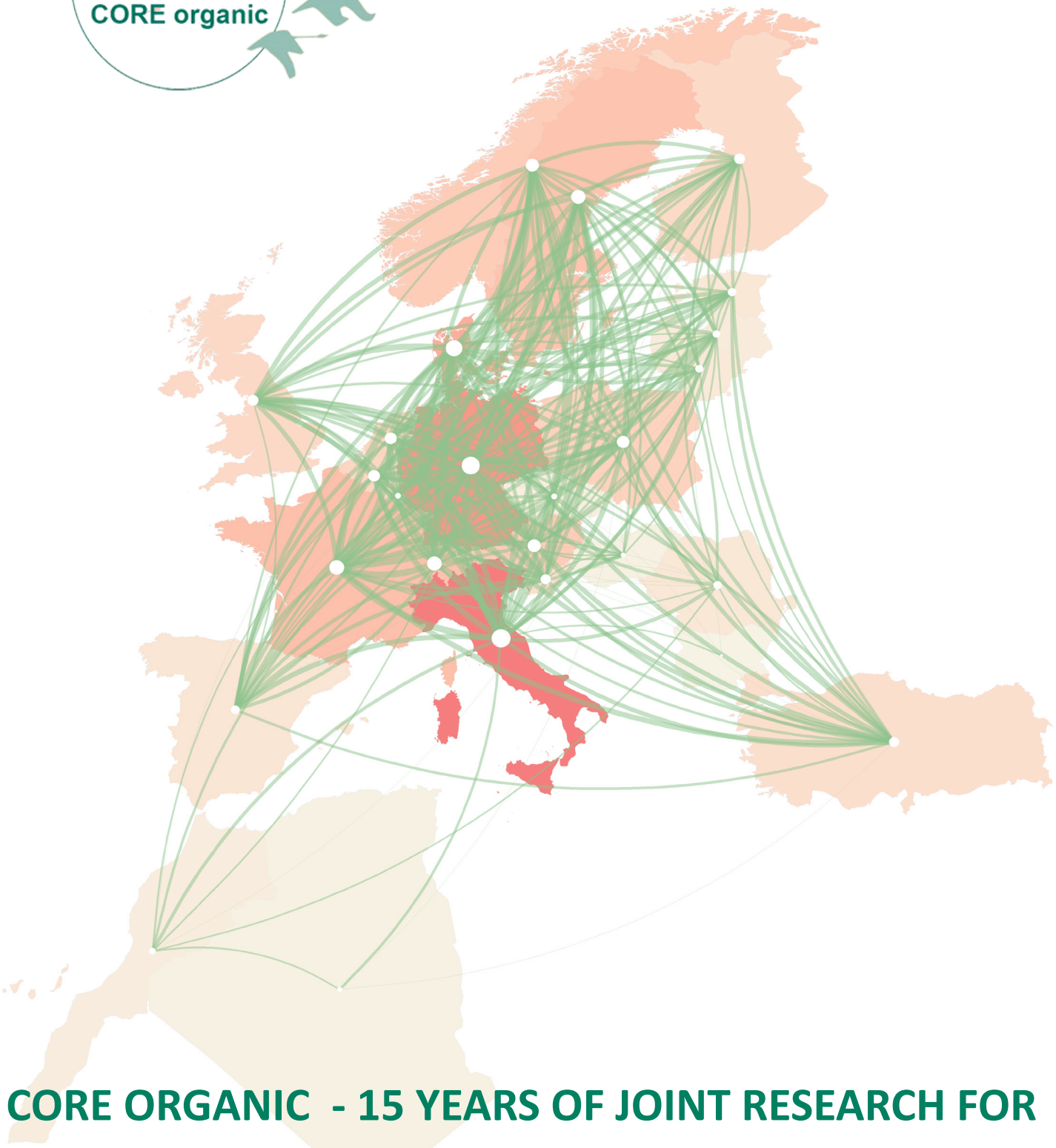

CORE ORGANIC - 15 YEARS OF JOINT RESEARCH FOR ORGANIC FOOD AND FARMING SYSTEMS

CORE Organic 15-year activity report (2004-2019)

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CORE Organic
Coordination of European Transnational Research in Organic Food and Farming Systems

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Table of contents

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Executive summary

Organic agriculture is considered to be one of the important development pathways towards a more sustainable agriculture and food production. This development has been and will be dependent on continuous research and innovation. The ERA-NET[1] CORE Organic ('Coordination of European Transnational Research in Organic Food and Farming Systems') was established in 2004. On 1 October 2019, the network celebrated its 15th year of activity. It presently includes 27 ministries and research councils from 19 countries and regions whose main purpose is to fund and support transnational organic research. CORE Organic (CO) partners have been working together to increase innovation potential, knowledge accessibility, alignment of national research and international outreach in support of the ERA-NET's objectives. By joining forces, the network sustains focused and coordinated research and innovation efforts, covering the most important challenges at every link of the organic value chains.

The objective of CO has been, from the beginning, the enhancement of the European research area (ERA) on organic agriculture with more efficient use of research funds and with a higher impact of research on the organic sector's development. This has been achieved, among other things, by reducing redundancies between EU and national funding, and by ensuring better use of the limited resources for research and innovation, thus achieving critical mass in research on organic food and farming. These improvements have aimed at supporting the development of a larger and more sustainable organic food system, including farming practices, processing and innovative value chains, with the purpose of fulfilling the growing demand for organic products, subsequently supporting health, trade and job creation. In pursuing these objectives, the CO network has also contributed to the improvement of the general competitiveness of European agriculture and to the development of innovative solutions for environmentally-friendly agriculture for Europe and the world.

After 15 years of experience, we can argue that CO has largely achieved its mission. The number of projects funded on topics identified as common priorities while ensuring the participation of SMEs and facilitating the integration of new forms of knowledge generation, innovation and dissemination, has allowed the sector to better meet the demand for organic food and products and, at the same time, to develop practices in accordance with organic principles and regulations. Significant parts of national and EU research funding in organic agriculture and food have been channelled into a common pot for transnational projects, in areas where transnational efforts are relevant and where results may be applied across regions and member states.

In addition, collaboration with the EU Technology Platform, TP Organics, and other relevant sector players has helped to ensure that the voice of transnational organisations representing farmers, industry and civil society has been taken into account. Moreover, the creation of Organic Eprints represents a cornerstone in the process of creation of a shared reservoir of knowledge and of an effective dissemination of research outcomes.

Based both on past assessments as well as on the present analysis developed during the preparation of CO's 15-year activity report, CORE ORGANIC – 15 YEARS OF JOINT RESEARCH FOR SUSTAINABLE FOOD AND FARMING SYSTEMS, CORE Organic (2004-2019), the following elements have emerged as an added value from the experience of the four CO programming periods:

[1] ERA-NETs are instruments for research policy coordination in the European Research Area, aimed at enhancing scientific research excellence and national alignment among the funders and, thus, among the participating countries.

1. Coordinating research efforts in organic food and farming, minimising duplications and covering issues not addressed by national research;
2. Creating a critical research mass and strengthening the leading role of the EU in organic research;
3. Giving researchers higher possibility to succeed in carrying out the proposals selected under CO, (e.g.by accompanying project implementation and monitoring);
4. Supporting innovation opportunities and solution-oriented research with potentially high impact on practices;
5. Becoming a point of reference for the entire organic sector, as well as networking and community building with stakeholders;
6. Enlisting smaller or "less organic" countries and less connected national research communities;
7. Influencing the national level of research policy, both indirectly (national plans refer to ERA-NETs) and through direct contacts and support;
8. Increasing research capacities and opportunities to better understand other European cultures;
9. Testing innovative transnational funding models;
10. Strengthening a proactive and cooperative network among national funding institutions and policy makers;
11. Supporting access to research findings through the development of a range of sources, including the open-access database, Organic Eprints.

The report constitutes Deliverable 7.4, 'Mapping of ongoing transnational and national research', and is one of the outputs of the multi-annual CO Task 7.7, 'Alignment of national and transnational research'. The report is a comprehensive analysis of the development process related to the CORE Organic network, encompassing all the activities from its start, including current research. The analysis is based on call documents and project descriptions resulting in various topical categorisations (i.e., thematic macro-areas). Funding commitments were also analysed in relation to partner countries and calls. Descriptive representations were part of the qualitative analysis that has made it possible to address issues such as networking and community building. The report aims at providing information about the achievements related to the magnitude and quality of support towards research and innovation in organic food and farming provided by the network partners. Based on the report results, CO partners should also more effectively understand how to face future challenges together, both in the context of changing organic sector demands and new EC Horizon Europe research and innovation framework programme.

The report will be distributed to funding partners, the EC, relevant stakeholders, researchers and the organic sector via different tools as CORE Organic Cofund Webinar (29 September, 2020) and planned participation in the IFOAM Organic World Congress 2021.

1. Introduction

The ERA-NET CORE Organic ('*Coordination of European Transnational Research in Organic Food and Farming Systems*') was established in 2004. It presently includes 27 European ministries and research councils whose main purpose is to fund transnational organic research. By joining forces, the network supports focused and coordinated research and innovation efforts, covering the most important challenges at every link of the organic value chains. On 1 October 2019, the network celebrated its 15 years of activity.

The CORE Organic (CO) network of funding organizations and relevant stakeholder partners was proposed by the growing organic sector some 15 years ago. At that time, research on organic food and farming (OFF) was *a 'fairly new, but rapidly expanding discipline on the European research scene".* [2] One of the problems faced, in this early phase, was that the research effort in organic food and farming in Europe was characterised by small research communities, often scattered and fragmented both geographically and institutionally. Therefore, *"a gathering of the dispersed expertise to a critical mass in order to increase the competitive quality and relevance of the research as well as the dissemination and use of the research"* [3] was deemed necessary. Ever since then, the CO network has worked towards increased cooperation between national research activities and involved research institutions, and has always been supported by the EU Commission under its funding Framework Programmes for Research.

This report is intended for national funding institutions, stakeholders from the organic sector, partners from other ERA-NETs and, in general, public-public partnerships, for the research community, advisors, end-users, policy makers, and for the EU Commission. It provides an overview of CORE Organic through two main aspects that have marked its evolution: (1) the experience of a transnational partnership network built over its 15 years of existence; and (2) the seven scientific calls for funding research in organic food and farming in Europe and beyond.

The document briefly summarises the history of CO since its establishment, followed by the presentation and discussion of its main outcomes and achievements, with a focus on the lessons learned. A detailed analysis has been conducted on a dataset based on the seven COcalls implemented during four programme periods, from CORE Organic I (2007) to the joint SUSFOOD2/CORE Organic Cofund call (2019).

The following reflection focuses on various aspects that are particularly relevant for a discussion that hinges on experience with an eye to the future, in particular, the legacy of CO in terms of its vision of organic food and farming (OFF) and related research themes, and the experience gained in terms of forms and practices on community building and networking. These elements are finally interpreted in the light of the new EU policy context and of the present and future challenges.

More specifically, **Chapter 2** provides a description of the context in which CO was created and of the challenges for OFF research at that time, followed by the creation of the ERA-NET and by a description of its evolution over its 15 years of activity, covering the four programme periods and the seven related calls for research projects. The chapter introduces information about the supported thematic areas, the total number of funded projects, countries, etc.

Chapter 3 provides a detailed description of the call-related CO activity throughout its existence, based on data analysis regarding the four programming periods. The analysis was conducted using a diversified methodology, both quantitative and qualitative, as described in Section 3.1. An overall view per research area is followed by an analysis from the point of view of participants, institutions and countries. Key

[2] As stated in the final report of the 1st CORE Organic (2004-2007).

[3] Ibid.

thematic areas around which CO research has been promoted are discussed, as well as the networking triggered by the calls and the impact of CO on the research community.

Chapter 4 provides a general reflection on the CO experience, with regard to the vision of organic farming and related research, to the functioning of this specific transnational cooperation model, and to the capability to influence the OFF sectors and the policy context, at both the EU and the national level. The end of this chapter focuses on the capability of CO to achieve a real impact on the organic sector and its added value compared to other less coordinated funding mechanisms. Attention is also paid to the dissemination of results, with identification of strong points and areas for improvement.

Chapter 5 presents conclusive remarks with respect to the future of research policy coordination in the OFF field, focusing, in particular, on the CO legacy in the new EU policy context (Horizon Europe, new partnerships, etc.).

2. A brief history of CORE Organic

2.1 The establishment of CORE Organic

In the 1990s, consumers became more and more aware and interested in a healthy diet, environmentally-friendly food production methods and animal welfare.[4] In response to these consumer demands, the market for organic food products began to rapidly grow.
Since then, organic farming has expanded in almost all European countries. Between 1986 and 1996, the land under organic management in the 12 EU countries grew by 30 per cent annually (see Fig. 1).

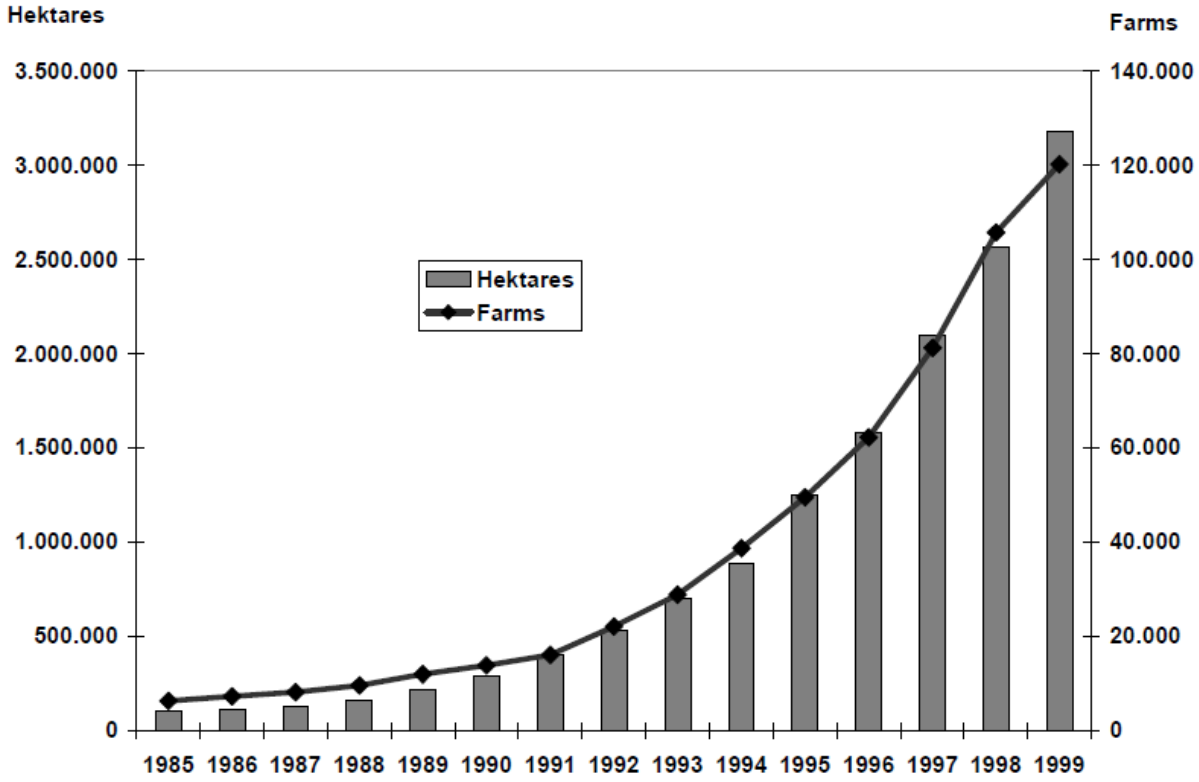


Figure 1: Development of organic agriculture in the EU from 1985-1999, Source: Willer and Youssefi (2000). Organic Agriculture Worldwide – Statistics and Future Prospects, p. 52, https://orgprints.org/13880/1/willer-yussefi-2000-02-world-of-organic.pdf

This rapid spread of organic farming, although with differences among countries, was accompanied by the increasing number of farmers who adopted this production method. The beginning of the 21st century also corresponds to a diversification of organic farming models, both in terms of production and consumption, yet the development trajectories differ among countries. In a study comparing six European countries, Michelsen et al. (2001) identify common stages: organic farming was first a social movement before gaining political recognition and then generating a market. In the Western Balkan countries, political recognition preceded production support measures and market development (Hamade et al., 2008).[5]

[4] https://www.scirp.org/html/1-2701821_64475.htm

[5] Michelsen J. et al., 2001. Organic Farming Development and Agricultural Institutions in Europe: A Study of Six Countries. Organic Farming in Europe: Economics and Policy Volume 9. Univ. Stuttgart-Hohenheim.

Padel (2001) emphasized that the high rates of conversion to organic farming during those years were accompanied by a different characterisation of the majority of organic farmers. The "early adopters" were more closely connected to the organic community and their ideals of a genuine and eco-friendly agricultural alternative rather than to the local agricultural context, and often conducted their own experiments and peer-to-peer exchanges. The "late adopters" were quite rooted in the local context rather than in the organic community, and highly interested in the possibility to use reliable and affordable agronomical and technological solutions in their activity.[6]

Thus, the social composition of the new entrants and their knowledge background was heterogeneous (some of them did not have an agricultural background), and needs tailored to the specificities of organic farming became more apparent and diversified. This provided a further challenge to the design of adequate support measures and research policies, and suggested innovation pathways other than classical top-down processes.[7]

In short, at the turn of the century, the context was marked by a diversified community of organic farmers with their specific situation and needs,[8] together with a growing interest in OFF by the wider public and the research sector. At the beginning of 2000 in the 15 EU countries – and its six candidate countries - and in the EFTA countries (Iceland, Liechtenstein, Norway and Switzerland), almost 3.5 million hectares were organically managed by 130,000 farms. This constituted more than 2% of the agricultural area and almost 1.5% of the farms.

This trend continued in the following years. The Eurostat database indicates that from 2002 to 2005, the total area for the EU-28 cultivated as organic continued to grow, increasing from approximately 5.0 million to 6.2 million hectares.[9] It can also be noted that the development of organic farming is geographically disparate throughout Europe (Fig. 2).

Hamade K. et al., 2008. Institutions and Policy Development for Organic Agriculture in Western Balkan Countries: a Cross-Country Analysis. Poster at: Cultivating the Future Based on Science: 2nd Conference of the International Society of Organic Agriculture Research ISOFAR, Modena, Italy, June 18-20, 2008. https://orgprints.org/12362/

[6] Padel S. (2001). Conversion to Organic Farming: A Typical Example of the Diffusion of an Innovation? Sociologia Ruralis 41(1), 40-61.

[7] Sylvander B. et al. (2006). Facing the organic reality: the diversity of development models and their consequences on research policies. Proc. Eur. Joint Organic Congress. "Organic Farming and European Rural Development", 2006/5/30-31, Odense (DK): 58-61.

[8] As an example, it can be noted that most of the candidate countries had no legal recognition of OF before they joined the EU.

[9] Also see https://ec.europa.eu/agriculture/rica/pdf/Organic_2016_web_new.pdf

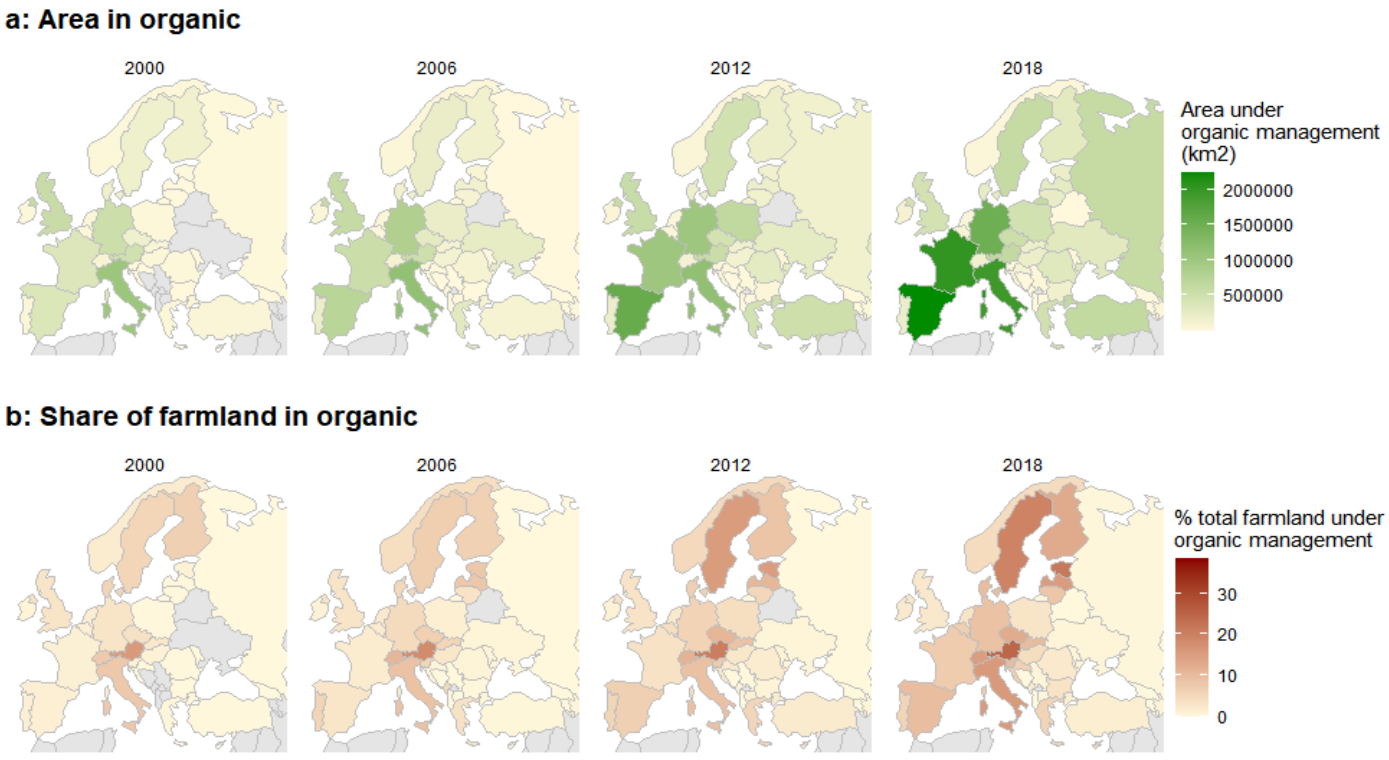


Figure 2: Evolution of the share of organic farmland from the total farmland in European countries (*Source: Elaborated by the authors based on FiBL statistics - https://statistics.fibl.org/*).

The rapid expansion of organic farming triggered the interest of research policy makers. The development of organic agriculture had been supported by national (and EU) subsidies since the beginning of the 1990s.[10] However, the lack of government regulations for organic agriculture made it difficult in many countries to distinguish organic from low-chemical, low input or other types of "green" but non-organic methods. Organic farming itself, with its intrinsically holistic approach, was a relatively new research domain.[11]

Governments and funding administrations found themselves confronted with questions like: What are the priorities in organic research? What problems should be addressed in order to support organic farms? Which specific methodological requirements are needed for research in organic farming?

The general research and innovation landscape in OFF appeared to be highly fragmented. In Europe, It was both geographically and institutionally dispersed, with small research communities not always in close communication with each other.[12] [13] For this reason, the need to unify this dispersed expertise towards a critical mass was deemed crucial in order to maintain and increase the competitive quality of European organic research and development. Since the 1992 reform of the European Common Agricultural Policy (CAP), the EU also formally recognizes that organic agriculture can substantially contribute to agricultural sustainability. To set a course for the continued development of organic agriculture, the EU Commission has progressively introduced legislation related to the production, trade, monitoring and labelling of organic products. EU member states have a high degree of flexibility in interpreting and applying these

[10] Willer, H. and Youssefi, M. (2000). Organic Agriculture Worldwide – Statistics and Future Prospects. https://orgprints.org/13880/1/willer-yussefi-2000-02-world-of-organic.pdf

[11] Blanc, J. et al. (2008): How to promote innovation and interdisciplinarity in organic food and farming research evaluation. 16th IFOAM Organic World Congress, Modena, Italy, June 16-20, 2008. http://orgprints.org/view/projects/conference.html

[12] Melby Jespersen, L. (2009). CORE Organic I - Final Project report. https://www.coreorganic.org/core1/library/pub/core_i_final_scientific_report.pdf

[13] https://www.coreorganic.org/pdf/CORE_Organic_Intl_Innovation_169_Research_Media.pdf

European regulations. Most EU member states implement organic action plans, but national institutional conditions and policies for organic agriculture vary widely. Furthermore, the size of the organic agricultural sector differs considerably among the Member States.

In 2004, the European Organic Action Plan of the Commission[14] called for support of research on organic farming, arguing that new information and new technologies were required for the further expansion of the sector, and that research on organic farming and processing methods was therefore necessary (EC COM 2004/415). In this context, a partnership between EU public institutions that supported research for the organic sector and European Commission (EC), tailored on needs and capacities of existing and future organic farmers, was envisaged. CO was seen as a key tool towards the triggering of additional research and effectively coordinating government efforts.

As put forth in 2019 by Hans-Jörg Lutzeyer, the EC project officer at the EU's DG Research and Innovation, when recalling the rationale for establishing an ERA-NET on organic farming: "*While most agricultural ERA-NET topics came out of discussions of SCAR[15] on building the European research area, this ERA-NET topic was actually proposed by the sector. As 'Organic' was an under-researched theme, but economically growing sector, it was an opportunity to strengthen its innovation capacity also in terms of job growth policies. Furthermore, the 2004 European Organic Action Plan of the Commission called for support of research on Organic. The 2014 EU Organic Action Plan, outlines CORE Organic as a tool to improve the coordination of research funding.*"[16]
The new ERA-NET was expected "*to link the national research programmes and to avoid unnecessary duplication of research*".[17] The ambitions for the new instrument were even broader: Lutzeyer underlines that CO was also expected to reflect the growing market for organic products in the light of its emerging globalisation, as well *as "to be a driver for innovation and for knowledge underpinning new regulations*".[18]

The ERA-NET scheme[19] established by the EU Commission in support of public-public partnerships was first implemented in 2003, and in 2004, one of the few dealing with agriculture, was granted.

CORE Organic was initiated by 13 organisations from 11 countries as part of the ERA-NET Scheme under the 6th Framework Programme for Research and Innovation of the European Commission. The former Danish Research Centre for Organic Farming (DARCOF), which changed its name to ICROFS in 2008 (International Centre for Research in Organic Food Systems) took the lead, with its managing office at Aarhus University (AU). During the CORE Organic network-building phase and first call, Erik Steen Kristensen and Lizzie Melby Jespersen were the primary coordinators.

[14] https://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=COM:2004:0415:FIN:EN:PDF
[15] Standing Committee on Agricultural Research, established in 1974, source of advice on European agricultural research for the EU Commission and for the Member States, https://scar-europe.org/.
[16] Bunthof C. (2019). CORE Organic: a very sustainable network (interview), https://projects.au.dk/coreorganiccofund/news-and-events/show/artikel/core-organic-a-very-sustainable-network/
[17] Ibid.
[18] Ibid.
[19] The ERA-NET scheme aims at developing and strengthening the coordination of national and regional research programmes. Under the ERA-NET scheme, national and regional authorities, represented by so-called 'programme owners' and/or 'programme managers', identify research programmes they wish to coordinate or open up mutually. The focus and role of ERA-NETs have varied across the Framework Programmes (https://www.era-learn.eu/partnerships-in-a-nutshell/type-of-networks/era-net-scheme).

2.2 The four programming periods and the seven calls

The 15 years of the ERA-NET CO, always headed by ICROFS, have been supported by four European Community/Union grants. Thanks to the financial contribution of the EC under the 6th, 7th and Horizon 2020 funding programmes for research, and particularly thanks to the involvement of all its members, the network has been able to build a critical mass of stakeholders that are active in the organic sector.

At this time, CO is composed of 27 members from 19 countries/regions. As of 2008, after the first CO experience, the new ICROFS director at that time, Niels Halberg, and the project manager, Ulla Bertelsen, were a driving force in expanding the committed network of funders launching joint calls, always with the aim to promote organic farming.[20] Presently, CORE Organic Cofund is led by Ivana Trkulja, the programme coordinator, in collaboration with Jakob Sehested, ICROFS director since 2019.

The process related to setting of priorities and funding of research projects by the CO network is based on a two-level negotiation. In the first round, the governing board of the CO programme, composed of national representatives from the public administration and/or research institutions, meets to define calls and their priority topics. The agreement on shared priority topics is generally challenging and subject to many discussions between different members with their specific national needs and expectations. Then, in each country, the budget allocated to the call is negotiated between contributing institutions (the ministry and other funding institutions).

Figure 3 illustrates the chronological timeline of the four programming periods, highlighting their main characteristics and features, plus the recent Joint Call implemented together with the ERA-NET SUSFOOD2 Cofund. During the four periods, CO was able to implement seven calls and has jointly funded 57 projects for nearly 58M euros.

[20] Adapted from Bunthof, C., https://projects.au.dk/coreorganiccofund/news-and-events/show/artikel/core-organic-a-very-sustainable-network/

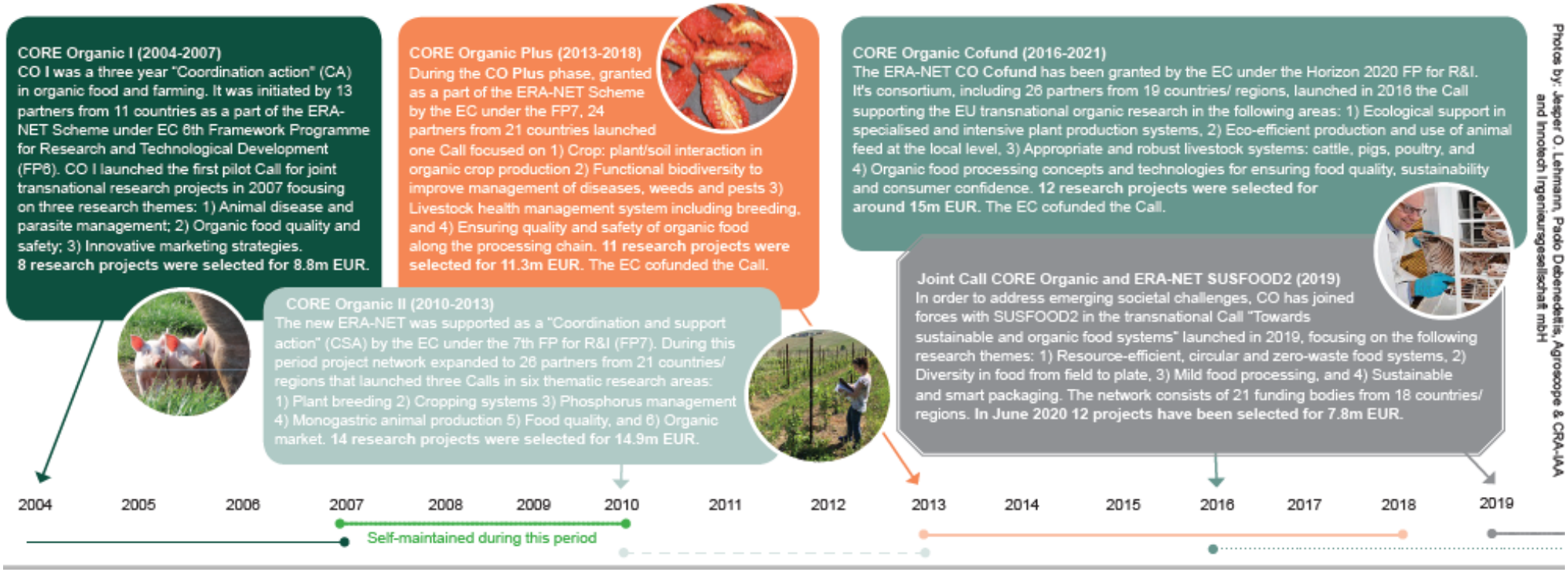


Figure 3: Timeline of CO programme periods (Source: Elaborated by the authors based on the CO 15th Anniversary brochure. See https://projects.au.dk/fileadmin/projects/coreorganiccofund/CO_15_Anniversary_brochure.pdf).

The gradual geographical expansion of CO since its inception will be explored in more detail in Chapter 3. Following is an overview of CO's capability to raise interest and aggregate new countries, starting from its core group of the funding members and illustrated by the maps that correspond to the four programming periods.

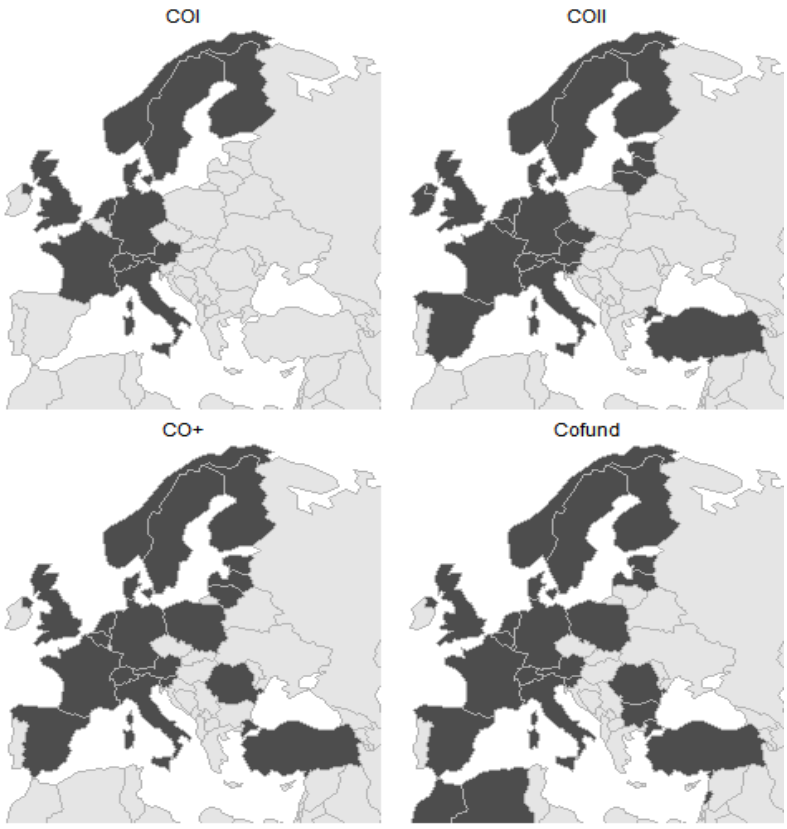


Figure 4: Evolution of the countries participating in funding of the four CO programming periods. In the Cofund Joint Call period, some funding countries such as Algeria, Lebanon and Morocco are international partners within the call, whereas the UK is involved as a part of the SUSFOOD2 ERA-NET, which co-funds the call with the CO programme.
Source: Elaborated by the authors.

3. Main outcomes and achievements

3.1 Introduction and methodology

This section reflects on the achievements of the CO transnational cooperation setting whereby various countries agreed on research priorities and topics for joint calls. It provides an analysis of a dataset based on the seven CORE Organic calls implemented during four subsequent programme periods, from CORE Organic I (2006) to the joint SUSFOOD2/CORE Organic Cofund call (2019), representing a total of 21 call topics, 57 selected research projects in which 26 countries, 232 distinct institutions, and at least 498 individuals participated. It offers some answers to the following questions: What are the trends of the CO programme related to actor involvement perceived in the projects, funding and topic prioritisation? What are the determinants of their involvement in the programme?

The dataset is an ex-post compilation of information taken from documents on projects and CO calls throughout the entire CO programme. The dataset comprises the programme periods, the calls, the selected research projects, the individual research participants, their institutions and countries. Based on call documents and project descriptions, various topical categorisations were carried out. Funding was also analysed in relation to countries and calls. Descriptive representations made it possible to address networking and community building.

To analyse researchers' contributions on call topics, we used three different thematic characterisation approaches based on different data and purposes. The first one is directly derived from the prioritised topics that were proposed in each call (see Tables 3 and 5 for details), and that we manually coded under five categories "meta-topics". We also manually coded each project using one of these topics and the project leaflets. The second categorisation is a direct coding of project description using three aggregated 'macro-areas' (crop systems/animal production/value chains), making it possible to see the general trends along the entire programme period. The third one is based on major key words present in project leaflets, leading to 12 main categories. These leaflets are available on the web (https://www.coreorganic.org/, except for the CO-SF call in which project abstracts were used. These textual descriptions of CO projects with leaflets are relatively standardised in their length and structure.

Moreover, we collected information on the funding of topics in each call and on their distribution by the contributing country. Indeed, the funding used in the report refers to the committed funds, which were indicated in the call announcement, not the ones actually spent. It does not include extra budgets that were sometimes added by the single funders during the funding decisions in order to be able to select the maximum number of projects with high scientific quality. Moreover, the ERA-NET Plus and the ERA-NET Cofund scheme provided a direct contribution to the call from the EU Commission: part of this contribution was pre-allocated (10-11% of the national commitments) and finally allocated during the selection of the projects, while another part (2-3 M euros), the so-called top-up budget, was used during the selection of the projects in order to fill the funding gaps. CO Cofund used part of the EC contribution to cover the coordination costs of the projects as well.

The dataset was checked and updated. For instance, the names of some of the participating institutions changed during the period, particularly when merged with other institutions. They were then attributed the name of the most recent one.

The dataset was analysed using different descriptive representations: tables, histograms, networks and maps (as well as a mixture of maps and graphs).

Since networking is an essential component of ERA-NETs, special attention was given to this component. Networks display collaborations between actors (often called "nodes" in the graph theory lexicon), i.e., individuals, institutions or countries that co-participate in the same project(s). In other words, a link between two nodes occurs when each of them participates in the same project. Betweenness centrality was also used as a metric in order to measure the influence of nodes in the networks (formally, it is the sum of the shortest paths to a node from all the other nodes of the network). The "communities" of nodes were also identified using a specific tool (the Louvain algorithm).[1] This classical clustering algorithm makes it possible to extract groups of nodes ('communities') according to the strength and the density of links between some of the nodes in relation to the rest of the network. It is a non-overlapping clustering algorithm, meaning that there is only one cluster per node even if this node can be linked to others from other communities. These communities can be interpreted as indices/proxies of common interests or concerns of actors.

The CO programme was analysed on the basis of these descriptive features, but also when relevant in relation to the history of the development of the organic sector in the EU.

3.2 Overview on the four CO periods of the programme

The expansion of the CO programme can be illustrated with several elements of its subsequent periods and calls. From the table below, we can identify an overall continuity in all aspects of the CO periods and calls. There was a significant leap in all of the programme parameters between CORE Organic I (COI) and CORE Organic II (COII) calls. The COII period was a game changer with the highest numbers of projects, countries, institutions and participants per call. Indeed, COII comprised three sub-calls. This fluctuation was later stabilised under CORE Organic Plus (CO+) and the CO Cofund periods.
As the number of participating countries increases, the number of project partner institutions does as well. The committed funding per project also increases, as well as the number of contributing countries. The CO programme has maintained its implementation capacity in terms of the number of projects, countries, institutions and participants per period, from COI onwards. The committed funding and funders have increased over the whole period.

Table 1: General information on the overall CO programme and its four periods.

Period	Start year	No. calls	No. projects	No. countries	No. project partner institutions	No. individual participants	Committed funding (K €)	No. funding countries
COI	2006	1	8	11	39	65	8850	11
COII	2010	3	14	21	108	174	13504	21
CO+	2013	1	11	19	66	120	10515	20
Cofund	2016	2	24	22	118	210	24403	24

Table 2 provides additional information at the scale of individual calls, in relation to Table 1, with more detailed data about the three calls under COII published from 2010 to 2012 and the two calls under CO Cofund. The third COII call differs since it used a real common-pot system involving less funding bodies and announced only one single topic (see Section 4.3). The second CO Cofund call also differs from the other calls as it was

[1] Blondel V.D. et al. (2008). Fast unfolding of communities in large networks. *Journal of Statistical Mechanics: Theory and Experiment*, vol. 1008, n° 10, pp. 1-12. http://arxiv.org/pdf/0803.0476

jointly implemented with ERA-NET SUSFOOD2 Cofund. The average number of participants significantly increased in COIIb due to one project that included 40 institutions.

Table 2: Evolution of call characteristics (additional information in bold characters, compared to Table 1).

Period	Calls	Year of publication (call launch)	No. projects selected	No. countries	No. project partner institutions	No. individual participants	No. call topics	Committed funding (K€)	No. funding countries
COI	COI	2006	8	11	39	65	3	8850	11
COII	COIIa	2010	10	20	67	109	3	7918	21
	COIIb	2011	3	20	57	62	2	4726	16
	COIIc	2012	1	6	7	8	1	860	6
CO+	CO+	2013	11	19	66	120	4	10515	20
Cofund	Cofund*a*	2016	12	19	70	146	4	14818	19
	Cofund *SF-CO*	2019	12	12	58	67	3	9585	18

These results show the management flexibility allowed by the ERA-NET instrument, which has made it possible to launch calls on different topics according to variable modalities, mobilising a wide range of actors throughout the programme.

3.3 Thematic orientation and commitments

Institutional commitments can be assessed with data on budgets allocated by countries on each of the subsequent topic calls. Except for COIIc (one single topic), each call was subdivided into two to four priority topics developed by the Call Board composed of the CO funding partners, in line with the national strategies and a European/transnational vision. Call Board partners take part in the meetings where they voice their national priorities and discuss them in the context of overall network objectives dominated by a transnational vision and a contribution to the European Research Area (ERA). The process on establishing common call priorities and approving call topics can last longer than a year. Resolving such a complex equation between national and transnational spheres is still challenging, but has always been successful. Table 3 shows that all countries do not equally invest in the proposed priority topics (except for COI), indicating that overall and also for each country, some topics have a higher priority than others. This is reflected in the budget committed per topic and, finally, in the number of funded projects. During the last joint SUSFOOD2-CO call, no projects' proposals were selected under the prioritized topic "Sustainable and smart packaging".

Table 3: Evolution of topic calls, aggregation in meta-topics and distribution of their funding.

Period	Calls	Priority topics of the call	Meta-topic	Committed funding (K €)	No. funding countries	No. funded projects
COI	COI	Animal disease and parasite management, including preventive and health improvement therapies to reduce reliance on antibiotics	Animal production	2950	11	3
		Quality of organic food - health and safety	Food quality	2950	11	3

Period	Calls	Priority topics of the call	Meta-topic	Committed funding (K €)	No. funding countries	No. funded projects
		Innovative marketing strategies. Identification of successful marketing methods. Local markets.	Market development	2950	11	2
COII	COIIa	Cropping: designing robust and productive cropping systems at field, farm and landscape levels	Cropping systems	3804	20	5
		Monogastric: robust and competitive production systems for pigs, poultry and fish	Animal production	2149	13	4
		Quality: ensuring quality and safety of organic food along the whole chain	Food quality	1965	13	1
	COIIb	Plant breeding - Improvement of production efficiency and agricultural biodiversity within cropping systems by using eco-compatible breeding techniques	Cropping systems	3105	14	2
		Supporting the development of organic markets	Market development	1621	12	1
	COIIc	Sustainable and efficient management of phosphorus and use of secondary fertilisers within organic agriculture	Resource efficiency	860	6	1
CO+	CO+	Crops: Plant/soil interaction in organic crop production	Cropping systems	2940	15	3
		Functional biodiversity to improve management of diseases, weeds and pests	Cropping systems	2364	12	2
		Livestock health management system including breeding	Animal production	2849	14	3
		Ensuring quality and safety of organic food along the processing chain	Food quality	2362	11	3
Cofund	Cofund*a*	Ecological support in specialised and intensive plant production systems	Cropping systems	4324	17	4
		Eco-efficient production and use of animal feed at the local level	Animal production	2886	11	1
		Appropriate and robust livestock systems: cattle, pigs, poultry	Animal production	3669	13	6
		Organic food processing concepts and technologies for ensuring food quality, sustainability and consumer confidence	Food quality	3939	12	1
	Cofund *SF-CO*	Diversity in food from field to plate	Market development	2927	16	2
		Resource-efficient, circular and zero-waste food systems	Resource efficiency	2947	17	7
		Mild food processing	Food quality	1912	13	3
		Sustainable and smart packaging	Market development	1800	12	0

As a result, some topics received more funding than others during the programme. Beyond each specific call topic, we were able to identify some recurrent and dominant meta-topics, as well as some others that were more specific and less well funded. Commitments to five meta-topics identified are represented in Fig. 5, showing their relative importance, both in terms of funds allocated and of number of projects selected, with slight differences in the meta-topic hierarchy. For instance, the budget allocated to cropping systems was higher than the one for animal production, but more projects were funded in animal production (Fig. 5).

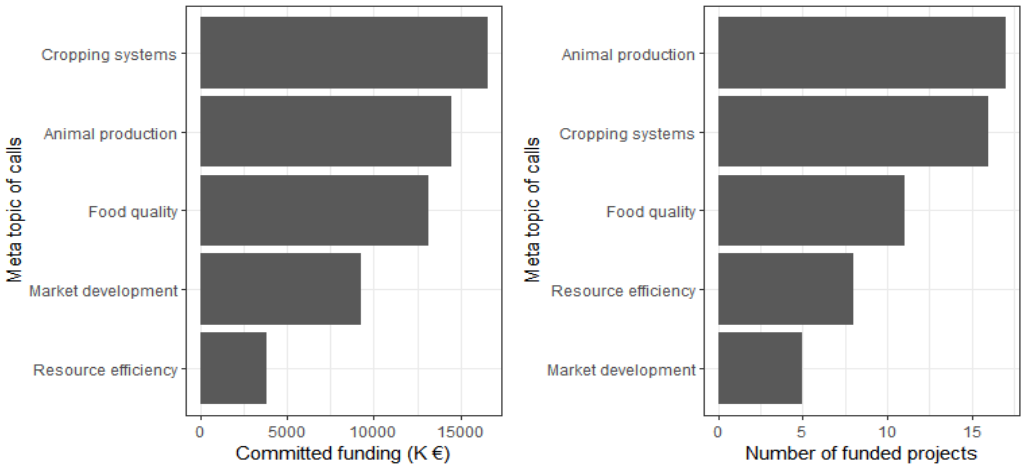


Figure 5: Ranking of funding commitments on meta-topics (left) and subsequent number of funded projects (right).

Animal production is a recurrent meta-topic from COI to CO Cofund. First, it was addressed under the health issue in COI and CO+. It was then associated with some particular species and/or related issues in other calls: e.g., robustness and competitiveness of monogastric production systems in the first COII call, and animal feed and nutrition for eco-efficient production in CO Cofund.

Cropping systems, not present in COI, were targeted under different calls, particularly under COII and CO+, first, to design robust and productive systems at various scales (COIIa). The issue of plant breeding was then specified in COIIb, whereas research on the use of functional diversity for pest management was targeted in the CO+ call, and ecological support in specialised and intensive plant production systems for the first topic in the CO Cofund call.

Food quality is a recurrent main topic, but with more variable investment in terms of intensity and subtopics. It was first addressed in generic terms (quality, safety, health) along the whole food value chain, and later in connection with more specific issues (e.g., consumer confidence in CO Cofund, and mild food processing in the joint SF-CO call).

Another meta-topic from COI to Cofund, but not CO+, was dedicated to **Market development**, considering either generic issues (development of organic markets in COIIb), or more specific aspects (innovative marketing strategies in COI. Sustainable packaging topic was proposed in Cofund SF-CO, although no project was ultimately funded.

The meta-topic, **Resource efficiency,** appears to be more isolated and less specifically funded, but nevertheless relevant in the programme. Resource efficiency was addressed in COII and Cofund SF-CO in relation to the specific case of phosphorus management and with a broader circular economy scope. It should be noted that even if the concept of resource efficiency is clearly indicated only in these two call topics, it has been addressed by researchers in many projects under other meta-topics (efficient use of nutrients, reduced use of energy in food processing, etc.).

Another general insight into the thematic orientation of research projects can be based on the key words used in project leaflets. On the basis of this list of words, it is possible to identify the major traits that characterise research implemented in the CO programme. Among this set of words, we identified a set of categories of interest for CO (Table 4). We chose to focus on these specific topics across the CO projects and to identify their place and their evolution from the beginning of the CO programme. Technically, a category includes semantically coherent words that can be searched for inside available project leaflets (all except projects from

the SUSFOOD2-CO call where only abstracts were available). For instance, the category “Productivity” contains the following words: yield, productivity, competitiveness.

Table 4: Thematic categories used in project leaflets or abstracts for the SUSFOOD2-CO call.

Meta-categories	Categories	% projects
Approaches	System	86.0
	Experimentation	33.3
	Participatory approach	14.0
	Agroecology	1.8
Non-human entities	Plant	63.2
	Animal	45.6
	Biodiversity	38.6
	Soil	31.6
Human entities	Farmers	75.4
	Consumers	54.4
	Policy	31.6
	Retailers	8.8
	Processors	8.8
Performances	Quality	71.9
	Health	70.2
	Productivity	64.9
	Resource efficiency	50.9

Concerning the conceptual and methodological approaches developed in CO projects, one important development is that the focus on systems approach was favoured and developed, especially in Cofund calls, encouraging funders and researchers to embrace the concepts of food systems and overall sustainability, even projecting beyond the organic sector (e.g., some activities such as on-farm processing can also be relevant for other types of agriculture). This is consistent with the definition and identity of organic farming. This is also obvious when considering project descriptions. Thus, 86% of leaflet projects mention “System”. Other research approaches are also mentioned, but to a lesser extent, e.g., experimental and participatory ones (in 33% and 14% of leaflets or project abstracts, respectively). Agroecology, which is considered as an overarching approach that supports practices like organic farming, is mentioned in only 2% of the projects.

Moreover, we focused on some human and non-human entities mentioned and thus studied in projects. Plants are the most frequently studied entities (63.2% of projects), then Animals (45.6% of them), Biodiversity (38.6%) and, finally, Soil (31.6%). On the human entity side, CO projects are mostly focused on the production side of OFF, with 75.4% of projects mentioning farmers, and only 8.8% considering processors or retailers. Consumers are mentioned in 54.4% of projects, and policy concerns in 31.6%.

Finally, the calls open a pathway for the improved performance of the organic sector within multiple areas, in particular associated with organic farming. Quality and Health are first mentioned (in 76 and 73% of project leaflets), followed by productivity issues (69%) and resource efficiency use (49%).

In order to follow the global thematic trends across the entire length of the CO programme, we can finally highlight three thematic macro-areas coded directly from available textual project descriptions. Two are

related to production (Animal Husbandry vs. Crop Systems), and one is related to Value Chains (i.e., projects addressing more than one phase of the chain, from production to consumption).

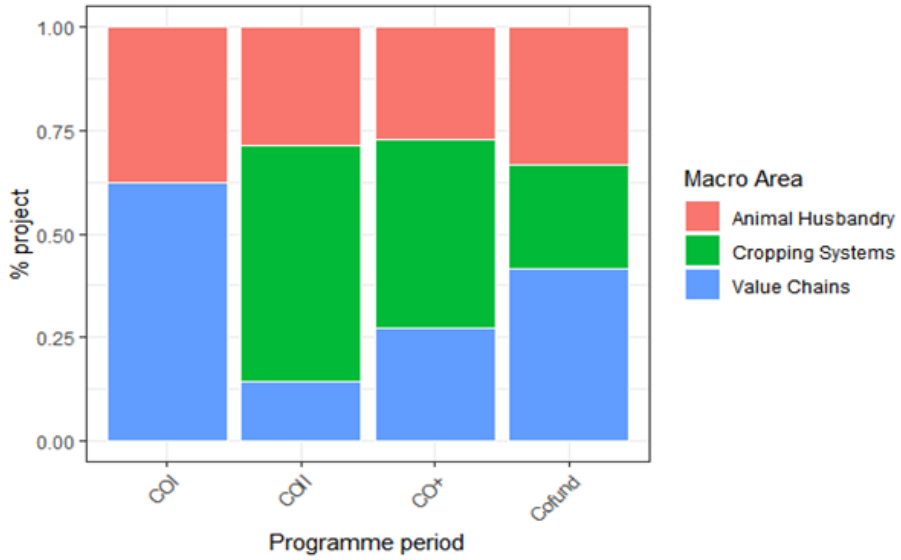


Figure 6: Evolution in the three macro-areas of CO projects during the overall programme.

Figure 6 shows that COI is thematically less diversified than the subsequent calls. The value chain theme is lower, albeit increasing, in the subsequent periods, to the benefit of biotechnical themes (animal husbandry and cropping systems). Cropping systems dominate the COII period, with more than 50% of the projects, but relatively decrease as of COII, whereas the share of projects concerning animals remains relatively stable from COI to Cofund.

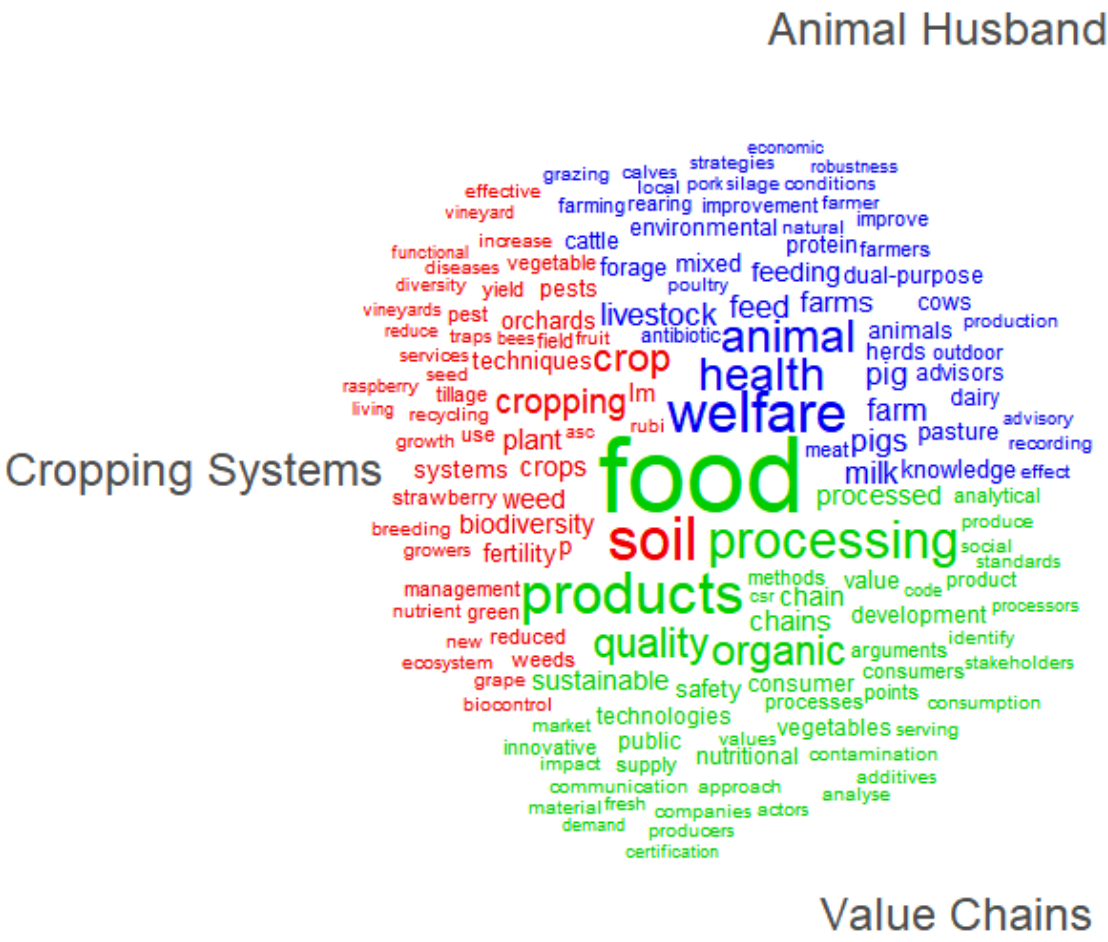


Figure 7: Wordcloud for project leaflets or abstracts and their significant link to each of the three macro-areas (providing indications on semantic fields for each macro-area.

Figure 7 and the corresponding underlying leaflets show the main keywords and their diversity, specifically associated with each of the three macro-areas. Projects in Animal Husbandry mainly deal with **animal welfare and health**, of different species (principally pigs, cattle, dairy animals), **and management aspects**, mainly feeding strategies (e.g. PhytoMilk, ICOPP) and the reduction of drug use (e.g. ANIPLAN). Cropping systems are mainly analysed through **soil fertility management** via tillage (e.g. TilmanOrg), service crops (e.g. SoilVeg) or living mulches (e.g. INTERVEG); **weed and pest management**, particularly via biocontrol solutions (e.g. BICOPOLL); **ecosystem services** provided by functional biodiversity (e.g. EcoOrchards); and **seed production** (e.g. COBRA). Various cropping systems were considered: field crops, fruit and vegetable production (including in greenhouses, e.g. GreenResilient).

Value chain projects addressed a diversity of questions about food quality across organic food chains concerning diverse **processing technology issues for food safety** (e.g. AGTEC-Org), **packaging** (e.g. Ecoberries), **quality analysis technologies** (e.g. QACCP or AuthenticFood), as well as **consumer** targeting (e.g. iPOPY), **value concerns** (e.g. Healthygrowth) and **communication issues** (e.g. FCP).

3.4. Geography of thematic investment

From the choice of topic calls and their funding, to the participation of researchers in projects, CO has allowed a differentiated investment of countries in topics (Fig. 8). There is a rough correlation between country funding of topics and country participation in projects. Indeed, there is the possibility for countries not interested to

fund some topics to assess the outcomes of selected research projects and then to reinforce their capacities on these topics in order to participate in the future calls.

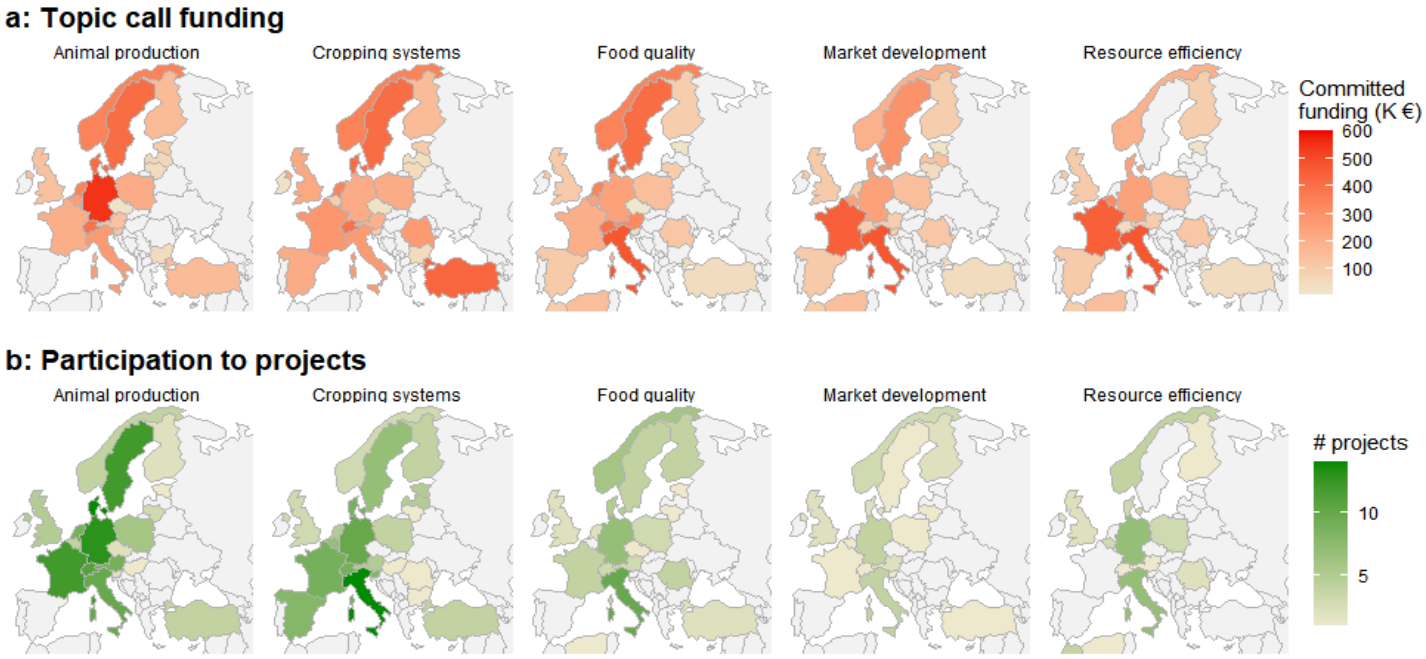


Figure 8: Map of country investment in meta-topics according to funding (top) and to participation in projects (bottom).

Using the three thematic macro-areas, we also noted the differentiated investments across participating countries (Fig. 9). The high investment in animal husbandry is especially true for a core of countries from Italy to Sweden, and including France and Germany. Cropping systems are roughly worked by the same set of countries, with varying intensity, except for Spain, Poland and the Baltic countries that generally invest in arable vegetable crops. On the other hand, value chains concern projects and countries to a lesser degree, with a central axis from Italy to Sweden.

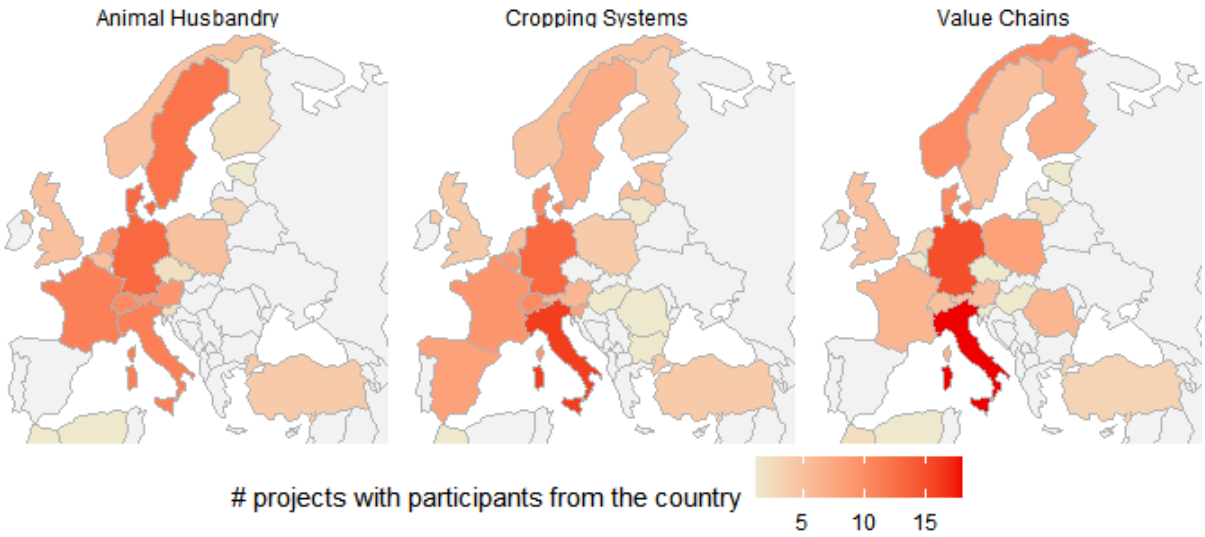


Figure 9. Map of thematic orientations (using the three macro-areas) per country ("topicality").

A differential investment by countries is also confirmed using a correspondence analysis (Fig. 10). Countries in the middle of the factorial plan (e.g., France, Germany, Italy, Turkey, etc.) tend to deal with all the

thematic macro-areas (in blue on Fig. 10). Countries far from the middle have more specific thematic orientations. For instance, Bulgaria, Spain and Latvia have preferentially invested in Cropping Systems, especially those in fruit production (right side of Fig. 10); the Netherlands, Lithuania and the Czech Republic are more focused on Animal Husbandry (lower left side of Fig. 10); whereas Value Chains are preferentially addressed by Romania, Finland and Norway (upper left side of Fig. 10).

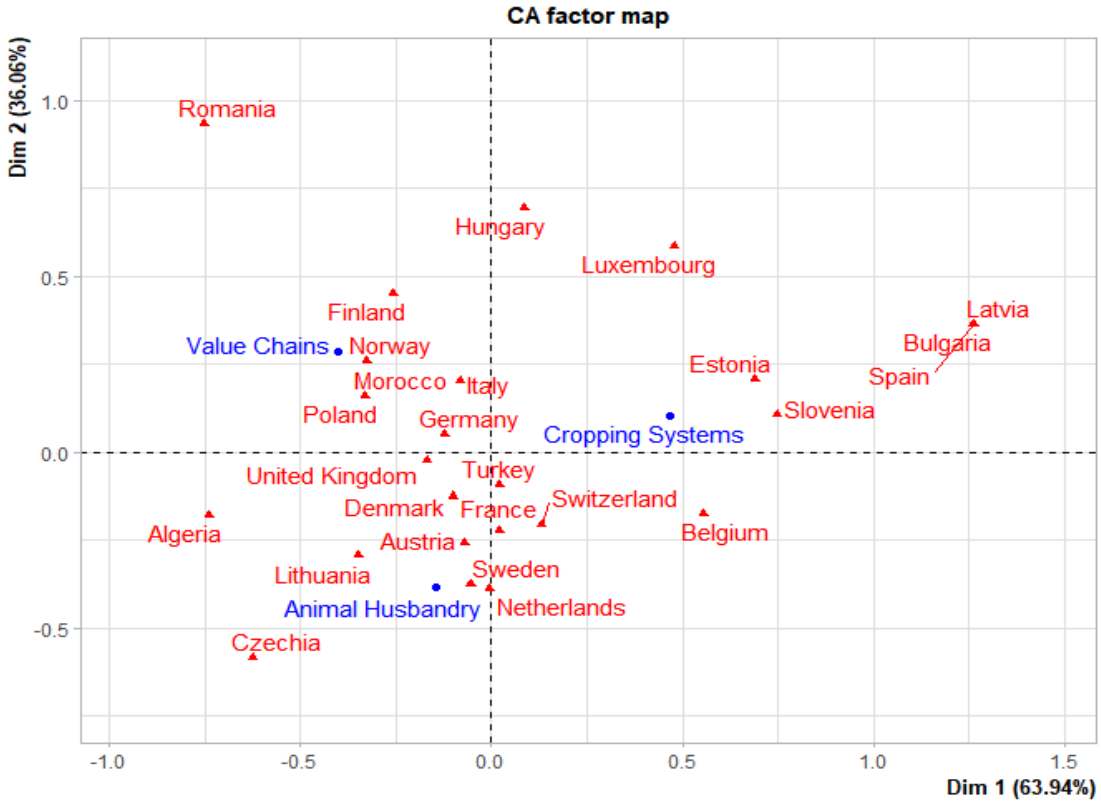


Figure 10. Country macro-area correspondence analysis.

Overall, both the funding and the thematic orientations of projects reveal geographic differences among participating countries. This topicality is not an obstacle for cooperation, as shown in the following section.

3.4 Individual participants and their networks in CO programme

The contribution of individual participants in projects follows a power-law phenomenon: few of them participated in many projects, whereas many only participated once. More precisely, most of the contributors (87%) participated only once in a project, while very few individuals participated more than once and only one person participated in five projects. Thus, few researchers participated in more than four CO projects (and periods also), which means that the CO programme had a high turnover and many researchers benefited from CO support: as a whole, 498 individual participants contributed to 58 research projects.

The features of the collaboration network that emerge from the whole CO programme can be depicted according to the previously described approach (Section 3.1). Figure 11 shows the collaboration network of researchers that emerges from the entire duration of the CO programme and all of the individuals (n= 498).

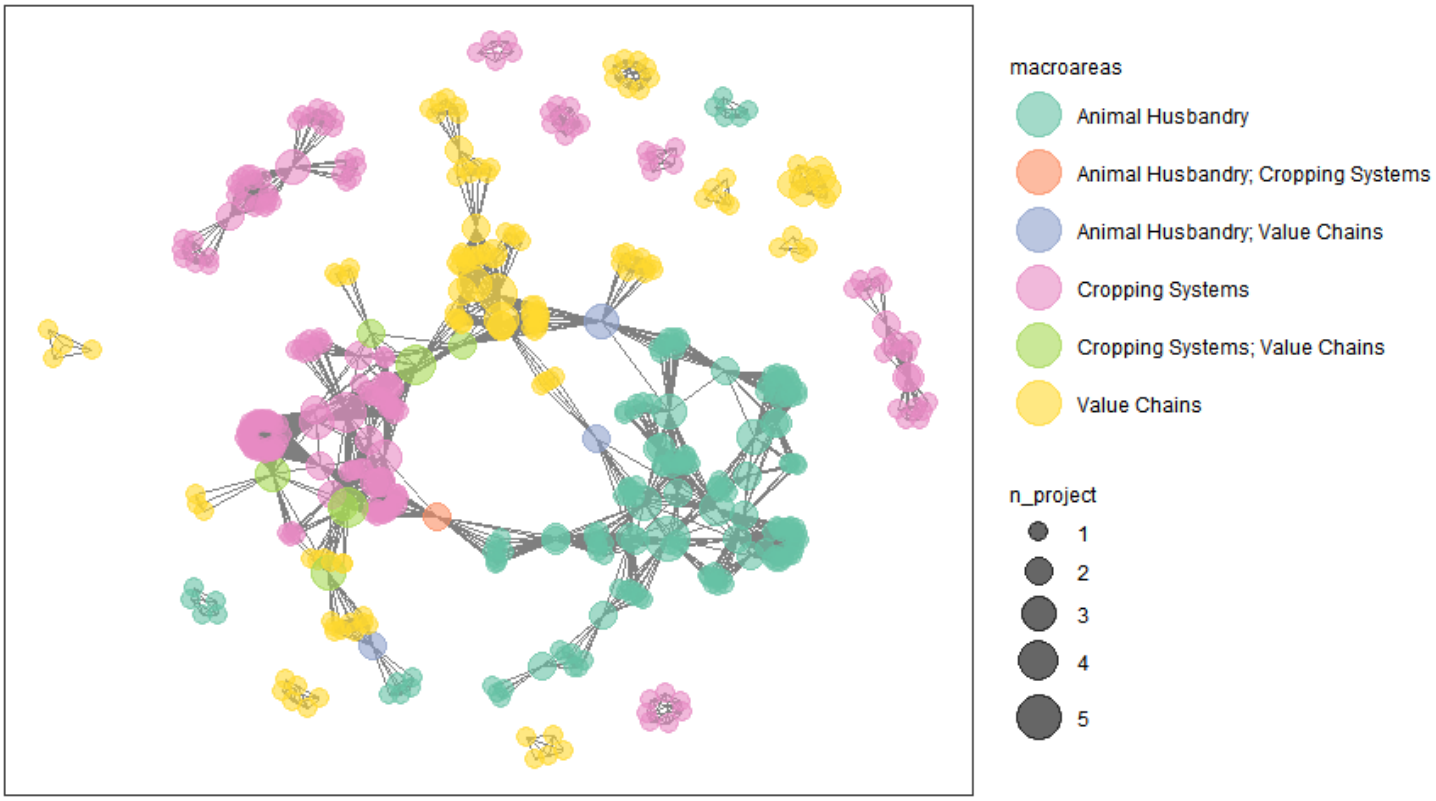


Figure 11. Network of co-participation of individuals in projects during the whole CO programme.[2]

An elementary node represents a researcher and the node size corresponds to the number of projects where the researchers participated. The node colours correspond to the macro-area of the project(s) and the combinations between two of the three macro-areas. Links among nodes are co-participations of researchers in the same project. A cluster of nodes without connection to other nodes (at the periphery of Fig. 11) means that a specific research group collaborated on one single project.

Figure 11 displays a dense network in the central part, structured around the three macro-areas, and more scattered collaborations around one or two projects at its periphery. It shows the presence of sub-groups, quite cohesive internally in terms of collaborations during projects, as well as thematically. Some sub-groups are connected to others by a few key researchers who participate in more than one project and who act as "bridging nodes" between sub-groups. These more central individuals are involved in many projects, either through successive projects on related topics, or by dealing with different research topics (described here through *macro-areas*).

Indeed, the collaboration network is composed of a big component (a set of individuals all interconnected through projects), and other small components that reflect a lesser continuity of the people involved as well as a shorter investment in the theme that they deal with. For instance, the Animal Husbandry theme, followed by Cropping System and Value Chain macro-areas, are common features of three sub-clusters that compose the biggest component in the graph, while smaller, peripheral, isolated or dispersed clusters are those that focus either on Cropping Systems or Value Chains.

[2] Node size corresponds to the number of projects where individuals appeared; node colours correspond to the (eventual combination of) individuals' macro-areas.

The structure of the collaboration network reflects the type of actor involved in the CO programme, either continuously or occasionally, and with differing degrees of partnerships as well, where some actors deal with the same partners, whereas others change.

3.5 Analysis by institutions

Some institutions contributed to many of the programme's projects (Table 5), e.g., ten of them were in more than ten projects and participated during all of the programme periods and the majority of calls. The institutions in this core group are frequently connected with each other (e.g., Aarhus University, CREA, FiBL, Wageningen University and Research, etc.), and can also act as a catalyst by involving other less integrated institutions. They constitute a sort of core group of organic researcher communities in Europe, which reveals a certain capacity to aggregate a wide range of research groups for one or several projects, which is also important because it means extending networks beyond the usual suspects. The institutions that participate the most in CO tend to be generalists from the thematic point of view. As indicated in Table 5, these institutions generally work in the multiple macro-areas that are associated with a large workforce and a more recent growth trend, but that often are not strictly specialised in research on organic agriculture (except for FiBL, ORC and a few others). Moreover, these institutions are mostly from Nordic and Western European countries that were also often the founding members of IFOAM.[3]

Table 5: Main research institutions in the CO programme (top 20 in terms of project number).

Institution	Country	No. projects	No. distinct participants	No. CO periods	No. calls	No. macro-areas	Macro-areas (sorted by number of projects)
Aarhus University (AU)	Denmark	23	20	4	6	3	Animal Husbandry [11]; Cropping Systems [7]; Value Chains [5]
Research Institute Of Organic Agriculture (FiBL)	Switzerland	20	27	4	5	3	Animal Husbandry [9]; Cropping Systems [6]; Value Chains [5]
Swedish University Of Agricultural Sciences (SLU)	Sweden	19	19	4	5	3	Animal Husbandry [10]; Cropping Systems [6]; Value Chains [3]
Council For Agricultural Research And Agricultural Economics Analysis (Crea)	Italy	17	16	4	6	3	Cropping Systems [8]; Value Chains [6]; Animal Husbandry [3]
INRAE	France	15	22	4	5	3	Animal Husbandry [7]; Cropping Systems [4]; Value Chains [4]
University of Kassel	Germany	15	13	4	6	3	Value Chains [7]; Animal Husbandry [5]; Cropping Systems [3]
Wageningen University (WUR)	Netherlands	14	20	4	4	3	Animal Husbandry [7]; Cropping Systems [4]; Value Chains [3]
University of Natural Resources And Life Sciences (Boku)	Austria	13	9	4	6	3	Animal Husbandry [8]; Value Chains [3]; Cropping Systems [2]
University of Copenhagen (KU)	Denmark	12	9	4	7	3	Value Chains [5]; Cropping Systems [4]; Animal Husbandry [3]
Bioforsk	Norway	10	11	4	6	3	Cropping Systems [4]; Animal Husbandry [3]; Value Chains [3]
Louis Bolk Institute (LBI)	Netherlands	8	4	3	4	2	Animal Husbandry [5]; Cropping Systems [3]
Institute For Agricultural And Fisheries Research (ILVO)	Belgium	7	4	3	4	3	Cropping Systems [4]; Animal Husbandry [2]; Value Chains [1]

[3] International Federation of Organic Agriculture Movements

Agroscope	Switzerland	5	6	3	3	2	Cropping Systems [4]; Value Chains [1]
Estonian University of Life Sciences	Estonia	5	5	3	3	3	Cropping Systems [3]; Animal Husbandry [1]; Value Chains [1]
Natural Resources Institute Finland (LUKE)	Finland	5	5	3	4	3	Cropping Systems [3]; Animal Husbandry [1]; Value Chains [1]
The Organic Research Centre	United Kingdom	5	5	3	4	3	Cropping Systems [2]; Value Chains [2]; Animal Husbandry [1]
University Of Agronomic Sciences And Veterinary Medicine of Bucharest	Romania	5	3	2	3	1	Value Chains [5]
University of Bologna (Unibo)	Italy	5	4	3	3	2	Value Chains [3]; Cropping Systems [2]
Inagro	Belgium	4	2	3	4	2	Cropping Systems [3]; Animal Husbandry [1]
Institut Technique de l'Agriculture Biologique (ITAB)	France	4	4	2	3	3	Animal Husbandry [2]; Cropping Systems [1]; Value Chains [1]

Focusing on institutions involved in more than two projects (Table 5), we further observe a similar pattern, as indicated above. The evolution of institutional commitment during the CO programme exhibits different behaviours. First, there is a core of institutions that have a high and quite continuous rate of participation in the CO projects (e.g., FiBL, Aarhus University, SLU, University of Kassel). Another group of highly participating institutions has significantly reinforced its participation (e.g., CREA, INRAE, Wageningen). This might be due to the increase in the recognition of research on organic farming within the respective institutions, as is the case for INRAE, for instance. Some institutions also reduced their participation in the programme (e.g., Bioforsk).

Each call is characterized by the arrival of newcomers, which is applicable for the majority of institutions. Some of these institutions remain throughout the whole programme, whereas others appear only occasionally or irregularly. On the whole, almost 75% of the institutions appear only in one programme period, which indicates a high level of turnover and the ability of the programme integrate the newcomers.

The collaboration between ERA-NET CORE Organic and SUSFOOD2 in the second Cofund call attracted research groups that were better acquainted with food systems and its thematic areas, as well as with the CORE Organic research focus. Hence, this shared experience between two different networks generated other multidisciplinary projects. To sum up, the CO programme not only functions as a club, but as a hub as well, allowing institutions to deal with OFF research inside evolving consortia.

3.7 Analysis by country

The participation of a country in the CO programme depends on (i) its contribution to the programme budget, and (ii) on the involvement of researchers from the country in selected projects. Both dimensions are correlated (correlation coefficient=0.92 between funding and number of projects per country). Table 6 shows the different variables expressing country involvement in the CO programme, summed up in the column 'Degree of involvement'.

Table 6: Country involvement.

Country	Committed funding (K €)	No. projects	No. distinct institutions	No. distinct participants	No. period	No. calls	Degree of involvement
Italy	6748	45	31	92	4	6	high
Germany	6115	41	30	76	4	7	

Denmark	7733	33	15	71	4	7	
France	3883	26	17	94	4	5	
Switzerland	2792	25	7	71	4	6	medium and continuous
Sweden	5569	24	9	39	4	5	
Austria	2141	20	11	37	4	6	
Norway	4446	20	14	30	4	7	
The Netherlands	2126	16	5	49	4	5	
Belgium	2595	15	11	27	3	5	
United Kingdom	1477	14	15	29	3	5	
Finland	1662	13	7	14	4	6	
Turkey	2027	11	12	19	3	5	
Poland	1592	17	10	33	2	3	occasional
Slovenia	681	11	5	13	3	4	
Spain	1091	8	8	13	3	4	
Estonia	629	7	3	10	3	4	
Romania	1382	7	4	8	2	3	
Lithuania	261	6	3	6	2	3	
Latvia	402	5	4	6	2	3	
Morocco	400	4	5	5	1	1	
Czech Republic	70	3	4	4	1	1	
Luxembourg	650	3	3	3	1	2	
Algeria	600	2	1	2	1	1	
Hungary	0	2	2	2	2	2	
Bulgaria	110	1	1	1	1	1	

The ‘degree of country involvement’ for each country was identified using a multivariate analysis of variables presented in the table: financial contribution, number of projects, participants, institutions per country, and their continuity in the CO programme (number of periods and calls). Three main levels of involvement were recognised.

The first type includes countries (Italy, Germany, France and Denmark) that contributed the most to the CO programme. They are statistically associated with high numbers of participants, institutions, projects, a high level of financial contribution and continuity of investment. It can be noted that France, with a lower financial contribution, has a high level of involvement thanks to the number of researchers participating. The low financial contribution figure is also impacted by French funding mechanisms where salaries are not included in the project budget.

The second type (Switzerland, Sweden, Austria, Norway, Belgium, UK, Turkey and Finland) is associated with the mean level of participation in projects (number of projects, involved institutions and participants), and the financial contribution, but with a high continuity in their involvement. It can be noted that some countries (Norway, Sweden) have high financial contributions but with relatively low participation in projects.

Finally, the last type encompasses the remaining countries, from the Mediterranean area (e.g., Spain, as well as Morocco and Algeria) and Eastern Europe (e.g., Poland, Czech Republic, Bulgaria, Slovenia, etc.). Countries under this heading have lower participation in all the considered metrics, and occasional contributions.

Another way to deal with country involvement is to consider the network of collaboration between them (Fig. 12). The node size corresponds to the number of projects in which the country is involved.

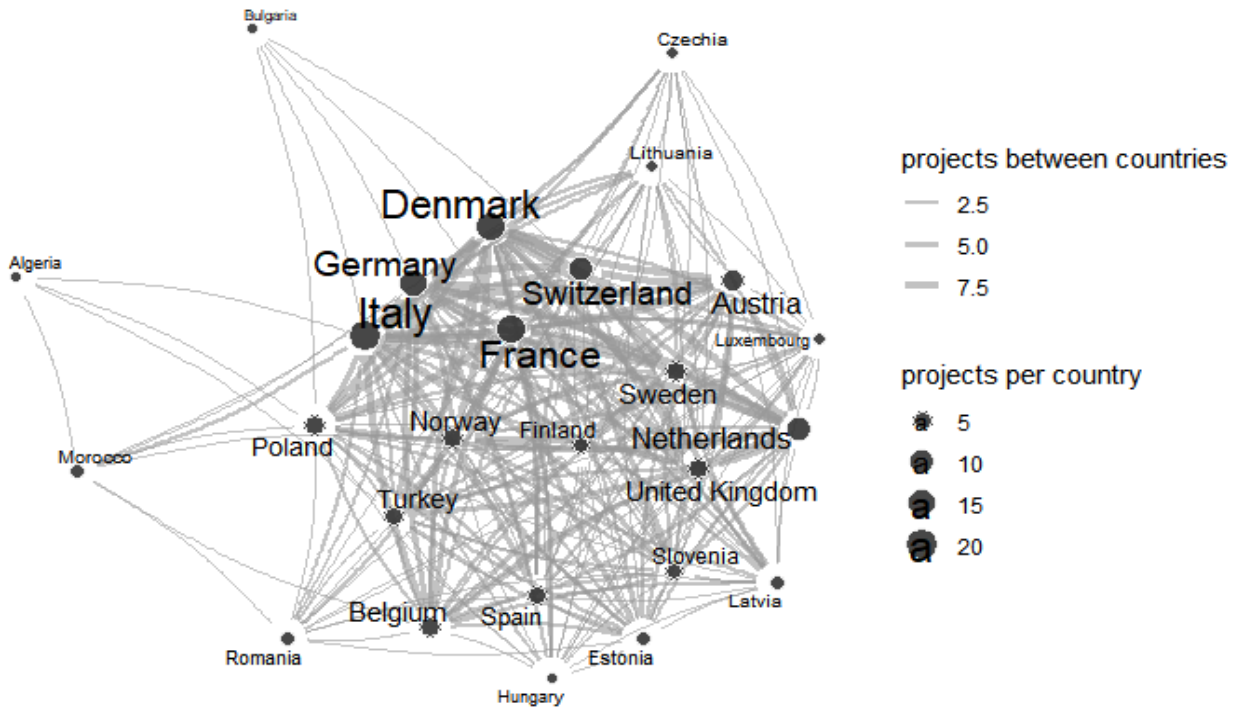


Figure 12. Network of countries working together on the same projects.

No clear sub-network appears over the global programme period (the "snow ball effect"). Indeed, every country seems to have collaborated with each other and with several countries that have participated only once in CO calls (Bulgaria, Romania, Morocco and Algeria). An automated cluster detection (Louvain algorithm), which considers the frequency of interactions, identified three clusters: a central one comprised of northern and central European countries, followed by a second group of countries (Italy, Finland and Slovenia), and a small third group (Poland, Turkey and Estonia). Thus, there is a cumulative effect of geographic and cultural proximity in the design of projects.

When projected on the geographical map, the country collaboration network takes on another aspect, reinforcing the effect of interconnection, which departs from the central axis to encompass all network partners (Fig. 13). Moreover, the continuous expansion of the collaboration among CORE Organic network partners is visible.

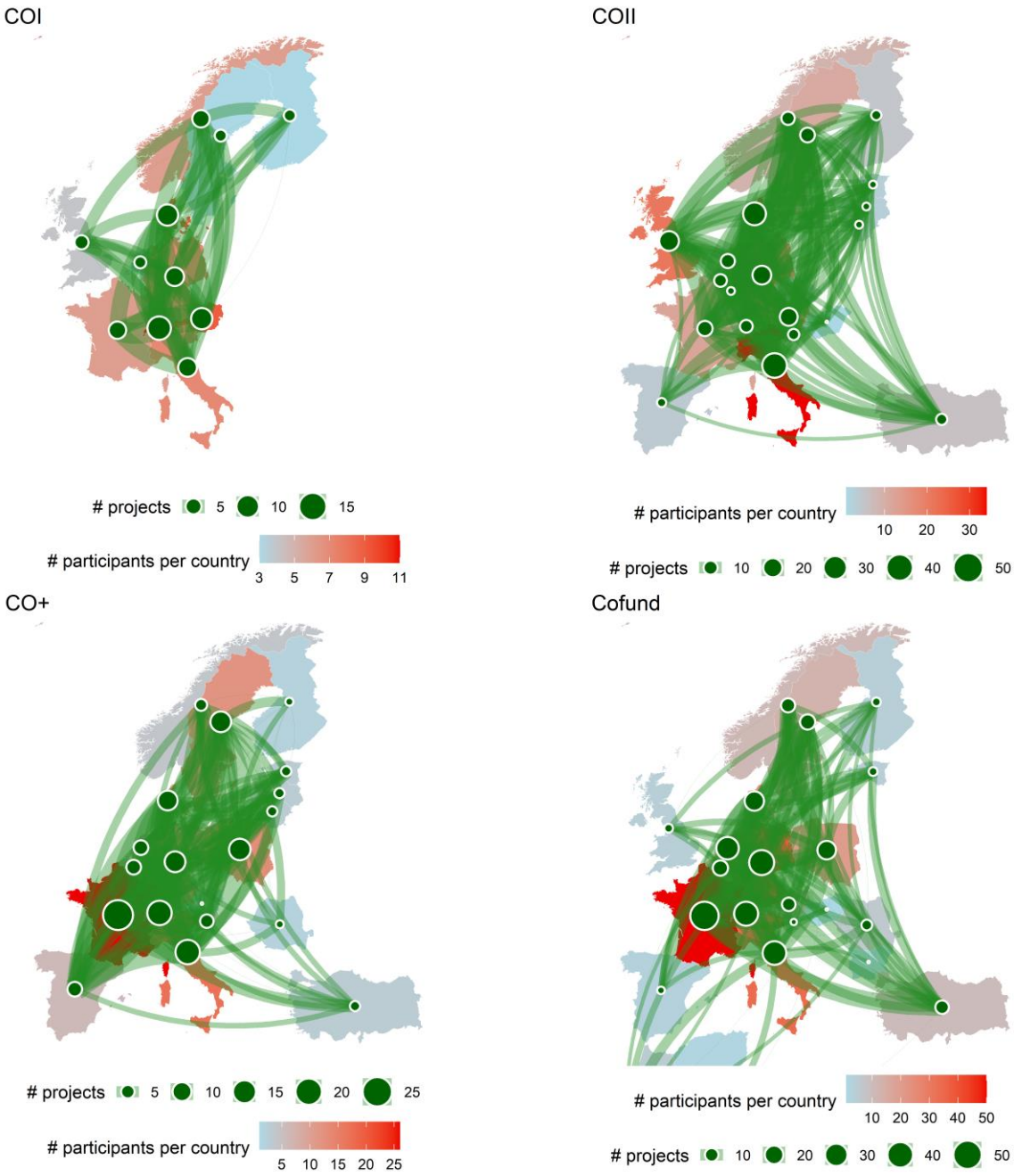


Figure 13. Map of the evolution of collaborations between countries.

Thus, a core of countries appears as being more involved than others, but there is no obvious and simple determination of involvement patterns. It is possible to identify a group of countries that has been more intensely involved in CO activities, and that broadly develops along a central axis going from Italy to Denmark, and including France, Germany and the Alpine area. Some countries are less involved (Czech Republic, Spain, East and Southern countries), whereas others have never participated as funding partners during the 15 years of the CO programme (Portugal, Greece, Slovakia and the Western Balkan countries).

It is also relevant to mention that countries from the central axis of CORE Organic have played a major role in the history of the international organic movement: in German speaking countries, the role of the FiBL that has spread from Switzerland to its neighbours since 1977, or in France where IFOAM was created in 1972. The relevance of Danish involvement reflects the key role played by ICROFS in the establishment and

development of CO and the high level of specialisation of Danish research concerning organic farming[4] (Gall et al., 2009). Moreover, Italy can be considered as one of the main pioneers in organic primary production. Consequently, behind the participation in the CO program, the historically-built networks of personal and institutional relationships and accumulated social capital, both in the organic movement and in the European Union institutions, still play a significant role.

The previous interpretation is reinforced by the analysis of national budgets allocated to the different calls (Fig. 14). Some countries have a continuous and significant contribution (DE, DK, IT), whereas others participate to a lesser extent in some topic calls. In each call, newcomers are also included (Morocco, Poland, Algeria, Lebanon).

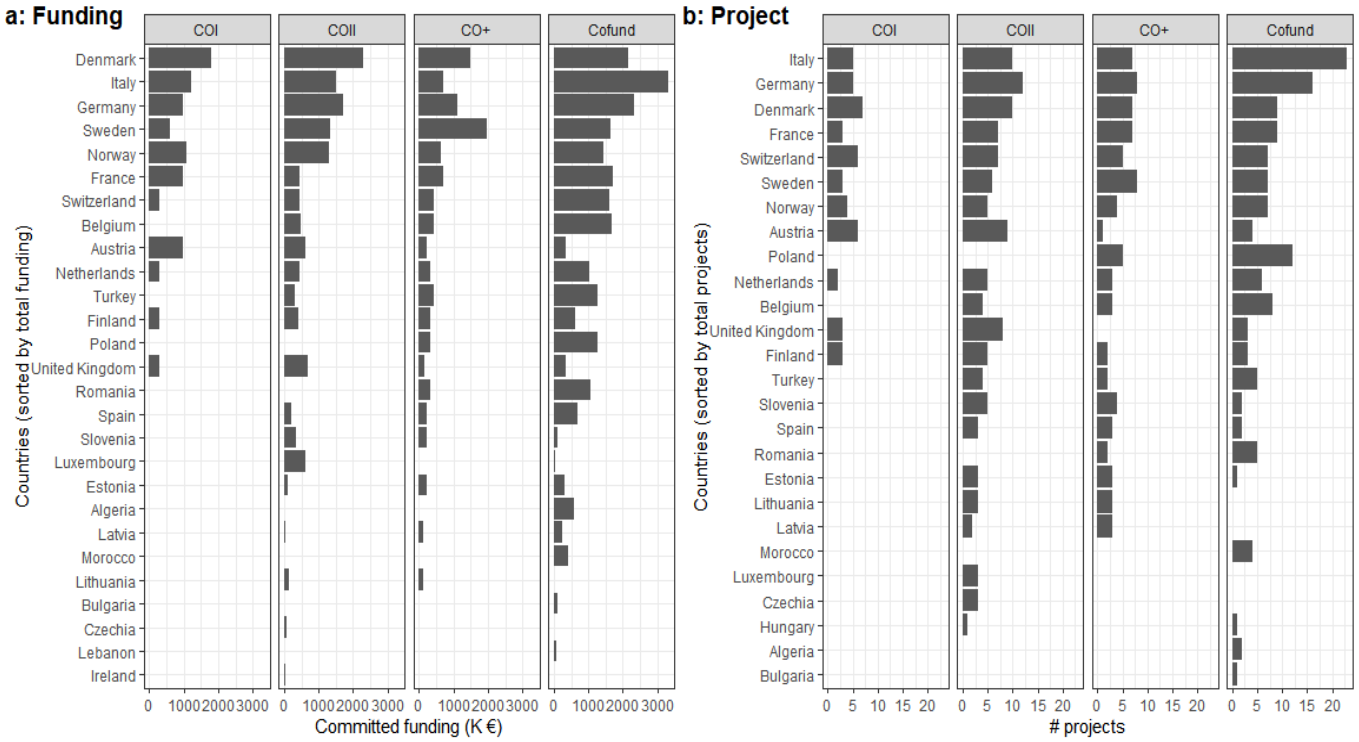


Figure 14: Evolution of country contributions in CO projects (A: committed funding, B: number of projects).

We can observe a trend towards an increased ambition of the programme, with a gradual increase in the number of countries involved and more connections created. Such trends are particularly apparent in the transition from COII to CO+. Looking at the geographical distribution of the participation, we see a progressive extension towards the east, first guided by the Baltic states (COII and CO+), and then by Poland (CO+ and CO Cofund). The increasing involvement of Turkey, absent in the first programme, also characterizes the evolution of the networking over time. The western side of the four maps bears witness to some interesting trends, in particular, the disappearance of the UK after a quite relevant involvement in the first two programmes and, on the contrary, a progressive establishment of the Spanish presence, although it never reaches the level of the central axis of the more involved countries. When considering

[4] Gall E. et al. (2009). Faiblesse de l'effort français pour la recherche dans le domaine de l'Agriculture Biologique: approche scientométrique. Innovations Agronomiques, no 4, pp. 363-75. http://www6.inra.fr/ciag/content/download/3547/35321/file/44-Gall.pdf

the number of institutions per country, Germany and Italy appear to be even more strongly dominant, whereas when considering the number of participants per project, France, the Netherlands, Spain, Poland, Turkey and the UK appear to be more present. This reflects the fact that when these countries participate, the “national teams” are not composed of single individuals.

4. The CORE Organic experience

4.1 The CO vision of organic food and farming and related research

Throughout its long programme implementation, CO impacted the organic food and farming landscape through its financial support for research and innovation, contributing as well honouring a vision for the organic sector. The call topics and approaches, the projects funded and their outcomes, the documents published over these 15 years and the activities performed all highlight the main elements of this vision.

CO supported an understanding of organic farming as a wide-ranging approach based on practical and context-specific knowledge, whose development hinges on finding solutions together with the involvement of different stakeholders. Transnationality is the key to triggering information exchange and to encouraging the diffusion of organic farming throughout the continent and beyond. It is also an asset to find general trends from contextualised situations.

At the same time, CO's vision of organics goes beyond the mere adoption of effective farming practices to comprehend issues such as the development of more sustainable organic processing and value chains, the capability to effectively fulfil the growing demand for organic products, the improvement of trade conditions and job creation in the organic sector, the development of more advanced and tailored organic regulation and support measures, and the wider ecological and social consequences of producing and distributing food and other primary products. CO's research activities have often focused on working towards the Code of Practice (CoP) for organic food processors in order to overcome the lack of mandatory standards for organic food processing at the EU level. The work on CoP connects researchers and organic processors, mainly through their national umbrella associations, with the aim to provide a flexible guide for organic processors when selecting technologies and innovations in accordance with organic principles. Several projects from different calls contributed to this work, as described below.

Code of practice for food processors

Mildsusfruit - Innovative Mild Processing Tailored to Ensure Sustainable and High Quality Organic Fruit Products (Joint SF/CO 2019 call).

ProOrg – Development of a Code of Practice for organic food processing (CO Cofund 2016 call).

SusOrgPlus – Development of smarter organic processing chains (CO Cofund 2016 call).

SusOrganic - Development of quality standards and optimised processing methods for organic produce (CO Plus 2013 call).

However, looking specifically at the knowledge base of organic farming and food production, one of CO's aims has been to build bridges across disciplines, between research findings and practical applications for end users.

Organic farming is certainly a knowledge intensive method, but the specific scientific knowledge needed by an organic farmer cannot always be covered by results from top-down mainstream agricultural research. Technological or organisational solutions must be validated in each specific socio-ecological system and for each individual farm. Thus, CO has aimed at providing a bridge between findings resulting from research projects, on the one hand, and practical solutions for end-users, on the other. In other words, the projects funded by CO have often focused on applied research, with results that were, in most cases, ready to be used by individual farmers with minor adaptations.[5] Moreover, though the facilitation of Organic Eprints' open source archive, the knowledge was produced as 'commons'. This vision has relevant implications as to the form in which organic research is designed. In particular, we can highlight two elements: (1) the importance of experimental fields and long-term field experiments; and (2) the active involvement of farmers and other stakeholders.

Since the first programming period, great attention has been paid to the presence in the partner countries of organic research farms and experimental fields.[6] In 2006, a specific report was dedicated to an analysis of the facilities and infrastructures for organic farming, focusing on the countries participating in CO. In addition, the aim was to analyse how various countries could coordinate and complement each other.[7] The report covered facilities like research farms, experimental fields, on-farm studies, networks, animal research facilities and leaching fields.

This approach, not exclusive of CO, also benefited the organic research community that was prepared to have continuous access to infrastructures, databases and special research equipment, through the participation in long-term field experiments as well. The attention of the EC focusing on "living labs" as pillars of future research in agroecology and on the activity of the EIP-AGRI "operational groups", bears witness to the importance attributed to solution-oriented research and to interactive and multi-directional knowledge co-creation.

Farmers' involvement before, during and after the projects has consistently been a cornerstone in the CO vision of organic research and was set as a standard in several projects. A quantitative impact analysis of the CO+ projects and a qualitative assessment carried out in France and Finland with a case-study methodology highlighted that both small and large consortia were able to involve stakeholders at the local level and in a broader geographical area, respectively. Interestingly, the results indicated that there was no trade-off between academic excellence, on the one hand, and stakeholder involvement and societal relevance, on the other. Areas identified for further improvement referred mainly to the capability to keep relevant stakeholders informed about the projects' outcomes and their possible use after the project conclusion.[8]

4.2 Transnationality and bridging countries

The above-mentioned arguments related to the context-specific dimension of solutions in organic farming do not deny the importance of having comparisons and knowledge-sharing across regions and countries. Solutions developed in one context can fruitfully be adapted elsewhere. Thus, transnationality in research is the key to triggering information exchange and to facilitating the adoption of organic farming throughout Europe and beyond. Moreover, many crucial issues for organic farming, such as livestock health

[5] https://www.coreorganic.org/pdf/CORE_Organic_Intl_Innovation_169_Research_Media.pdf.

[6] Melby Jespersen, L. (2009). CORE Organic I - Final Project report, p.5.
https://www.coreorganic.org/core1/library/pub/core_i_final_scientific_report.pdf

[7] CORE Organic D4.1a: Analysis of facilities in OFF research in participating countries of CORE Organic.
https://1library.net/document/1y9728lq-analysis-facilities-research-participating-countries-core-organic.html

[8] Impact Assessment of CO+ projects in CORE Cofund Deliverable 4.1: Impact Assessment – "Assessing the potential impact of 11 CORE Organic Plus research projects using a quantitative and qualitative approach".

management and development of climate-smart organic systems, are typically transnational in their character. The additional strength of CORE Organic is that it provides continuity among the transnational research groups by pursuing research on certain thematic areas, as in the example of pig husbandry related to the COII ProPig project and the CO Cofund POWER project.

The ProPig project **handbook,** *Improving health and welfare of pigs* **for farmers** in Europe, with versions in four languages: English, French, German, Italian and Czech (2015). BioSwiss https://www.bio-suisse.ch/en/home.php has bought books and has sent them free of charge to all organic farms in Switzerland!

There is a new **handbook** in preparation under the POWER project that focuses on evaluation of the overall effect of the identified innovative housing designs and management strategies on cost effectiveness, system resilience and ecological footprints in pig production. https://projects.au.dk/coreorganiccofund/core-organic-cofund-projects/power/

CORE Organic II project 'Strategies to reduce environmental impact by improving health and welfare of organic pigs' (ProPig, 2007-2010).
CORE Organic Cofund project 'Power to strengthen welfare and resilience in organic pig production' (POWER 2018-2021).

Transnationality is by definition a key element of any ERA-NET, and CO is no exception in this regard. Complementarity among teams and valorisation of the differences between countries and regional contexts, seen as opportunities for mutual learning and flexible approaches, are the most common added value of transnational projects. This is also the case for CO, even more since organic farming is far from promoting standardisation, but instead seeks locally-grounded solutions that can be applied to specific climates, ecological interactions, soil characteristics, etc. Furthermore, as stressed by Bellon and Bertelsen,[9] the wider range of situations characterising a multi-national project provides a diversified experimental setting, offering the possibility to have more robust conclusions and a wider range of solutions, applicable in various contexts beyond site specificities.

Moreover, the development of organic farming is not the same in the various countries and regions, and the situation was even more diversified when CO was established. Thus, since the beginning, CO aimed at facilitating the transfer of research knowledge and best practices from the countries with a longer tradition in organic farming (including organic food production, processing and consumption) to the partner countries with a newer tradition in organics. Hence, CORE Organic has facilitated transfer of expertise and research methods from partners with an established organic sector, ensuring overall development and inclusion of the organic scientific communities from all partner countries for the overall benefit of the European Research Area (ERA). As emphasized by the former ICROFS CO project manager, Ulla Sonne Bertelsen, some countries had less experience in organic farming and their researchers were often not involved in already existing networks.[10] In these cases, CO tried to integrate these researchers by

[9] Bellon, S.M. and Bertelsen, U.S. (2017). The added value of CORE Organic II research projects. In Rahmann et al.: Proceedings of the Scientific Track "Innovative Research for Organic Agriculture 3.0", Organic World Congress 2017, New Delhi, India, November 9-11: pp. 678-681.

[10] https://www.coreorganic.org/pdf/CORE_Organic_Intl_Innovation_169_Research_Media.pdf

encouraging the research consortia to add a partner from these "less organic" countries, thus ensuring that countries with a shorter history in organic research would be integrated into successful proposals.

In another words, during the transnational calls, if a partner country did not have enough applicants in successful pre-proposals, the project coordinators were encouraged to integrate a partner from the country with less applicants, under the condition that the selected project, as a whole, would gain from it. The procedure is still recommended to the funding partners and adopted when national conditions can be fulfilled. In general, such an extension has had a positive impact on the research consortium and has ensured greater inclusiveness and competence building.[11] A further element in this endeavour is the criterion for which each project is assessed by the evaluators involved in the call process in terms of its cross-border relevance and, ideally, in those countries not participating in CO as well,[12] given that the ultimate goal of CO is the broader adoption of organic farming. This evaluation is also performed during the monitoring of the research projects throughout their implementation period. CORE Organic has established a tradition that began in COII where all projects are monitored throughout the whole period of their implementation and coordinators receive direct support from the CORE Organic monitoring team (i.e., support with project reporting, dissemination activities, contact with funding bodies, etc.).

The benefits offered by this transnational networking go beyond the research sphere and the aggregation of research partners. It also provides a platform for collaboration among the national funding institutions on policies and regulation issues, aimed at overcoming barriers and bottlenecks that stand in the way of a more effective European collaboration. As pointed out by Ivana Trkulja (ICROFS), CO coordinator since 2019, "*Like other ERA-NETS, CORE Organic demonstrates that collaboration is a long-term process. Linking national research systems and funding programmes is a really big step. The efforts and achievements are not to be taken for granted where the CORE Organic programme is an important transnational venue for the European scientific community dedicated to organics, but it is equally relevant for an alignment effort among the funding partners. The enabling environment also has to have a long-term perspective*. Looking further, Ivana adds: "*Existing collaboration with non-EU countries will bring even a wider synergy.*[13]

Starting from COII and in line with the EU recommendations, the consortium has approached different funding institutions from other EU and non-EU countries. In its last call, the CO consortium strengthened this transnational attitude, reaching out to new partners from the southern and eastern shores of the Mediterranean as well, given that the southern Mediterranean regions have been increasing their organic production in recent years and are providing more and more organic products for the European market.[14] The participation of new institutions from Algeria, Lebanon and Morocco will increase the capability of CO to support the spread of organic farming and the range of climatic, ecological and social contexts in which solutions will be explored, tested and shared. CORE Organic has made an effort to attract Brazilian and Canadian funding institutions by establishing initial contact with them when the CORE Organic delegation attended BIOFACH - World's Leading Trade Fair for Organic Food in 2018.[15] The BIOFACH hosted two different events where Science Day was co-organised between TP Organics and CORE Organic. In these

[11] Bunthof, C., https://projects.au.dk/coreorganiccofund/news-and-events/show/artikel/core-organic-a-very-sustainable-network/

[12] https://www.coreorganic.org/pdf/CORE_Organic_Intl_Innovation_169_Research_Media.pdf

[13] Bunthof, C., https://projects.au.dk/coreorganiccofund/news-and-events/show/artikel/core-organic-a-very-sustainable-network/

[14] During January 2019, TP Organics and the Mediterranean Agronomic Institute of Bari (CIHEAM Bari) hosted the CORE Organic Research Seminar arranged back-to-back with an Outreach Seminar where scientific exchange and the establishment of new international partnerships were the focus. See the article by Karin Ullven (EPOK, SE): https://projects.au.dk/coreorganiccofund/news-and-events/show/artikel/new-core-organic-cofund-projects-presented-at-research-seminar-in-bari-italy/

[15] For more information, see: https://projects.au.dk/coreorganiccofund/news-and-events/show/artikel/organic-food-processing-research-highlighted-at-biofach/

international settings, it is relevant to consider the influence EU has in organic regulations in other countries, in addition to the general role of IFOAM as an umbrella organisation, which is not the case in all agricultural fields.

Thus, the transnational approach of CO to research influences the national level at three interrelated levels: first, the most direct influence comes from the participation of national researchers in CO projects, sometimes triggered by CO itself when the participation of smaller or less committed countries is actively sought, therefore strengthening a wider organic research community; second, through the role of CO in shaping the EU research agenda during a phase in which national institutions are expected to be aligned with EU strategic frameworks and to fund national research according to the themes and priorities identified at the European level as an indicator of connection between national and international spheres; And third, in some cases the CO coordinators actively commit themselves to contacting national authorities in order to speed up bureaucratic procedures or to support policy processes at the national level thanks to the experience gained at the transnational level.

4.3 The CO cooperation model

In addition to the organic farming vision and related research, the specific forms of the ERA-NET transnational cooperation model assumed in CO practice also offer insights into and suggestions as to how different countries can fruitfully operate in such a complex and multidimensional (political, economic, social, technological) field.

Based on extensive cooperation between different funding institutions, research institutions, experts and organic sector stakeholders, CO was capable of creating a network of individuals and institutions from different countries and playing different roles (funders, researchers, EC officers, etc.). A large researchers' community was created based on project activities and participation in the CO Research Seminars, special events aimed at disseminating and communicating the project outcomes.

CORE Organic supports networking and dissemination of project achievements

On the 1st of October 2014, the ERA-Net CO Plus, for the first time, invited leading scientists, stakeholders and funding bodies to the research seminar where the 14 research projects supported by COII were presented and discussed. The seminar was a way to let project coordinators share knowledge about their projects and to create an opportunity for scientists to network with stakeholders, funding bodies and each other. Dissemination was a specific goal of the seminar. This activity is a must in every CO programme. In the following period, similar successful seminars were organized in Bucharest (2016), Paris (2018) and Bari (2019).

https://youtu.be/HZt_Coa5KAw

"In my experience scientists are not good at disseminating during the project period and that is why we need to arrange seminars like this," he said and encouraged for discussions and possible cooperation in the following workshop in which each of the project leaders presented their project to small groups of listeners.

Stockholm, research seminar, October 2014

Many of the people involved at the beginning of the CO programme remained committed for a long time and some still are.[16] The creation of a shared repertoire and synergies among research partners tends to persist beyond the end of the research project and of the consortium. Already after COI, more or less permanent networks among scientific partners from different countries had been established and were part of the communication and dissemination process.[17] Similarly, in the evaluation of the COII experience, many researchers continued to work with some of the project partners in new European projects, within or beyond the CO framework, and some have entered into new partnerships with researchers from other CO-funded projects.

Growth of an organic community

Food Citizenship in Capua (IT) – a **joint event organised by** the GreenResilient and ProOrg **projects**

On 1st of December 2019, "La Colombaia" farm, the Italian private partner in the CO Cofund GreenResilient project, organized an Open Day called "The LeafEaters". They invited local consumers to participate in an event devoted to consumer awareness with regard to the diversity of leafy vegetables that can be produced locally and to the taste of winter production. During the meeting, researchers involved in the Greenresilient project briefly described how diversified cropping systems can be and the impact this can have on soil health and the environment. After a visit to the experimental greenhouses, researchers from the CO Cofund ProOrg project described how the taste of food is perceived in our mouth and nose to the consumers.

CORE Organic Cofund project 'Organic and biodynamic vegetable production in low-energy GREENhouses – sustainable, RESILIENT and innovative food production systems' (GreenResilient, 2018-2021,) and 'Code of Practice for organic food processing' (ProOrg, 2018-2021).

Throughout the years, some former CO researchers have acted as call evaluators. The CO community has also shown itself to be capable of ensuring the good harmonisation of research methods, the closing of important knowledge gaps, and the coordinated follow-up of common research priorities in different partner countries. In the past, the community has also served as a source for joint publications (including books) and actions, beyond the CO project duration.

With specific regard to the role of funders, CO has always devoted a great deal of attention to a procedurally correct and transparent implementation of the calls for the funding of research, where project life times are considered as part of the process, addressing how call topics are identified, how calls are funded and launched, how project proposals are evaluated and selected, monitored and supported during their implementation, and how stakeholders are involved. The best practices from these processes have

[16] Ibid.

[17] Melby Jespersen, L. (2009). CORE Organic I - Final Project report. https://www.coreorganic.org/core1/library/pub/core_i_final_scientific_report.pdf

been shared and discussed with other ERA-NETs. Different ways for disseminating research results to stakeholders and end users have been tested and developed in CO as well as progressively refined.

Each of the seven calls implemented by CO has been followed by an evaluation survey addressed to all of the participants involved in the call process (applicants, funders and expert evaluators), and its outputs have been taken into consideration for the building and adaptation of subsequent calls. Indeed, strong features of CO have included project monitoring based on the continuous support given to project coordinators, and joint evaluation meetings involving funding institutions, aimed at enabling the projects to reach their full potential, as well as the implementation of a range of quantitative and qualitative assessments, overall and focused on specific countries.[18] This attention to project implementation implies the possibility of making timely adjustments of activity and dissemination plans with the involvement of all funders.

A specific CO achievement is related to the high level of dedicated cooperation among the partners during the identification of the research fields and, consequently, during joint selection of the call topics. A debate between different partners' views regarding topic formulation has enriched the vision of how research for organic farming can be designed. Some partners prefer narrower and more focused topics, whereas other partners argue for more widely formulated calls to allow researchers more room for identifying the most relevant and appropriate research questions.[19] We may look at this debate as a top-down vs. bottom-up identification of research topics, with pros and cons from both sides. As previously highlighted,[20] this debate probably reflects a true difference in research traditions between CO partners. However, funding institutions always reach an agreement on topics that reflect national priorities and that have a European scope. In all of the calls, CO consortia proposed two to four topics that the funding institutions were able to define together and decide to support.

Nevertheless, in each CO call, macro-themes have always been identified together with stakeholders in order to determine the actual research needs perceived by the organic sector. In this regard, a great deal of support has been given since COII by the partnership with TP Organics, the European Technology Platform for organic food & farming, which aims at unifying the whole food supply chain in order to propose research priorities related to OFF to policy makers. While CO partners are in close contact with the national political system and organic researchers, TP Organics is closely connected with the roots of organic farming, food production and European policy.

In relation to funding mechanisms, ERA-NETs usually adhere to the so-called Virtual Common Pot model: countries and regions pay for their own participants, applying existing national rules without transnational funding flows. This is the most common procedure because of legislative obstacles due to diverse national regulations. Therefore, the easiest solution is to have funding bodies just fund their own national researchers. In order to achieve further transnational alignment among the funding partners by providing a single centralised research project that reports to only one funding body, instead of usual reporting to all the funding partners involved, CO tested the Real Common Pot (RCP) funding mechanism during the COII period. The six CO members involved were able to pool their national contributions within a common and centrally administered call budget (meaning a single contact point for researchers and a unique regulation to follow), which provided funding for successful proposals, irrespective of the applicant's nationality, and resulted in transnational flows of funding (cross-border funding).[21] This funding model gave a deep

[18] Kemper L. et al. (2020). CORE Organic Plus, WP4. Deliverable 4.1 Impact Assessment. Assessing the potential impact of 11 CORE Organic Plus research projects using a quantitative and qualitative approach. https://orgprints.org/38186/

[19] Melby Jespersen L. (2009). CORE Organic I - Final Project report. https://www.coreorganic.org/core1/library/pub/core_i_final_scientific_report.pdf

[20] Ibid.

[21] An in-depth analysis was carried out on how to overcome legal/administrative/programme and project/ policy barriers to reach the best common funding model. The potential use of RCP in COII and beyond was first explored by identifying legal,

transnational character to the research: amalgamating national funds in a common pot strengthens the perception that common challenges require common efforts and that national borders cannot be an obstacle to deep coordination and joint undertaking. Nonetheless, it must be said that there have been problems in the implementation of this model due to the subsequent delays in the final distribution of funds. Some funding agencies were not able to terminate the process as it had been designed. This makes the experience important in view of a more effective means to design and manage similar processes in the future. In particular, it has been extended with more recent efforts to align national rules in the transnational calls.

Another step towards alignment is the procedure adopted by CO Cofund network partners to directly support project coordinators with so-called 'coordination budgets', using part of the EC contribution to the ERA-NET itself. The procedure followed recommendations by the projects' coordinators from the previous calls. Moreover, it has supported a transnational aspect of the coordination task instead of placing weight on the national funding availability.

The role of CO as a laboratory for exploring the ways in which research in organic farming could be better conducted was witnessed by a study made on the selection criteria and project proposal evaluation processes for the first pilot CO call, issued in September 2006.[22] The analysis identified the need to better reflect the interdisciplinary and innovative aspects of organic farming, and to create mechanisms to enable the funding of a few "risky" and exploratory research projects, as well as to facilitate the introduction of newcomers to the arena. Subsequent calls were therefore improved on the basis of previous experiences, guidelines for the applicants and evaluation criteria were reformulated and included the aspects mentioned above, and the panels of experts became multi-disciplinary. The calls included the concept of a knowledge creation process where peer reviewers were asked to write exhaustive evaluation reports together and to give recommendations to the applicants at the end of the first stage of the call (evaluation of pre-proposals), thus helping the applicants to reformulate their proposals in the event that they were not fully in line with the CO vision.

4.4 Dissemination activities and the Organic Eprints initiative

An important pillar for CO, as for any project or ERA-NET, is related to the communication of project activities and results, together with the storage and dissemination of information and knowledge created. Much of the dissemination material fades away over time or is stored in physical or virtual drawers without being valorised and utilised.

Scientific outputs of the projects can be difficult to locate and to find when a project has ended, and this is even more relevant for other documents like best practice collections, policy briefs and other documents oriented towards end-users and practitioners.

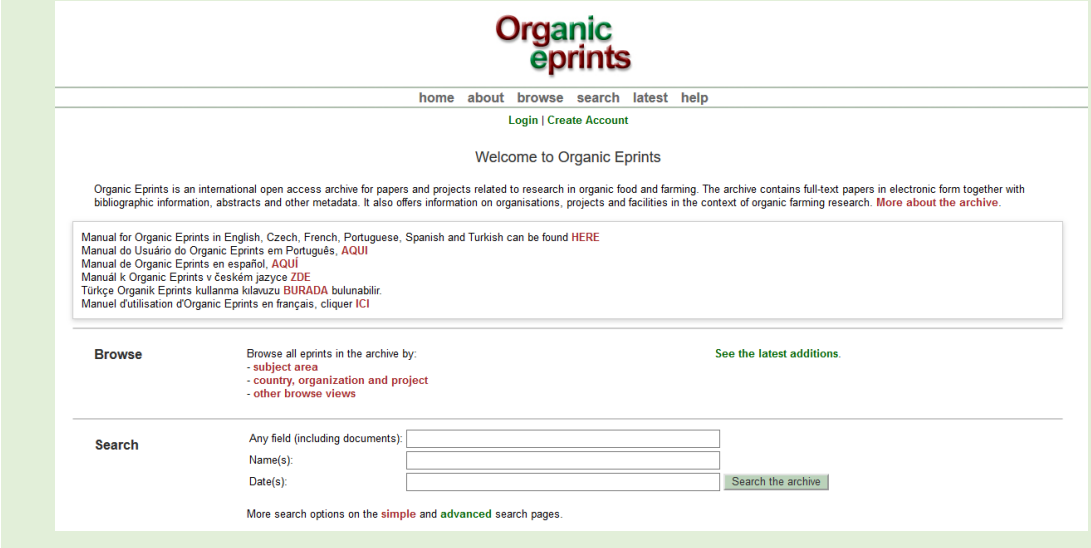
In this regard, CO has taken an important step since its first period as it was decided to use Organic Eprints (www.orgprints.com), an open source archive initiated and managed by ICROFS, where all information on research projects, programmes and facilities can be uploaded. Thanks to this repository, it was possible to preserve material over time and make it available to the international scientific community, farmers and all interested practitioners.

policy, administrative and project/programme barriers in the partner countries taking part in a RCP call. A report was also issued on the RCP pilot call, highlighting achievements, problems, findings, conclusions and recommendations. http://www.coreorganic2.org/Upload/CoreOrganic2/Document/D_6_3_RCP_final_rev.pdf.

[22] Blanc J. et al. (2008): How to promote innovation and interdisciplinarity in organic food and farming research evaluation. 16th IFOAM Organic World Congress, Modena, Italy, June 16-20, 2008. https://orgprints.org/11757/1/11757.pdf

Having identified this as a key tool for knowledge access, initiatives were taken at the beginning of the CO experience to make Organic Eprints known and workable. In September 2005, a two-day workshop was held where 21 project participants from the 11 partner countries involved at that time were educated in the use of the archive. CO partners are encouraged to require their organic national projects to use this tool, and there has been intensive collaboration towards ensuring interoperability between different open access archives (e.g., interoperability and automatic harvesting from INRAE archive, prodINRA and now HAL, into Organic Eprints)[23].

Organic Eprints is the only international open access archive for papers and projects related to research in organic agriculture in the world, and among top ten in the world. It has operated since 2002.



Today, Organic Eprints coverage goes beyond CO projects and activities and has become a point of reference for the entire organic research community that considers it as an excellent tool to map transnational and national research. "*As the sixth largest archive of agricultural research in the world, the database is used in 68 countries worldwide by [over 200,000 people– researchers, advisers, farmers and lecturers – on a monthly basis. It hosts all of the scientific publications from the CORE Organic research projects, as well as user-friendly leaflets, guidelines, best practice documents, handbooks and articles*".[24]

CO commitment to communication and dissemination goes beyond the valorisation of Organic Eprints. First and foremost, there is the CO website (with its links to the online archive), with its sections dedicated to each of the programming periods, as well as information on calls, projects and other CO-related initiatives. At the website, it is also possible to register to receive a newsletter,[25] edited in the past by FiBL and presently by EPOK, aimed at sharing scientific news from the projects and programme among main target groups. Four times a year, 902 subscribers receive the CORE Organic newsletter. Special emphasis is placed on dissemination and communication work. It is requested from the project coordinators under CO calls, to present a communication plan and, once the project implementation has begun to provide information needed for the preparation of individual project leaflets. CO attention is constantly focused

[23] PRODINRA is an open access archive managed by National Research Institute for Agriculture, Food and the Environment (INRAE, FR), while HAL (Hyper Articles en Ligne) is an open access archive managed by Centre pour la communication scientifique directe (CCSD, FR).

[24] https://www.coreorganic.org/pdf/CORE_Organic_Intl_Innovation_169_Research_Media.pdf

[25] https://www.coreorganic.org/library/news/index.html

on encouraging outreach to policy makers, citizens, and farmers' peer networks.[26] A critical appraisal of the analysis of Thomas Alföldi (FiBL), indicating the two peak communication patterns (at the start and end of the project implementation), has encouraged CO network to work towards the change of this pattern and have a more continuous communication flow throughout the course of individual projects in CO+ and CO Cofund. The gradual increase in the translation of dissemination material into national languages, encouragement for the production of videos, and the increased use of social media are also examples of this change.

Dissemination tools: video tutorials and technical leaflets

https://www.tilman-org.net/to-videos.html

FertilCrop (2015-2017) built on the network of the previously CO-funded projects COI AGTEC-Org (2007-2011) and COII Tilman-Org (2011-2014), using some data, samples and experiences gained in that project. It also took advantage of the CORE Organic network dissemination recommendations and released five technical notes about practical field tests for farmers and different practice-oriented videos.

The *Impact Analysis* conducted under CORE Organic Cofund indicated that FertilCrop had the highest impact among the 11 funded CORE Organic Plus projects in terms of scientific outputs and impact on 'the sector and society'.

The two projects were selected as 'Best Research Project' at the event for the 15th CO anniversary held in Bonn (DE), December 2019.

CORE Organic II project 'Reduced tillage and green manures' (Tilman-Org, 2011-2014)
CORE Organic Plus project 'Fertility Building Management Measures in Organic Cropping Systems' (FertilCrop, 2015-2017)
AGronomical and TEChnological methods to improve ORGanic wheat quality (AGTEC-Org, 2007-2011)

[26] Bunthof, C., https://projects.au.dk/coreorganiccofund/news-and-events/show/artikel/core-organic-a-very-sustainable-network/

The preparation of video tutorials and technical leaflets was an additional effort to increase the communication of research results and to make them accessible to as many users as possible. The quantitative analysis conducted for the assessment of CO+ results has shown that analysed projects with a comparatively high output for practitioners do not always create a similar outcome.[27]

A qualitative focus based on interviews with stakeholders in Finland and France highlighted the fact that the outputs produced were not always utilised in practice. In the respondents' view, this was due to insufficient dissemination activities at the national level. Thus, there is room for increasing impact on industry and society, in particular, in relation to the communication of research findings on national level. Translation of outputs into the national languages of each country (also with regard to outputs produced in a different country) represents an important factor in this regard. In the words of a French project partner interviewed for this qualitative assessment: "*It is not always easy to manage the linguistic constraints of the different participants: all of the exchanges and reports are done in English at the project level, whereas the same reports must be presented in the national language to the financers*". Another researcher involved in a project highlighted the importance of farmers' organizations for improved dissemination.[28]

However, the increasing focus placed on dissemination to industry and society by the CO secretariat and by CO partners seems to have been effective. An overall look at the various assessments carried out over the years, although with different methodologies, indicates that CO impact on the organic sector has increased between successive programmes, thanks to the lessons learned from past experiences and, specifically, thanks to the improved implementation and dissemination of the project results.

4.5 Overall impact and added value of CO

The analysis of the activities, outcomes and findings of these 15 years bears witness to the value of CO and its ability to have an impact on the organic farming sector, first, on research but, more importantly, on farmers and the wider organic farming community, as well as the food sector. Arising during a promising growth phase of the organic farming trajectory, but in a scattered and fragmented research landscape, CO successfully dealt with the challenges it was supposed to address. Among the specific achievements of CO are: the creation of a coordinated critical mass that has served as a basis for establishing an organic research community, the capability to recognize novel technologies, emerging needs and new research fields not always covered by national funding, and to direct research efforts in those directions. Moreover, the creation of a wide network of research groups and stakeholders made CO a catalyst for further innovation and a flagship for the entire organic sector, capable of supporting development from the pioneer stage to a well-established research community. It is still an important contributor to funding of joint research in organic food and farming, since organic remains a sector that justifies research efforts to cope with current and future challenges.

Indeed, the qualitative and quantitative assessments carried out for the various CO periods confirm the importance of CO for finding solution-oriented innovations and for promoting applied research in areas not always covered by national funding. This can be seen, in particular, as of the second CO period whose significant and positive impacts in terms of scientific output have been confirmed by dedicated

[27] Kemper, L. et al. (2020). CORE Organic Plus, WP4. Deliverable 4.1 Impact Assessment. Assessing the potential impact of 11 CORE Organic Plus research projects using a quantitative and qualitative approach. https://orgprints.org/38186/
[28] Ibid. p. 20.

assessments, as has its capability to strengthen international cooperation, coordination of efforts and the leading role of the EU in organic research.[29]

One of the other assessments, carried out through a survey conducted with organizations that participated in CO+ highlights interesting aspects of the perception of CO values according to researchers.[30] Among the expected impacts related to participation in CO projects, beneficiary organisations mentioned the following: "*improved profiles in the European/international research communities; improved access to networks and consortia; and improved competencies and skills*". Feedback showed that CO+ projects fully met, or even surpassed, the initial expectations, particularly in terms of scientific innovation and consequent ecological benefits. Project aspects such as greater probability of success, higher flexibility in project design and more solution-oriented results were listed among the strong points of participating in CO+.

Another interesting observation drawn from the same assessment is the comparison between opportunities and results derived from the participation in CO transnational projects vis-à-vis national projects, on the one hand (Fig. 15), and vis-à-vis other projects directly funded under EU Framework Programmes, on the other (Fig. 16). In both cases, participants were asked to state to what extent they agreed with each of the listed comparative sentences.

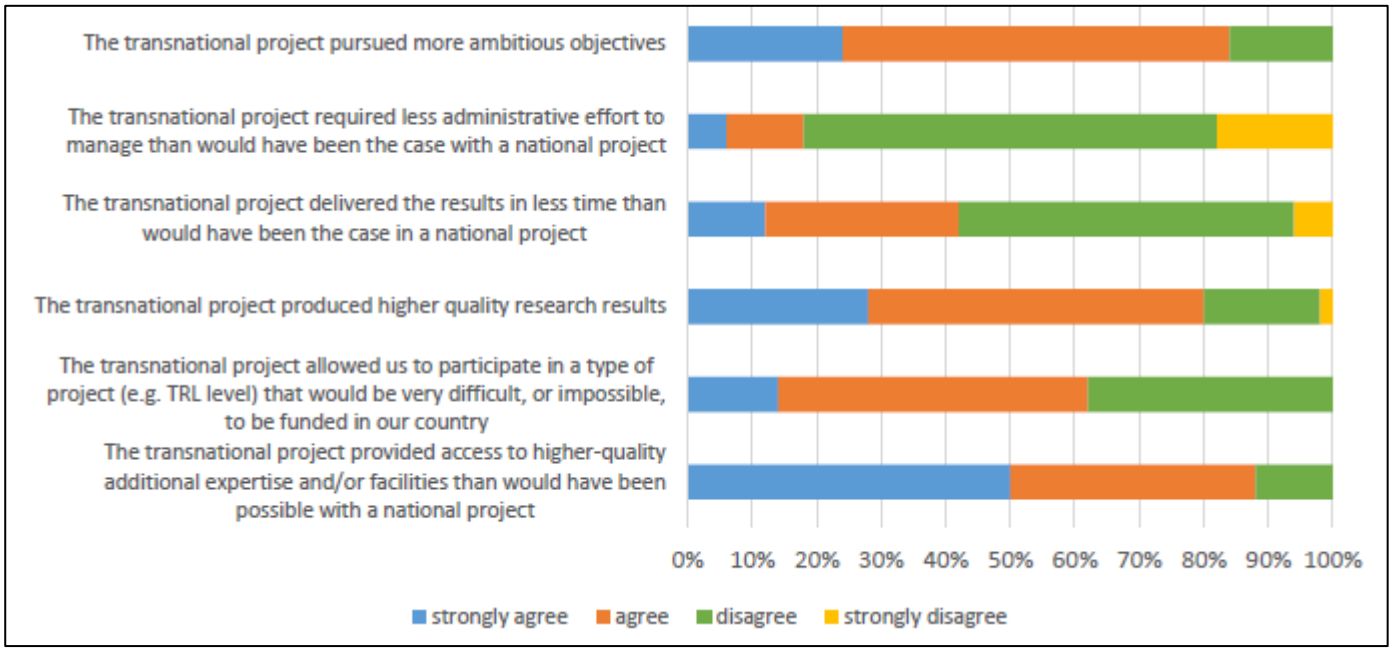


Figure 15. CORE Organic Plus vs. national projects (source: Kemper et al., 2020).

When compared to national projects, CO projects are seen as capable of pursuing more ambitious objectives and of achieving higher quality results, granting access to expertise and facilities that would have been difficult to achieve when relying on national projects alone. In contrast, administrative efforts are perceived as a quite heavy burden, and the time required to obtain project results was seen as longer than for national projects.

[29] CORE Organic II Final Report (2013). http://www.coreorganic2.org/Upload/CoreOrganic2/Document/COII_final_report_ECAS.pdf

[30] Kemper, L. et al. (2020). CORE Organic Plus, WP4. Deliverable 4.1 Impact Assessment. Assessing the potential impact of 11 CORE Organic Plus research projects using a quantitative and qualitative approach. https://orgprints.org/38186/

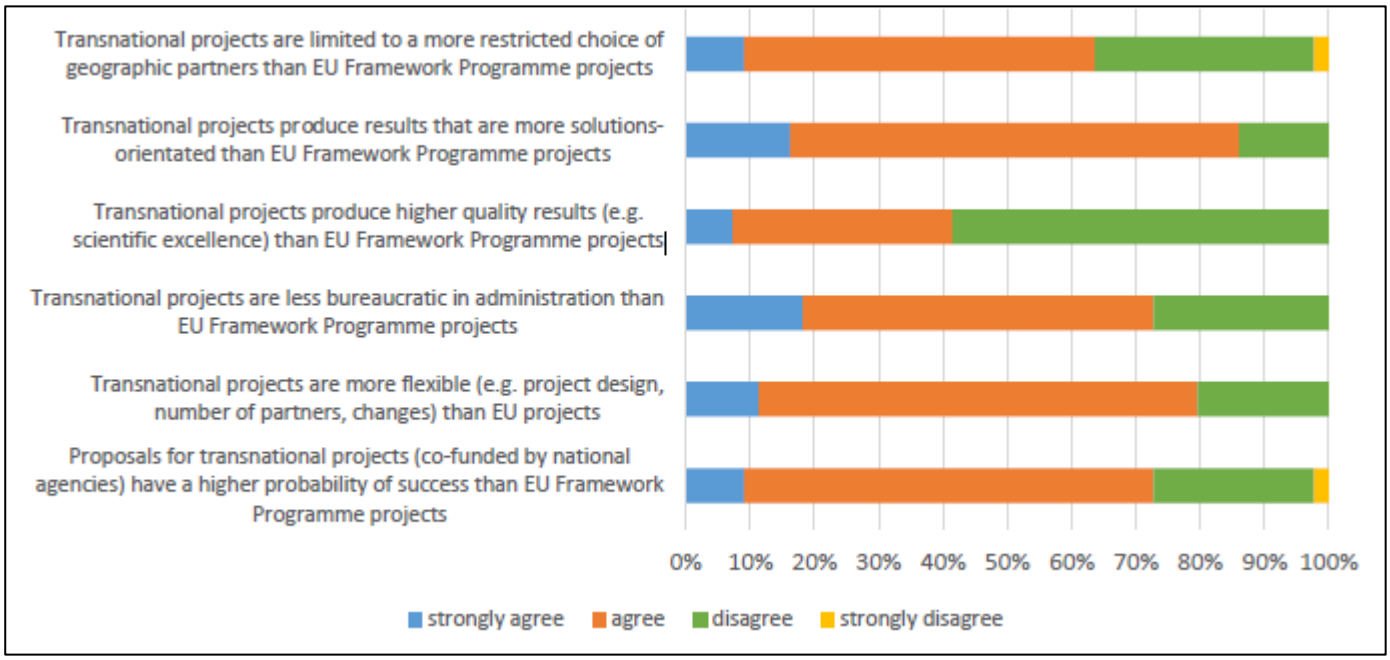


Figure 16. CORE Organic Plus vs. projects directly funded under the EU Framework Programme (source: Kemper et al., 2020).

When compared with the EU Framework projects, CO projects are seen as being more solution-oriented and more flexible in their design. The bureaucratic burden, which is heavier than that of national projects, is nevertheless seen as being not as hard to cope with as that of non-CO European projects.

To sum up, CO has been able to coordinate and support national policies, research and actors in the organic food and farming sector, and to create a transnational-wide community able to face the challenges for a more sustainable food supply chain. In view of what was presented in the previous sections, we can highlight some specific elements that represent the added value of the four CO programming periods and the main legacy of CO in the perspective of future initiatives:

1. Coordinating research efforts in organic food and farming, minimising duplications and covering issues not concerned by national research;
2. Creating a critical research mass and strengthening the leading role of the EU in organic research;
3. Giving researchers higher possibility to succeed in carrying out the proposals selected under CO, (e.g.by accompanying project implementation and monitoring);
4. Supporting innovation opportunities and solution-oriented research with potentially high impact on practice;
5. Becoming a point of reference for the entire organic sector, as well as networking and community building with stakeholders;
6. Enlisting smaller or “less organic” countries and less connected national research communities;
7. Influencing the national level of research policy, both indirectly (national plans refer to ERA-NETs) and through direct contacts and support;
8. Increasing research capacities and opportunities to better understand other European cultures;
9. Testing innovative transnational funding models;
10. Strengthening a proactive cooperation network among national funding institutions and policy makers;

11. Supporting access to research findings through the development of a range of sources, including the open-access database, Organic Eprints.

5 Towards the future

In 2020, OFF represents a key feature of the food system and a crucial asset for present and future development pathways in the field of agriculture and food. With regard to the European context, Eurostat Statistics[31] indicate that organic farming covered 13.4 million hectares of agricultural land in the EU-28 in 2018, which corresponds to 7.5% of the total utilised agricultural area.

Within this framework, the CORE Organic mission is still essential and responds to the old and new challenges that the EU and the world are facing: mitigation of climate change with the achievement of a carbon-neutral EU, the abandonment of dangerous pesticides and fertilisers for the development of resilient food systems, and the attainment of a healthy life for human beings.

These challenges will be addressed in a landscape characterised by the future Horizon Europe Research and Innovation Framework Programme, with its new policy coordination instruments like Partnerships and Missions, by the new Common Agricultural Policy and also by the EC New Green Deal[32] launched by the EC President Von der Leyen at the end of 2019, as well as by the EC's Farm to Fork Strategy.[33]

The transition towards a "fair, healthy and environmentally-friendly food system" is one of the key transformative pathways identified by the European Green Deal in order to achieve its ambitious goals, first and foremost, climate neutrality by 2050. The EC Communication "From Farm to Fork" clearly states that organic farming needs to be further promoted since "*it has a positive impact on biodiversity, it creates jobs and attracts young farmers*". The document acknowledges that although the legal framework already supports the shift to this method, more needs to be done to stimulate supply and demand of organic products. The document also sets the significant target of having at least 25% of the EU's agricultural land under organic farming by 2030, together with a significant increase in organic aquaculture, and regards OFF as a sustainable practice to be promoted within the wider framework of the agro-ecological approach, in view of reducing the climate impact from food and farming as well.[34]

Moreover, the biodiversity recovery pathway indicated by the EU Biodiversity Strategy[35] by 2030 requires further transition towards farming methods respectful of wildlife and ecological processes, thus preserving unspoilt nature and agro-biodiversity, for example, through organic management of food production.

In this context of strengthened and renewed attention for OFF, CO makes an important contribution in terms of organisation and governance, community building, shared resources and research findings. The importance of the extensive networking and the development of a shared vision and knowledge are among the key elements that can be integrated into new policy configurations for the second decade of the century and beyond.

[31] EUROSTAT: https://ec.europa.eu/eurostat/statistics

[32] EC COM 640 (2019): "The European Green Deal".

[33] Annex of EC COM 381 (2020): A Farm to Fork Strategy for a fair, healthy and environmentally-friendly food system".

[34] https://projects.au.dk/coreorganiccofund/core-organic-15th-anniversary/reflections-on-the-past-and-the-future-at-the-core-organic-anniversary/

[35] EC COM 380 (2020): "EU Biodiversity Strategy for 2030. Bringing nature back into our lives". A recent EU organic congress stressed that every country should be committed to this target (not only some leading countries). "A clear way to reach the target of 25% organic land at the EU level by 2030 is for Member States to set national targets in their CAP Strategic Plans and to ensure that the policy rewards farmers who provide public goods, going beyond the income foregone logic." (Jan Plagge, recently re-elected IFOAM Organics Europe President). These targets are also meaningful for all European countries and regions. It would be interesting to consider if these targets should be achieved individually by each country and what it would mean in the transnational context.

The analysis of the CO network development that reveals its stable continuity could perhaps suggest that CO has reached its saturation point, i.e., maximum programme growth capacity under the present budget, and that the network structure has been achieved. Alternatively, it could also be interpreted as a point of optimal equilibrium ensured by the permanence of the programme parameters, such as the number of projects, countries, institutions and participants. Whatever the answer is, CO is now at a turning point and its future is also in question as a result of the general fate of ERA-NETs and future transnational Public-to-Public funding instruments (P2P). Research coordination has to be placed within the framework of the new instruments and regulations. Improving the promotion of research in organic farming and food and green production methods is certainly a key challenge that will be addressed in the Horizon Europe context.

The new organisation of policy coordination in the Horizon Europe programme, which hinges on a limited number of large partnerships, is a crucial innovation whose potential must be taken advantage of. Two of the partnerships under construction seem to be the best options for developing CO themes and bringing them to the forefront.

1. The partnership on Agroecology is certainly a strategic instrument for the future of research in organic farming and food. Agroecological thinking is becoming a master frame for scientific research and policy design, and ecologically-based methods for farming and processing food are crucial elements for an agro-ecological approach.
2. The partnership in Food Systems is also a place where CO themes should be represented since the vision of organic farming that CO supports covers the entire food chain, "from farm to fork", while still being grounded in the primary production phase.

As highlighted by Karin Ullven from the Swedish University of Agricultural Sciences (EPOK, SLU) *"CORE Organic looks forward to the new opportunities in the context of the Horizon Europe structure at a time when joint forces to develop more organic and sustainable food systems are more needed than ever"*.[36]

[36] https://projects.au.dk/coreorganiccofund/core-organic-15th-anniversary/reflections-on-the-past-and-the-future-at-the-core-organic-anniversary/

CORE Organic 15th anniversary event held in Bonn, DE (December 2019). Photo credit: Arnd Bassler.

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Ivana Trkulja is a political theorist and works as the CORE Organic Coordinator at the International Centre for Organic Food Systems (ICROFS) in Denmark. Ivana's contribution encompasses dataset analyses and editing of the report. She had a dream of sharing the CORE Organic story with a wider readership and of presenting the multiplicity of interconnected layers that were created in the organic sector based on the network activities. This dream was fulfilled as a joint endeavour, together with all of the other report authors and network partners.

Stéphane Bellon an agronomist and works as senior researcher in agroecology and organic farming at the National Research Institute for Agriculture, Food and the Environment (INRAE) in France. Stephane's contribution includes data analyses and editing of the report. Stéphane has been part of CORE Organic since 2005 and is presently the Chair of its Governing Board.