CropBooster-P

Roadmap to future-proof Europe's plants

WP4: International Cooperation

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European Commission
Horizon 2020
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Work package 4: International Cooperation [Months: 1-36]
INRAE, WR, VIB, WU, CNR, EPSO, UDUS, UNOTT, CNRS, UCPH, ULANC, USAMV CLUJ, ESA, ACTA

Task 4.1. This task aims to map the existing research communities using existing formal and informal EU networks **(M1-M18).**
Task leader: UDUS; other partners: WR, VIB, CNR, EPSO, UNOTT, CNRS, UCPH, INRA, ULANC, USAMV, ESA, SORBONNE, ARVALIS

- Research communities (physiologists, geneticists, breeders, modellers, agronomists, socio-economists, pathologists, etc…) who are mostly coming from academic organisations (Research Institutes and Universities).
- Create a network model of existing or lacking interactions from the mapping of national or international communities and projects, and their distribution within Europe.
- Applied Research communities (Private companies, R&D services of Cooperatives, Technical Institutes, networks of Experimental Stations etc.).
- Selecting people from all partners at European level (including 13 SHG members) to assemble an expert panel.

Aim of first step:

- Research communities (physiologists, geneticists, breeders, modellers, agronomists, socio-economists, pathologists, etc…) who are mostly coming from academic organisations (Research Institutes and Universities).

Method: Screening of the scientific production (**WoS**) during five years **(2015-2019)**

Proof of concept: Use of the > 600 publications referenced during WP1 (database) to select traits (Yield, Sustainability, Nutritional quality).

Dominique Fournier, INRAE, Montpellier, France
Jacqueline Martin-Laffon, CNRS, Grenoble, France
Bertrand Muller, INRAE, Montpellier, France
Philippe Nacry, INRAE, Montpellier, France
Norbert Rolland, INRAE/CNRS, Grenoble, France

Proof of concept for the literature screening: Use of the > 600 publications referenced during WP1 to select traits (Yield, Sustainability, Nutritional quality).

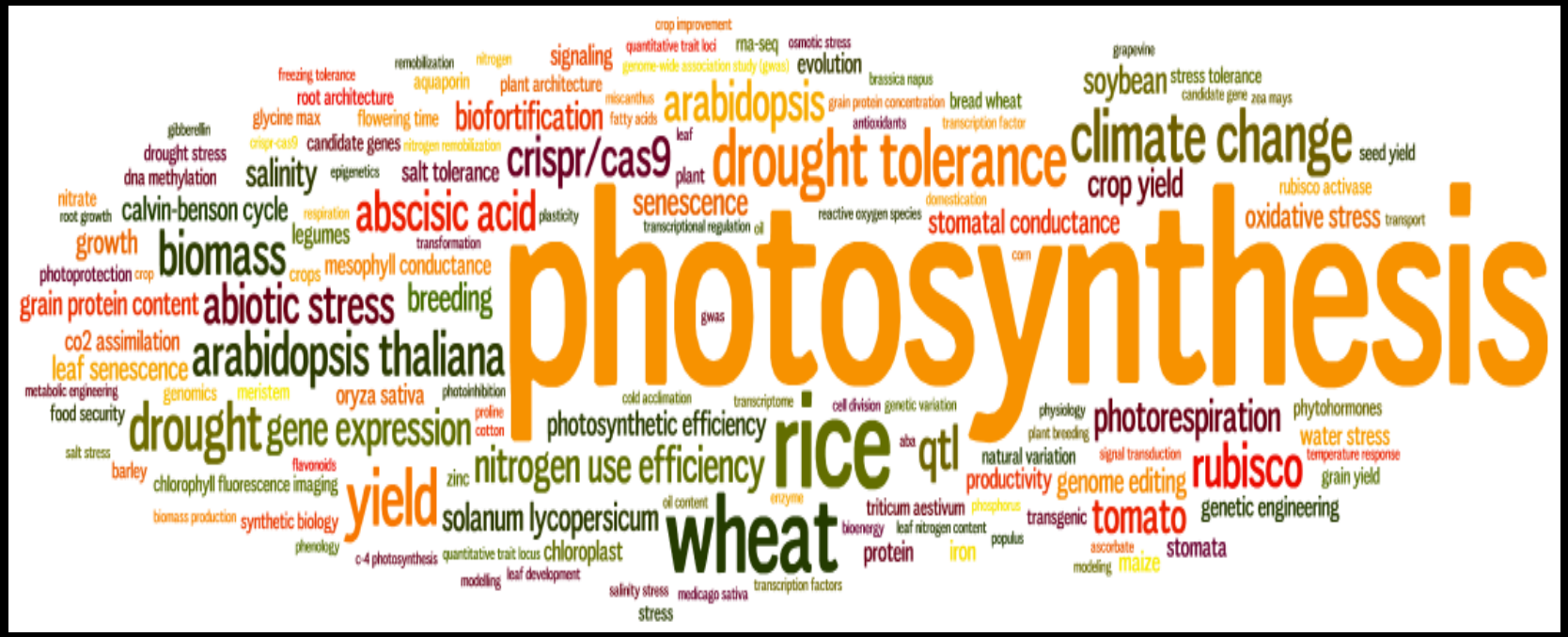
Method: Analysis of experts' publications 617 UT 612 publications referenced in the Web of Science and use of addresses to identify institutions and units

Main WoS Categories	Publications
Plant Sciences	390
Multidisciplinary Sciences	82
Biochemistry & Molecular Biology	73
Agronomy	62
Genetics & Heredity	56
Cell Biology	45
Biotechnology & Applied Microbiology	40
Horticulture	34
Biology	15
Agriculture, Multidisciplinary	8
Biochemical Research Methods	8
Ecology	8
Food Science & Technology	8
Chemistry, Multidisciplinary	7
Environmental Sciences	6
Energy & Fuels	5
Nutrition & Dietetics	5
TOTAL	852

Research fields - WoS Categories

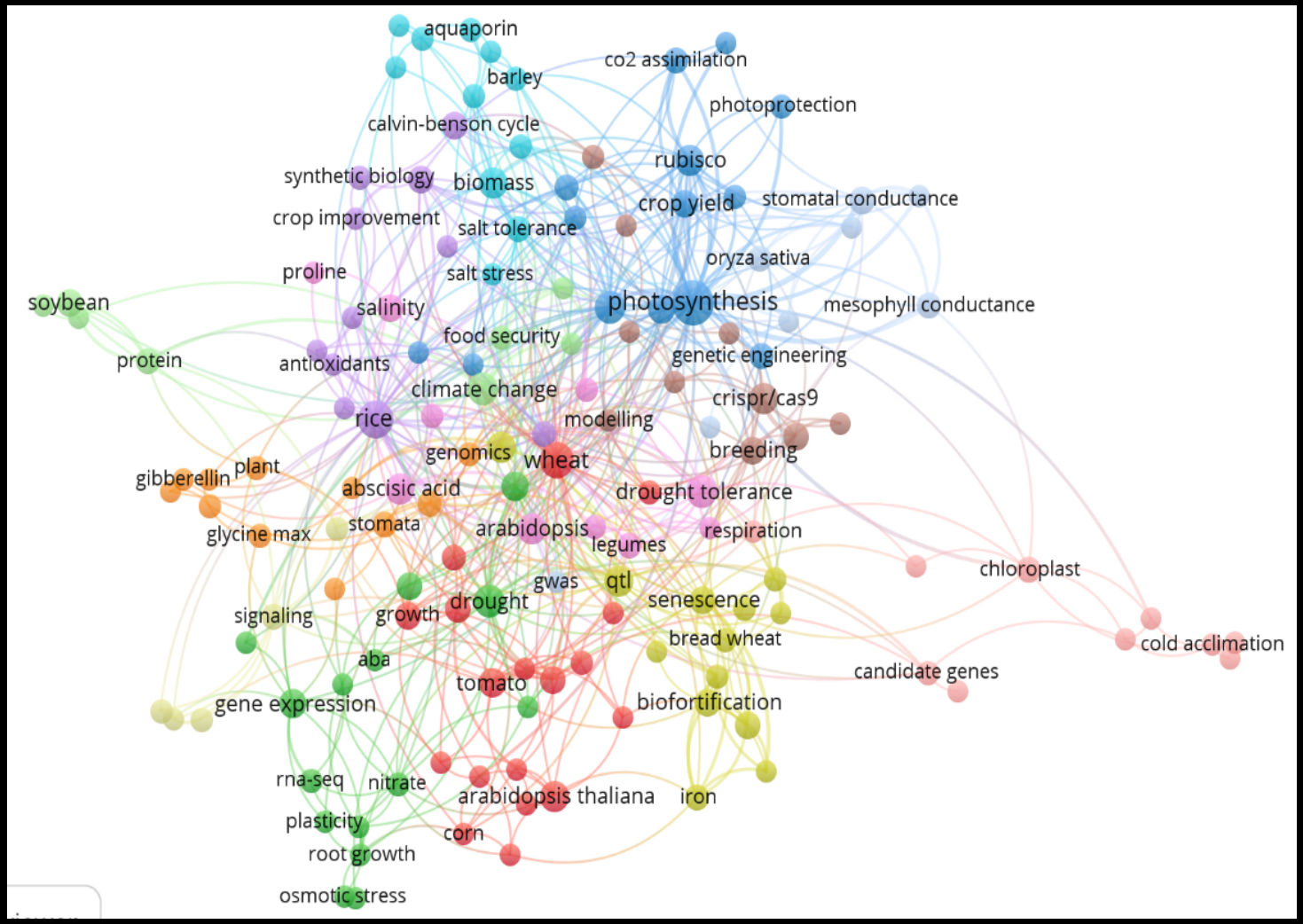
852 > 612 since some publications are present in more than one category

Author Keywords



Keywords associated to WP1 selected traits (Yield, Sustainability, Nutritional quality) as cited by authors of the > 600 publications present within the WP1 (database)

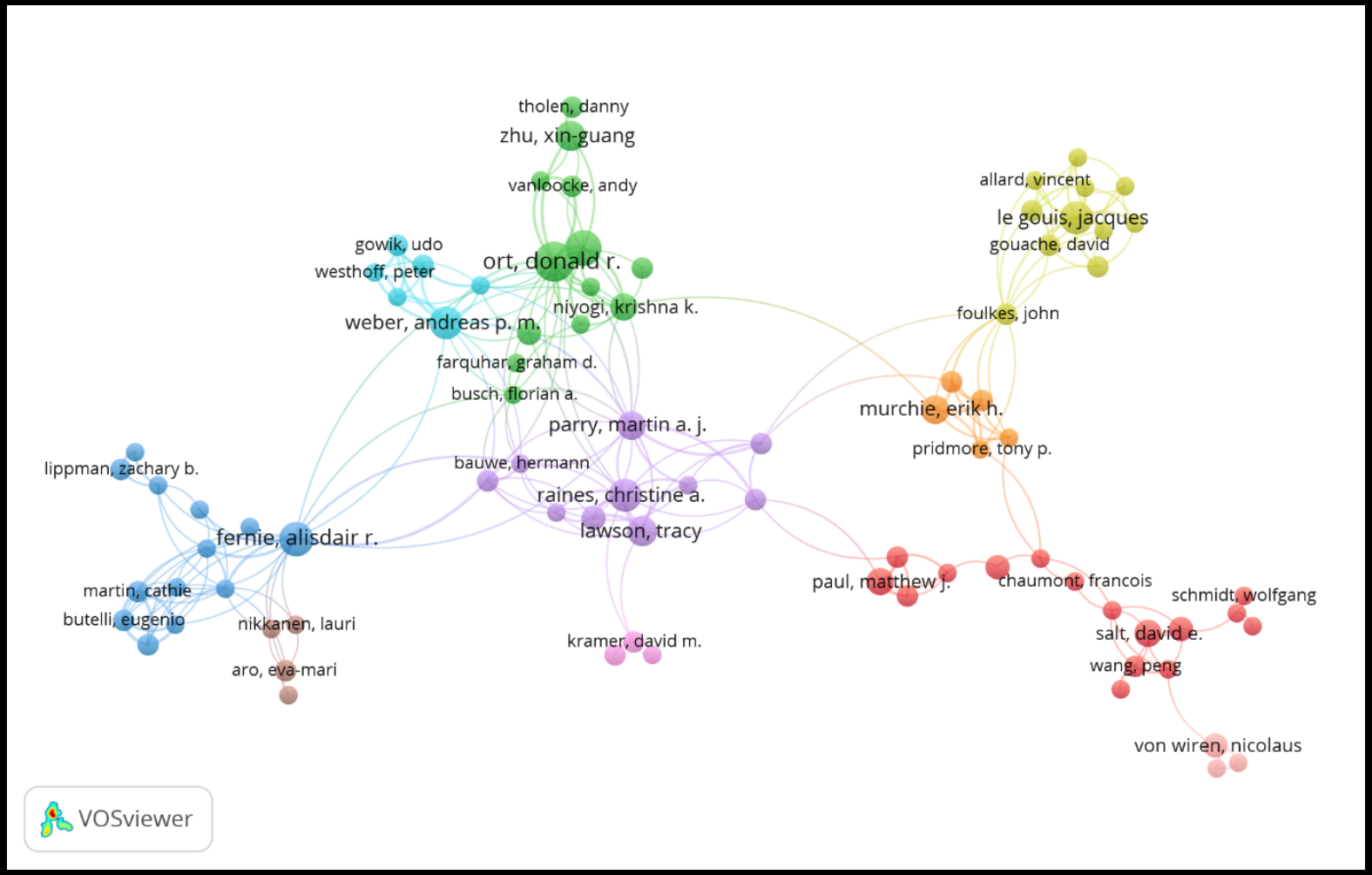
Network of keyword co-occurrence



Network of keyword co-occurrence help defining research fields associated to WP1 select traits (Yield, Sustainability, Nutritional quality)

Authors

Co-publications between the main authors (at least 3 co-publications)



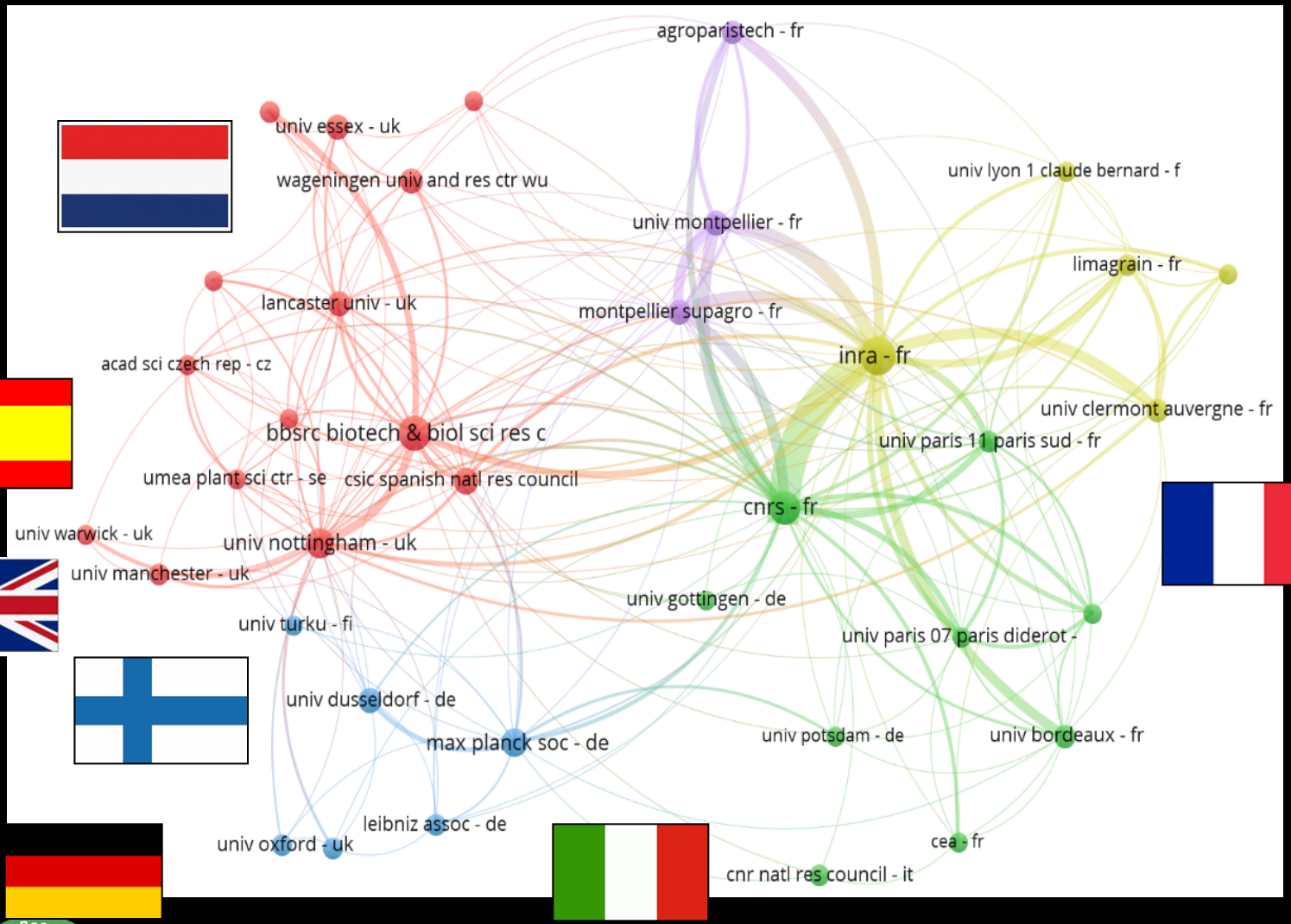
Most main authors, in the WP1 database, are from an EU28 country

Country	Main institutions	Publications
FR	Inra - FR	86
UK	BBSRC Biotech & Biol Sci Res Council - UK	54
FR	CNRS - FR	47
UK	Univ Nottingham - UK	31
DE	Max Planck Soc - DE	23
ES	CSIC Spanish Natl Res Council - ES	17
FR	Univ Montpellier - FR	15
DE	Univ Dusseldorf - DE	14
FR	Montpellier Supagro - FR	14
UK	Lancaster Univ - UK	14
NL	Wageningen Univ and Res Ctr WUR - NL	13
UK	Univ Essex - UK	12
FR	AgroParisTech - FR	11
FR	Univ Clermont Auvergne - FR	11
FR	Univ Bordeaux - FR	10
FR	Limagrain - FR	8
DE	Leibniz Assoc - DE	8
FR	Univ Paris 11 Paris Sud - FR	8
UK	Univ Manchester - UK	7
IT	CNR Natl Res Council - IT	7
UK	Univ Sheffield - UK	7
UK	Aberystwyth Univ - UK	7
UK	Univ Oxford - UK	7
FR	ARVALIS Inst Végétal - FR	6
UK	Univ Glasgow - UK	6
DE	Univ Gottingen - DE	6
BE	Ghent Univ UGent - BE	6
UK	NIAB Natl Inst Agr Bot - UK	6
SE	Umea Plant Sci Ctr - SE	6
FR	Univ Paris 07 Paris Diderot - FR	6
FI	Univ Turku - FI	6
CZ	Acad Sci Czech Rep - CZ	5
FR	Univ Lyon 1 Claude Bernard - FR	5
FR	CEA - FR	5
FR	Univ Evry Val d Essonne - FR	5
DE	Univ Potsdam - DE	5

Publications by European institutions

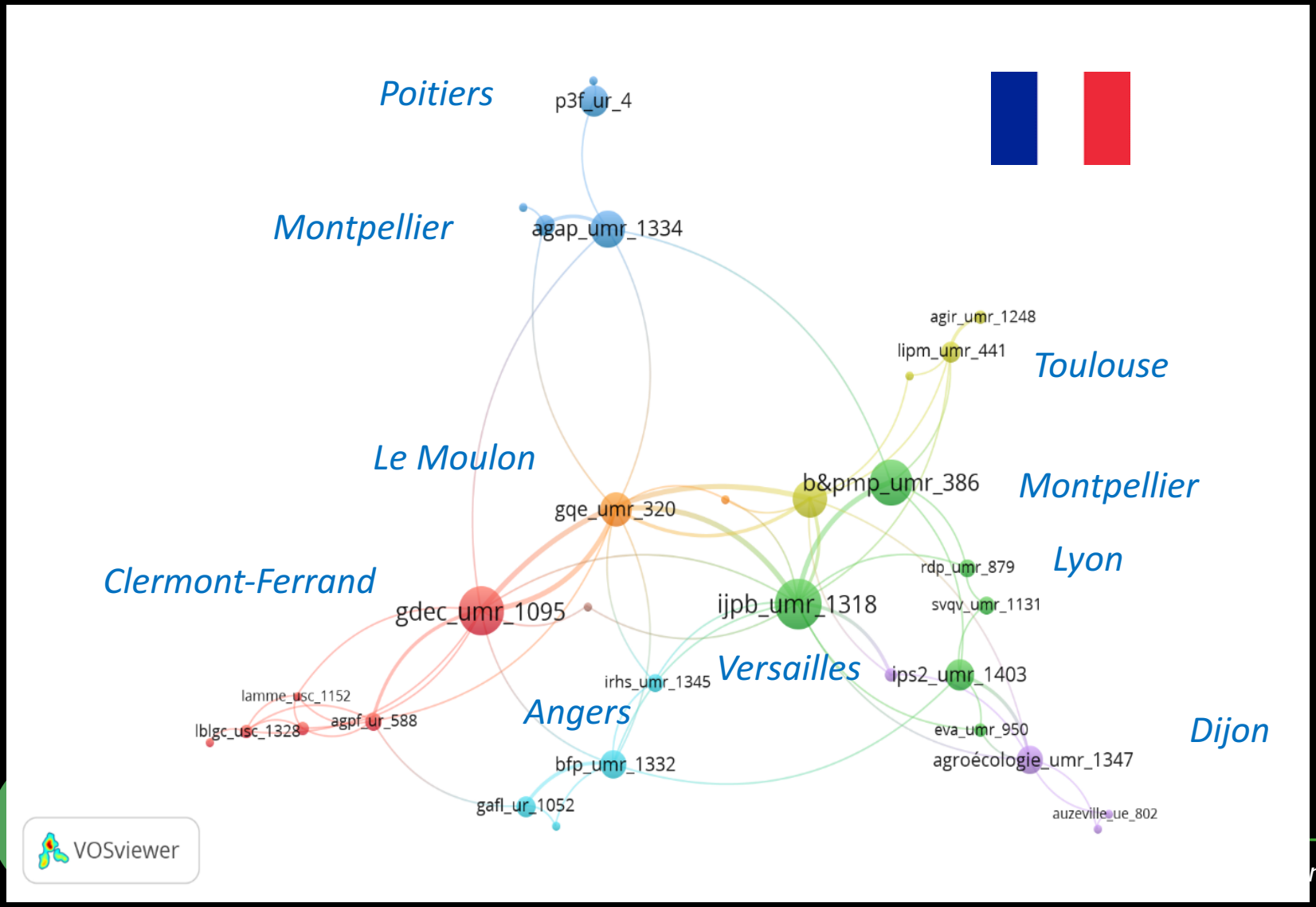
From analysis of publications (WP1 database), it is possible to identify main European institutions and Universities

Co-publications between European institutions



From analysis of co-publications, it is even possible to identify networks of interaction between laboratories within an institution (and thus to identify main actors in the fields)

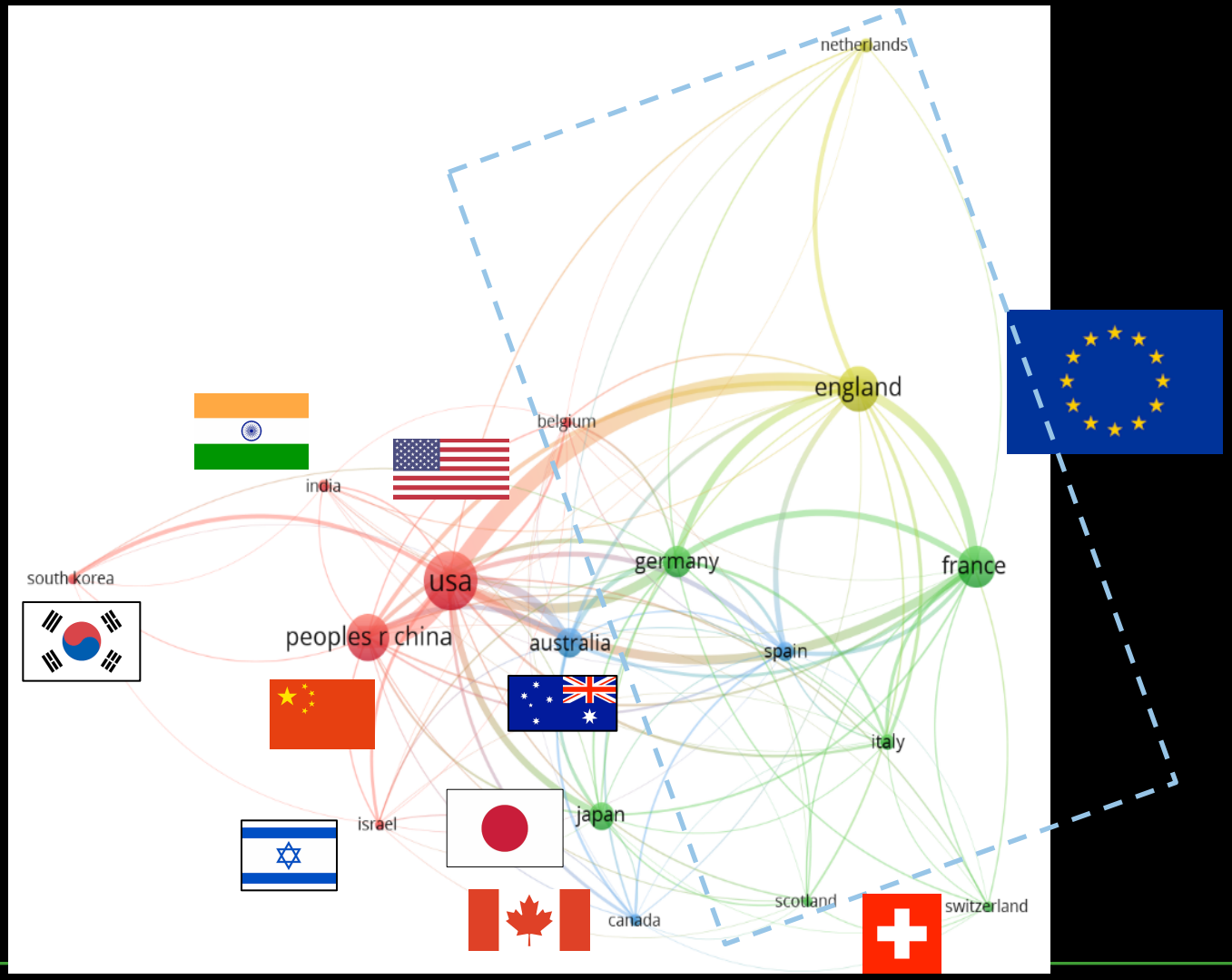
Co-publications between French institutions



Publications by countries

However, in the WP1 database, only half (52%) of the publications are co-authored by an author from an EU28 country , and part of them were published before 2015)

Country	Publications
USA	180
UK	133
China	129
France	107
Germany	71
Australia	62
Japan	58
Spain	34
Italy	25
Netherlands	21
Canada	16
India	15
Belgium	13
South Corea	12
Israël	12
Switzerland	12



Analysis of publications Web of Science™ 2015-2019

Aim of first step:

- Research communities (physiologists, geneticists, breeders, modellers, agronomists, socio-economists, pathologists, etc…) who are mostly coming from academic organisations (Research Institutes and Universities).

The aim of this study was to **identify the main European institutions** which publish in the fields corresponding to the different traits identified during WP1 as being able to improve yield.

*Method: **Construction of thematic equations** based on the combination of an equation # 1 "trait" with an equation # 2 "plant production" and an equation # 3 "European country": cf. Annex*

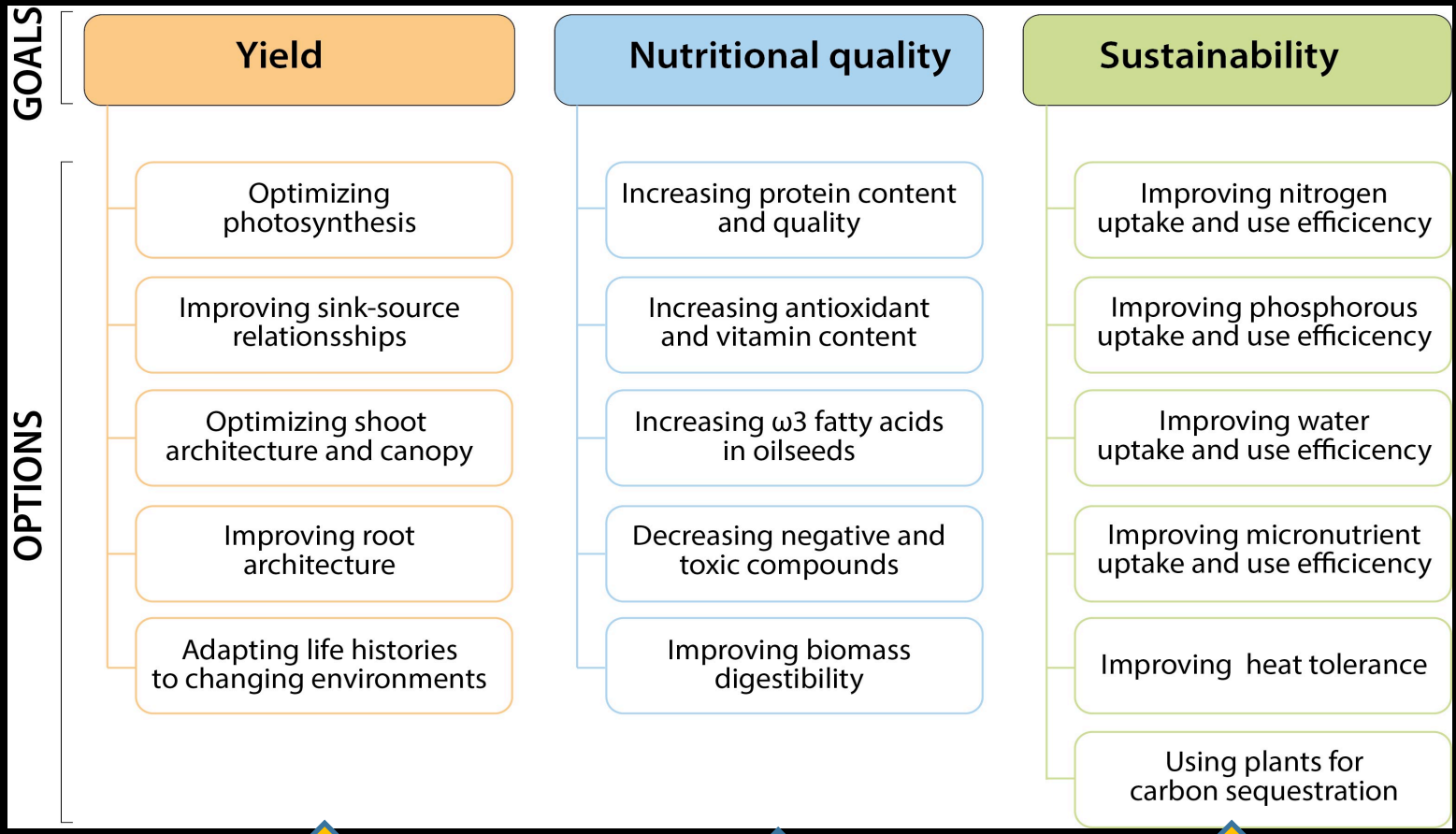
*These equations were used to **query the Web of Science™** (Science Citation Index Expanded, Social Sciences Citation Index. Arts & Humanities Citation Index, Conference Proceedings Citation Index), the terms being searched for in titles (TI), summaries (AB) and keywords authors (AK).*

The publications considered in this study are citable publications, such as Article, Review, Proceeding Papers and Letters.

A **total of 14,053 publications were collected and analyzed for yield and sustainability (step 1) (+ > 10,000 publications for nutritional quality, step 2)**.

Selected traits for the literature screening (According to WP1)

Step 1: Yield and sustainability

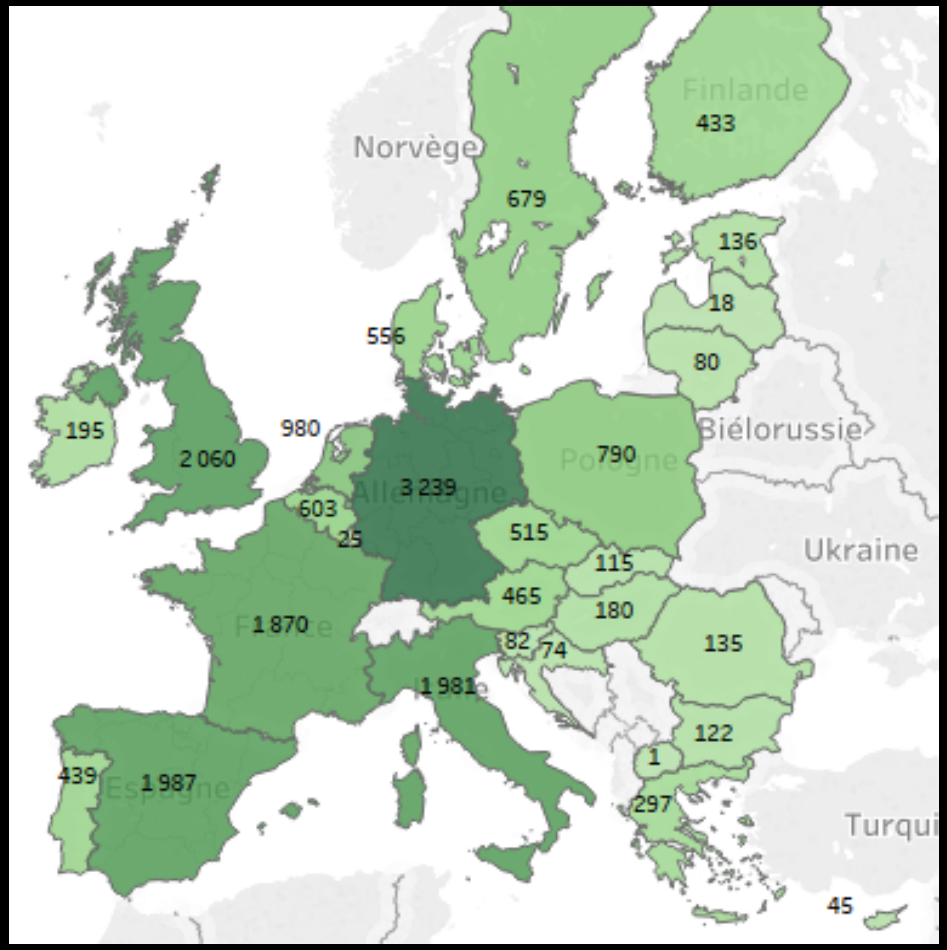


Part of UE28 in the publications collected and analyzed

Traits identified by experts in WP1	Publications UE28	Publications World	Publications UE28 / World
Nutrient-uptake	3 070	8 822	35%
Secondary-metabolism	3 040	8 880	34%
Growth-rate	1 960	7 119	28%
Nutrient-metabolism-transport	1 655	5 585	30%
Biochemistry-carbon-assimilation	1 372	3 491	39%
water-use-efficiency	1 226	4 371	28%
Nutrient-use-efficiency	824	3 001	27%
Photochemistry	669	1 543	43%
Photoprotection	556	1 288	43%
Shoot-architecture	492	1 454	34%
Primary-metabolism	455	973	47%
Source-Sink Balance	414	1 209	34%
Leaf-anatomy	263	885	30%
Source Web of Science Clarivate Analytics – 2015-2019 – Treatment INRAE/CNRS 2020 - Article , Review, Proceeding Papers or Letters			

A total of 14,053 publications collected and analyzed for UE28. In these research fields, publications signed by EU28 scientists represent between 27% and 47% of global scientific production.

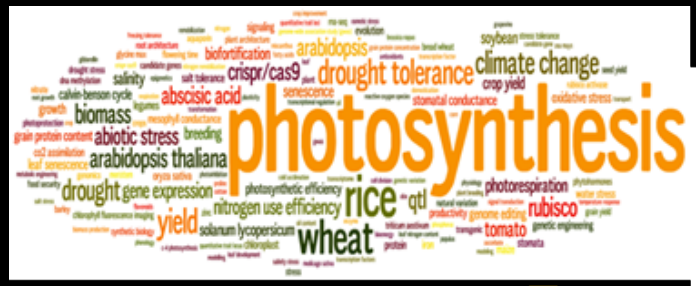
Origin of the 14,053 publications at EU28 scale



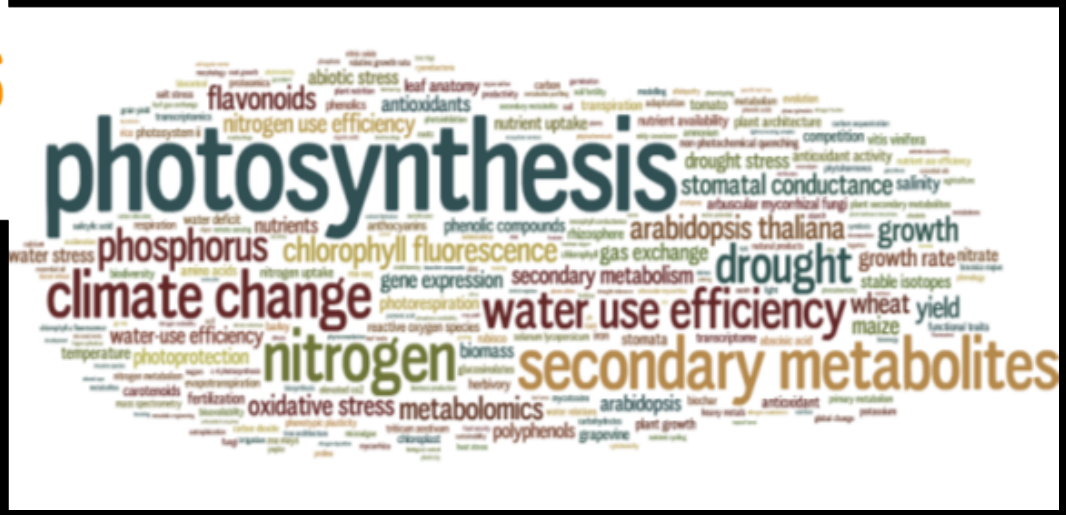
Analysis of publications Web of Science™ 2015-2019

Author Keywords

WP1 database

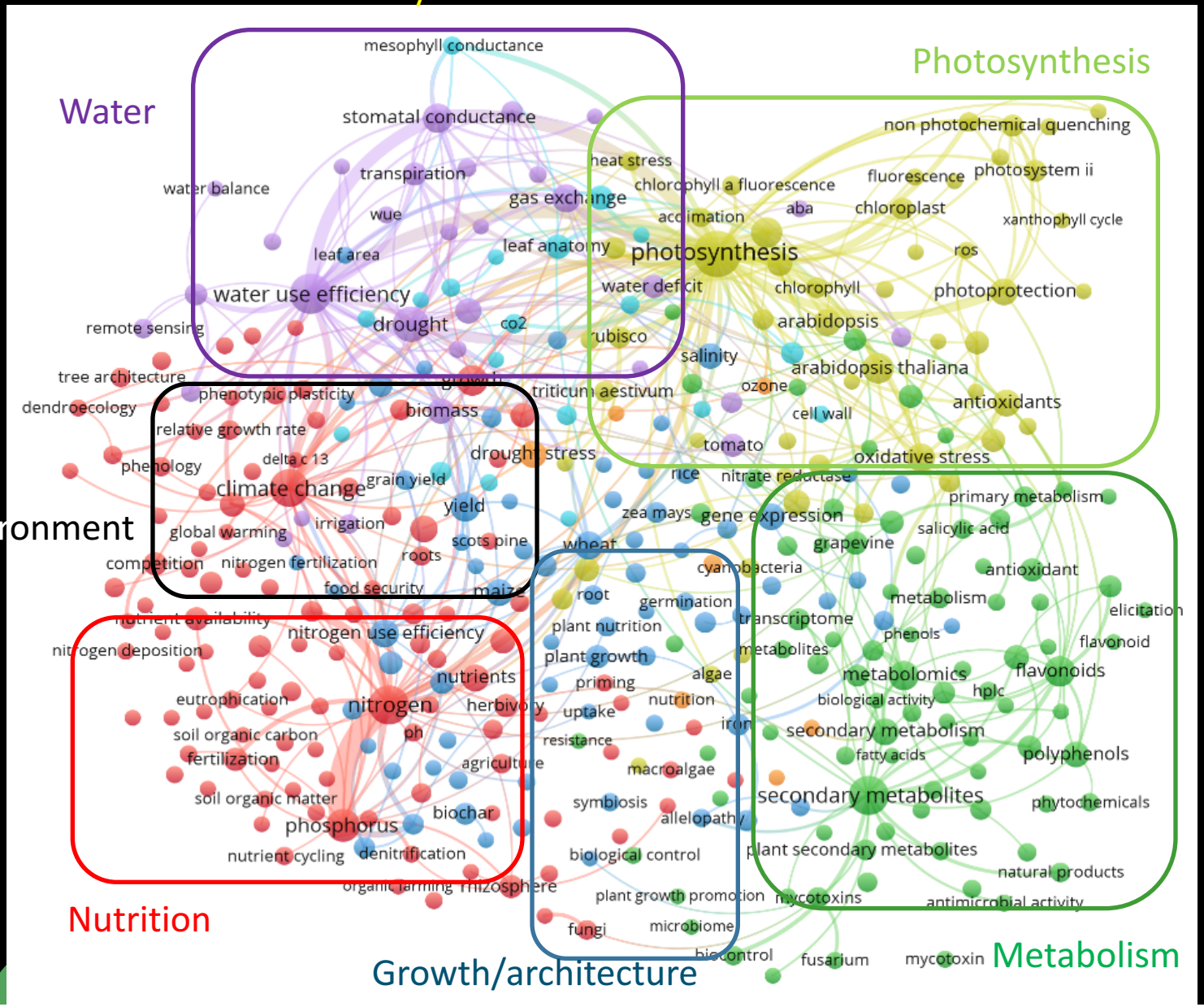


WP4 literature screening



Keywords (>24 occurrence) associated to WP1 selected traits (Yield, Sustainability) as cited by authors of the 14,053 publications published by UE28 institutions (2015-2019)

Network of keyword co-occurrence define main research fields

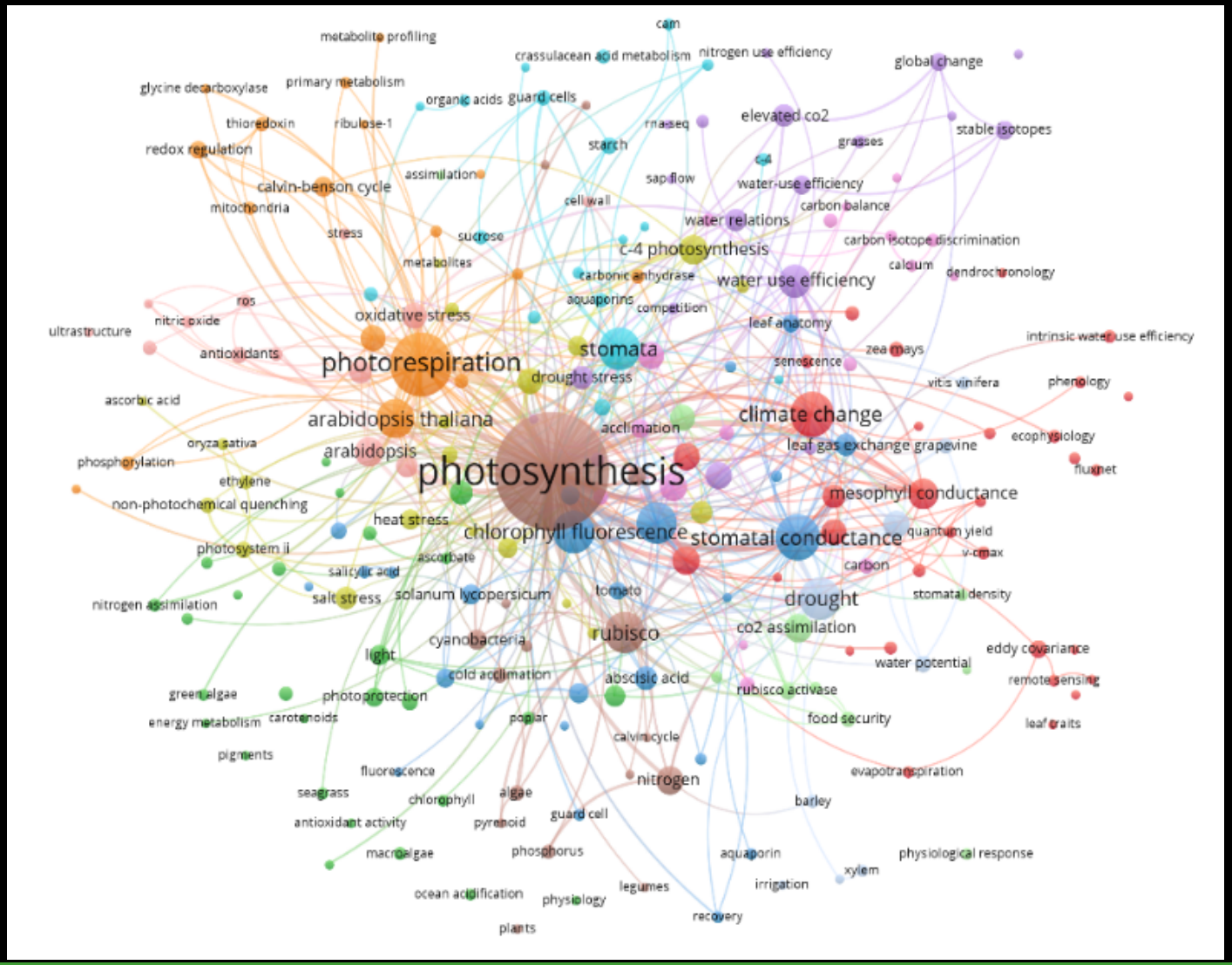


The network represents the co-occurrences of the main author keywords (minimum 20 occurrences, or 370 keywords) and the links indicate the existence of at least 5 publications with the 2 terms (threshold: 5, files Vosviewer network-Keywords-DE-20min-link-5-map.txt and network-Keywords-DE-20min-link-5-net.txt).

Keyword co-occurrence by traits

e.g. Biochemistry-Carbon-Assimilation

(threshold: 4 occurrences, links> 1)



Main authors

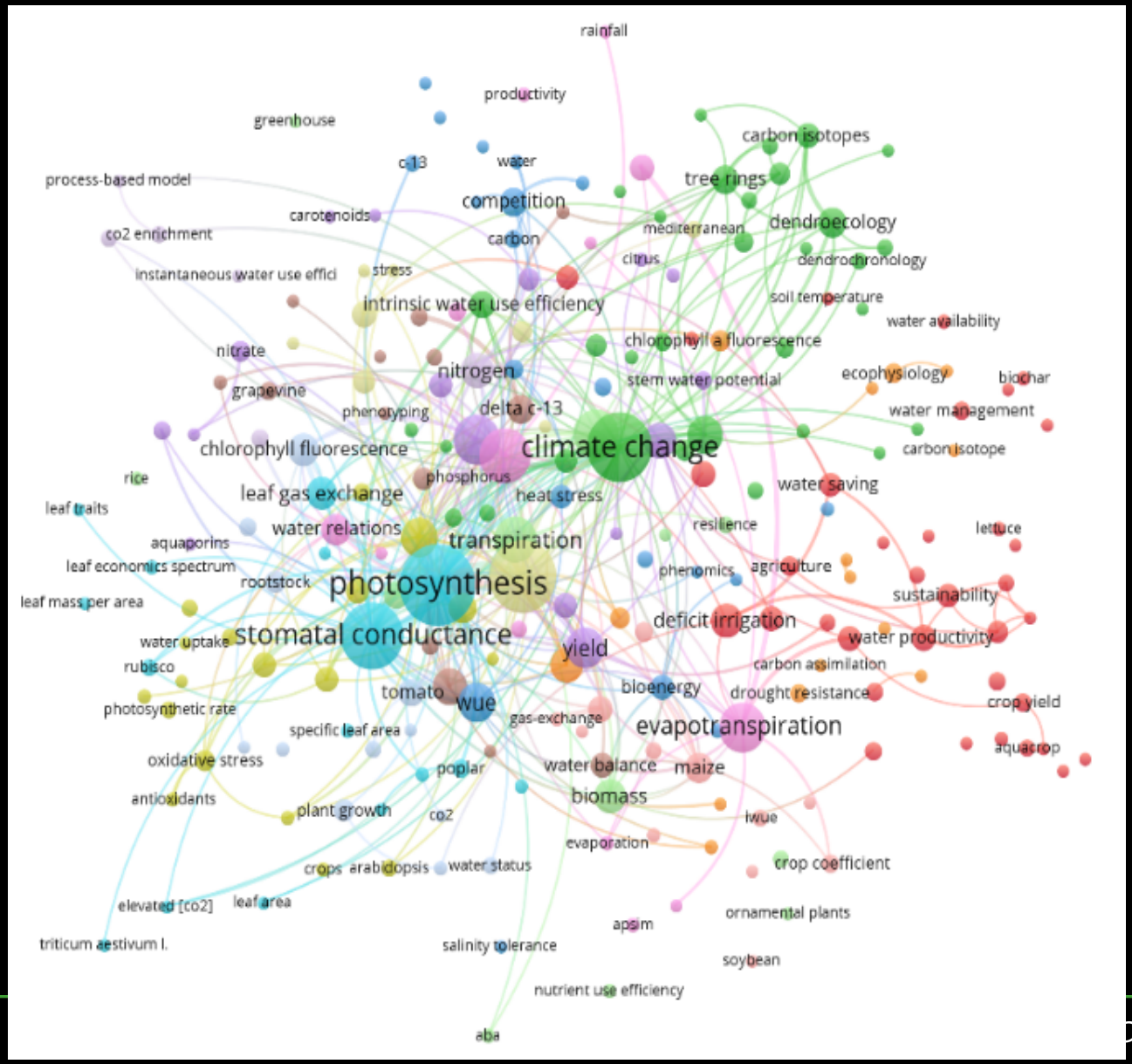
Photochemistry
Biochemistry, carbon assimilation
Photoprotection

Author	Documents	Citations	Total link strength
fernie, alisdair r.	39	614	74
ruban, alexander v.	38	774	64
croce, roberta	30	390	53
bassi, roberto	26	427	51
aro, eva-mari	23	471	51
van grondelle, rienk	23	200	34
bauwe, hermann	18	289	51
lawson, tracy	18	513	18
timm, stefan	16	298	51
weber, andreas p. m.	15	261	30
tikkanen, mikko	15	355	29
tcherkez, guillaume	15	147	15
aranjuelo, iker	14	80	4
suorsa, marjaana	13	377	36
dall'osto, luca	13	178	32
moustakas, michael	13	163	16
gessler, arthur	13	115	7
brestic, marian	12	547	23
zivcak, marek	12	547	23
niyogi, krishna k.	12	567	21
urban, otmar	12	84	18
morosinotto, tomas	11	127	33
centritto, mauro	11	87	32
chmeliov, jevgenij	11	147	30
valkunas, leonas	11	147	30
haworth, matthew	11	132	25
yin, xinyou	11	87	24
parry, martin a. j.	11	262	23
ballottari, matteo	11	125	22
garab, gyozo	11	133	20
carmo-silva, elizabete	11	195	17
long, stephen p.	11	393	10
niinemets, ulo	11	128	9
flexas, jaume	11	237	8

Keyword co-occurrence by traits

e.g. Water-use-efficiency

(threshold: 4occurrences, links> 1)



Main authors

Water-use-efficiency

Author	Documents	Citations	Total link strength
liu, fulai	15	104	6
julio camarero, j.	13	158	12
medrano, hipolito	10	228	26
haworth, matthew	9	132	20
korpelainen, helena	9	71	16
li, chunyang	9	71	16
niinemets, ulo	9	83	14
poni, stefano	9	75	13
battipaglia, giovanna	9	66	12
testa, giorgio	8	63	18
del amor, francisco m.	8	62	6
medlyn, belinda e.	8	138	5
rouphael, youssef	8	45	4
ciais, philippe	8	187	0
domec, jean-christophe	8	128	0
pou, alicia	7	188	21
tausz, michael	7	52	21
centritto, mauro	7	73	19
scordia, danilo	7	63	18
reichstein, markus	7	71	17
patane, cristina	7	77	16
loreto, francesco	7	57	14
flexas, j.	7	300	9
medrano, h.	7	315	9
cherubini, paolo	7	72	8
werner, christiane	7	79	5
canellas, isabel	7	75	2
lawson, tracy	7	145	2
campostrini, eliemar	7	54	1
tausz-posch, sabine	6	21	21
cosentino, salvatore l.	6	58	17
tortosa, ignacio	6	27	14
palliotti, alberto	6	30	11
sanguesa-barreda, gabriel	6	83	10

Etc...

Main actors (institutions) in all fields

Publications by EU28 institutions (threshold: at least 200 publications, 2015-2019 period).

Main actors in UE28 (> 200 publications)	Publications 2015-2019	Publications with UE28	% publications with UE28
INRAE - FR	1012	351	34,7%
CNRS - FR	885	345	39,0%
CSIC Spanish Natl Res Council - ES	690	281	40,7%
Max Planck Soc - DE	574	271	47,2%
Wageningen Univ and Res Ctr WUR - NL	496	231	46,6%
Helmholtz Assoc - DE	413	194	47,0%
CNR Natl Res Council - IT	405	141	34,8%
Leibniz Assoc - DE	331	126	38,1%
Swedish Univ Agr Sci SLU - SE	323	159	49,2%
Univ Copenhagen - DK	297	118	39,7%
BBSRC Biotech & Biol Sci Res Council - UK	266	98	36,8%
Univ Gottingen - DE	247	64	25,9%
Acad Sci Czech Rep - CZ	245	118	48,2%
CREA Council Agr Res & Agr Economics - IT	215	60	27,9%
Univ Montpellier - FR	210	73	34,8%
Univ Napoli Federico II - IT	210	72	34,3%
Cirad - FR	206	40	19,4%
Ghent Univ UGent - BE	201	95	47,3%
Aarhus Univ - DK	200	80	40,0%
Source Web of Science Clarivate Analytics – 2015-2019 – Treatment INRAE CNRS 2020 - Article, Review, Proceeding Papers or Letters			

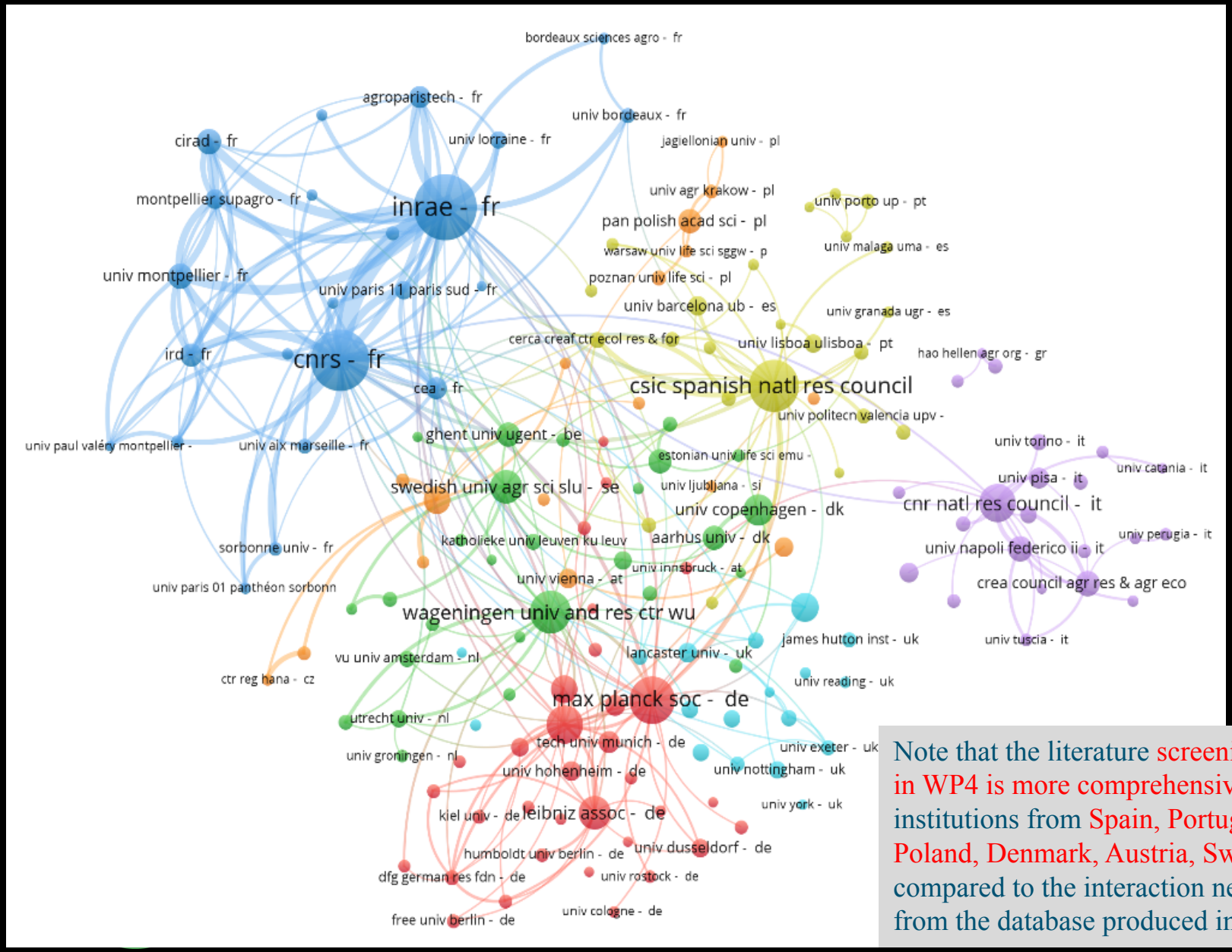
- Research communities (physiologists, geneticists, breeders, modellers, agronomists, socio-economists, pathologists, etc…) who are mostly coming from academic organisations (Research Institutes and Universities).

Next step:

- Create a network model of existing or lacking interactions from the mapping of national or international communities and projects, and their distribution within Europe.

Collaborations of the main institutions (which have at least 200 publications).

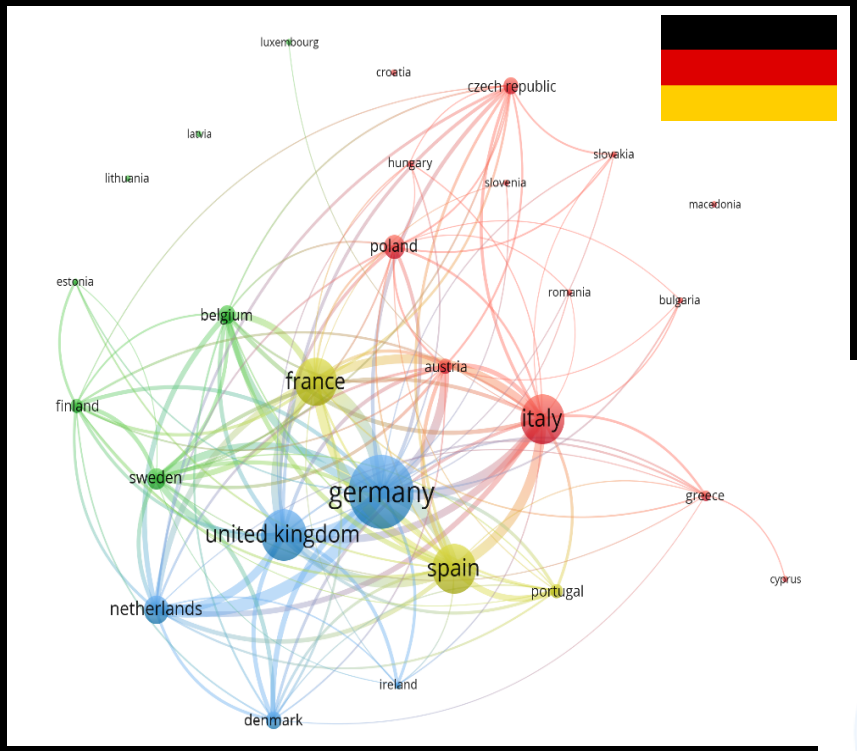
The links shown correspond to a minimum of 10 co-publications between the institution and its partner.



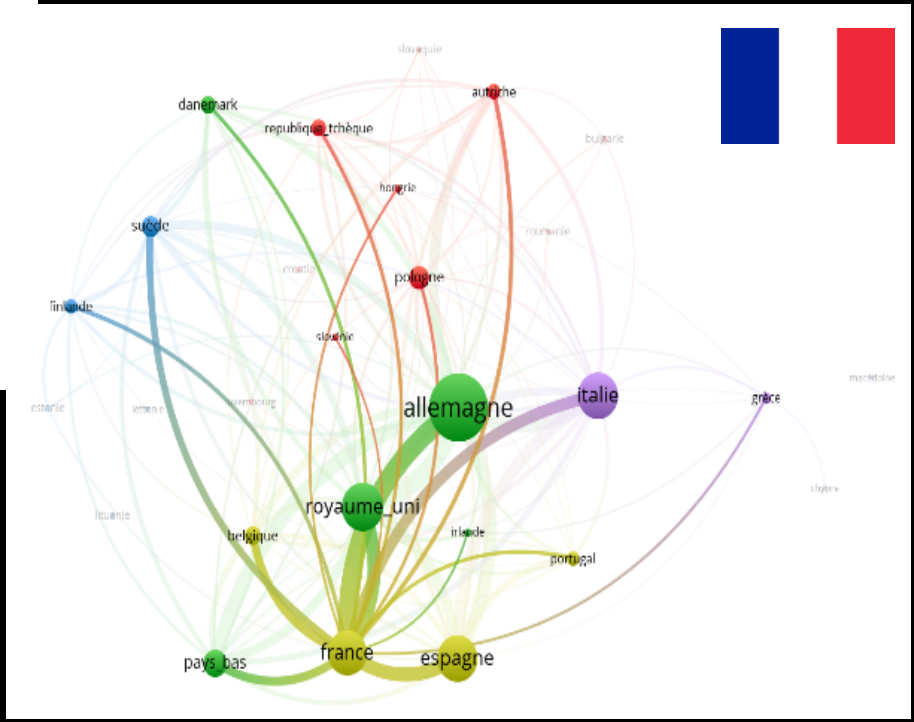
Note that the literature screening performed in WP4 is more comprehensive (e.g. institutions from Spain, Portugal, Greece, Poland, Denmark, Austria, Sweden…), when compared to the interaction network derived from the database produced in WP1.

Network of collaboration at country scale

e.g. Germany with UE28 countries



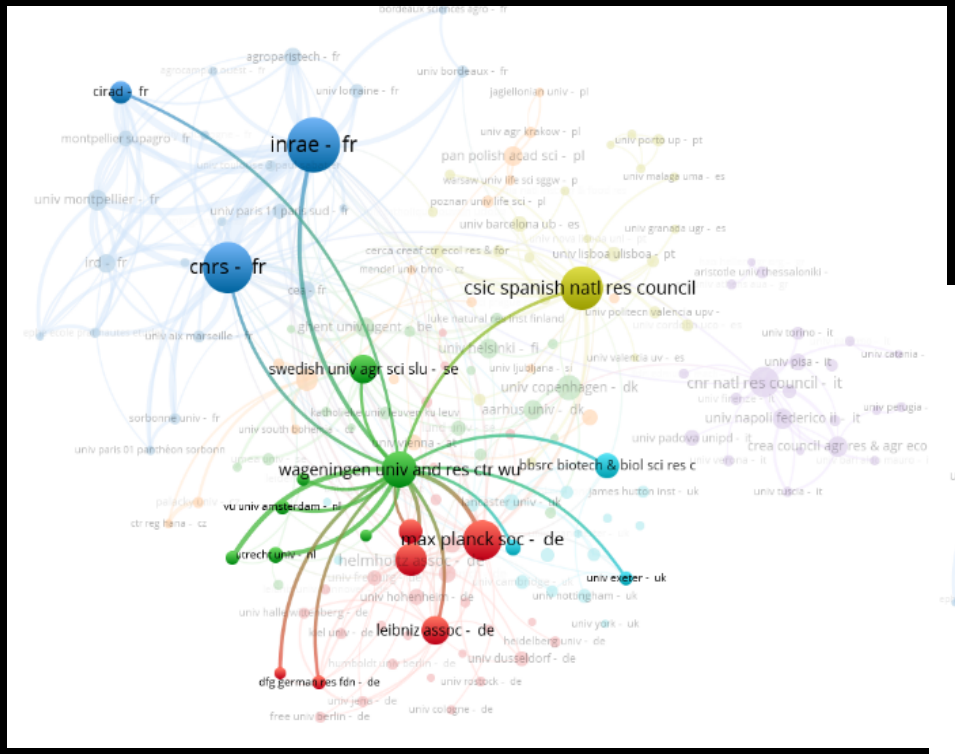
e.g. France with UE28 countries



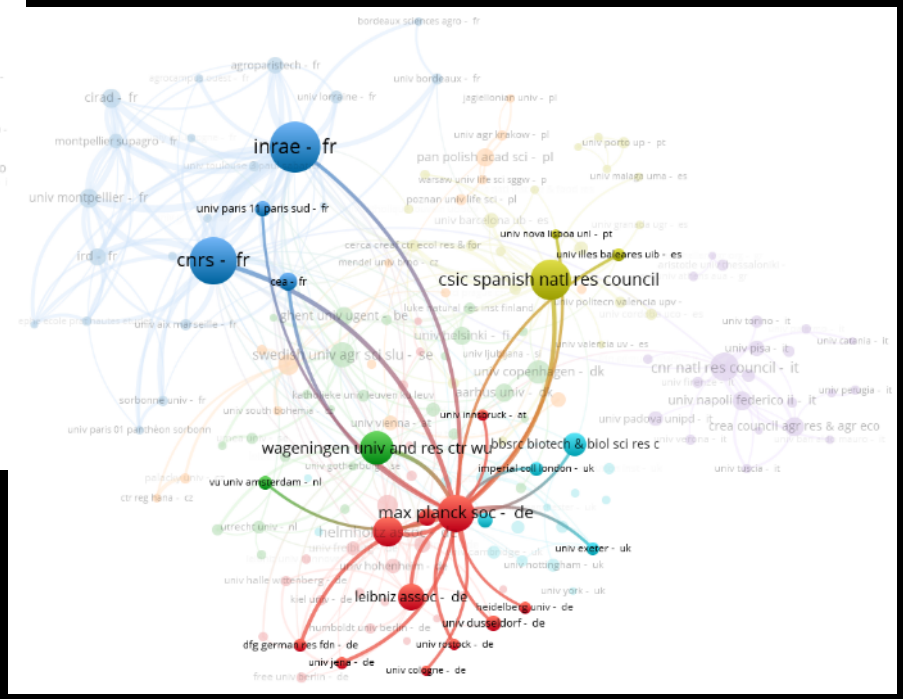
Etc…

Network of collaboration at institution scale

e.g. WUR with UE28 institutions



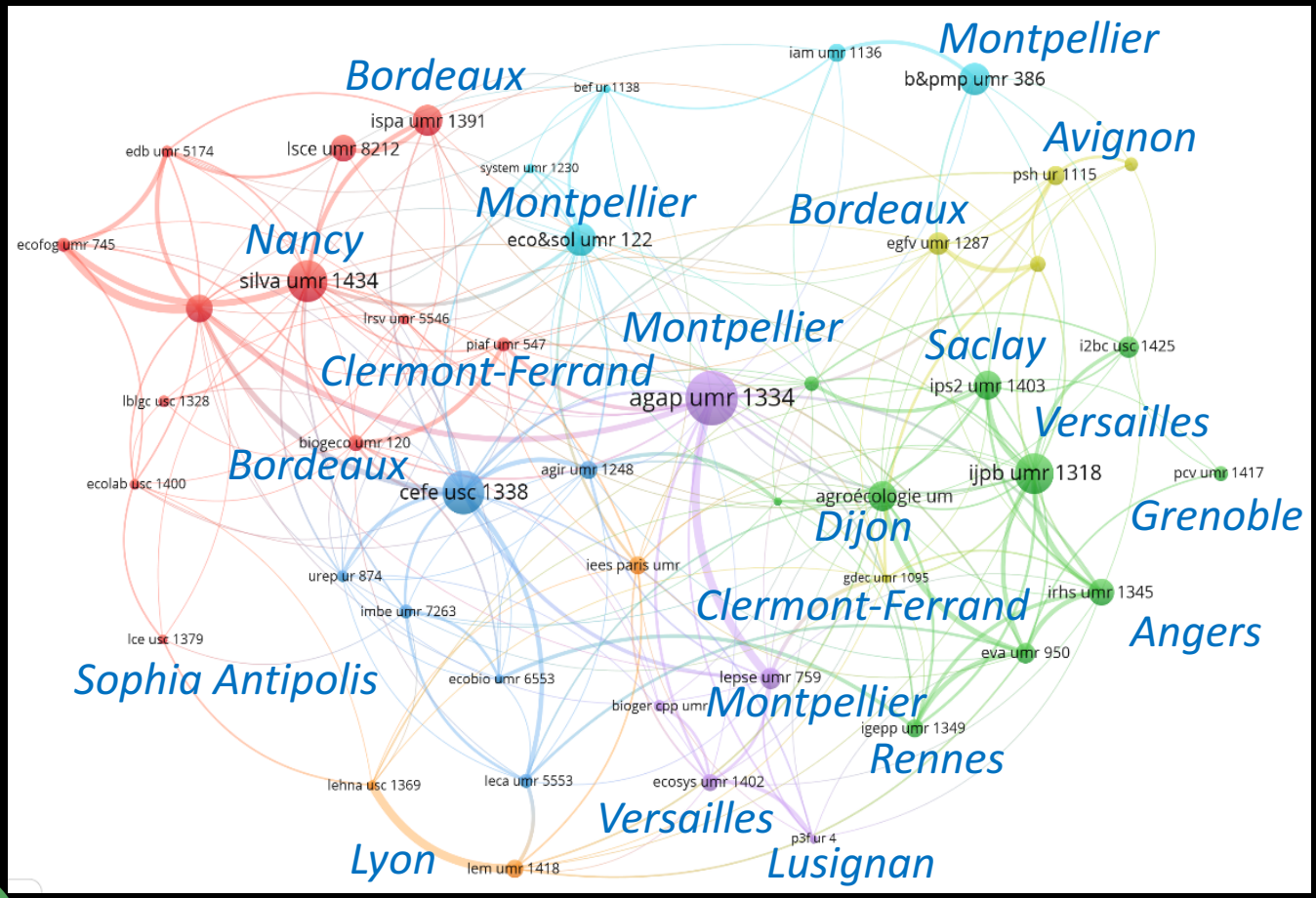
e.g. Max Planck Soc with UE28 institutions



Etc...

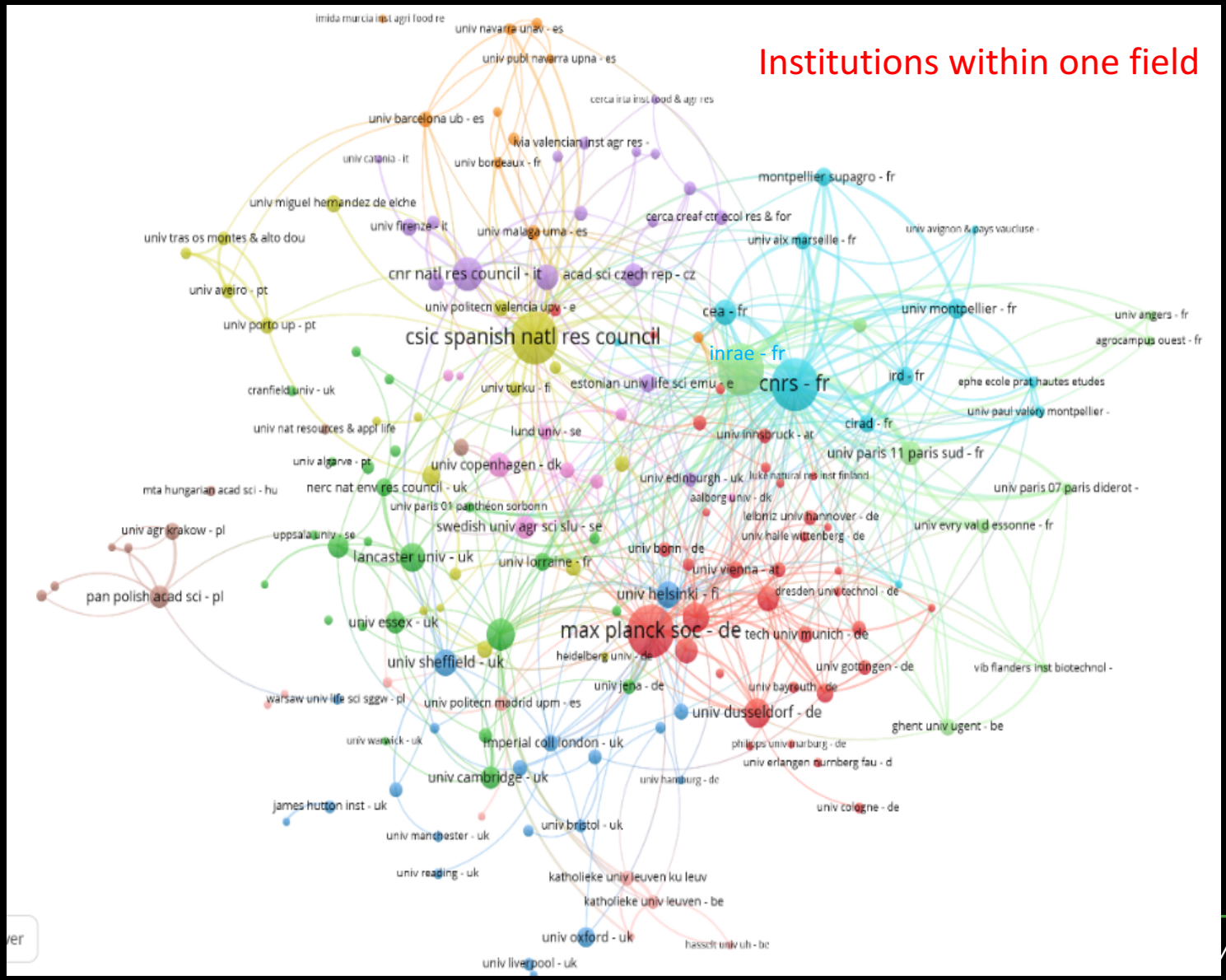
Network of collaboration at laboratory scale within an institution helps identifying main scientists in each field

e.g. INRAE laboratories with INRAE laboratories



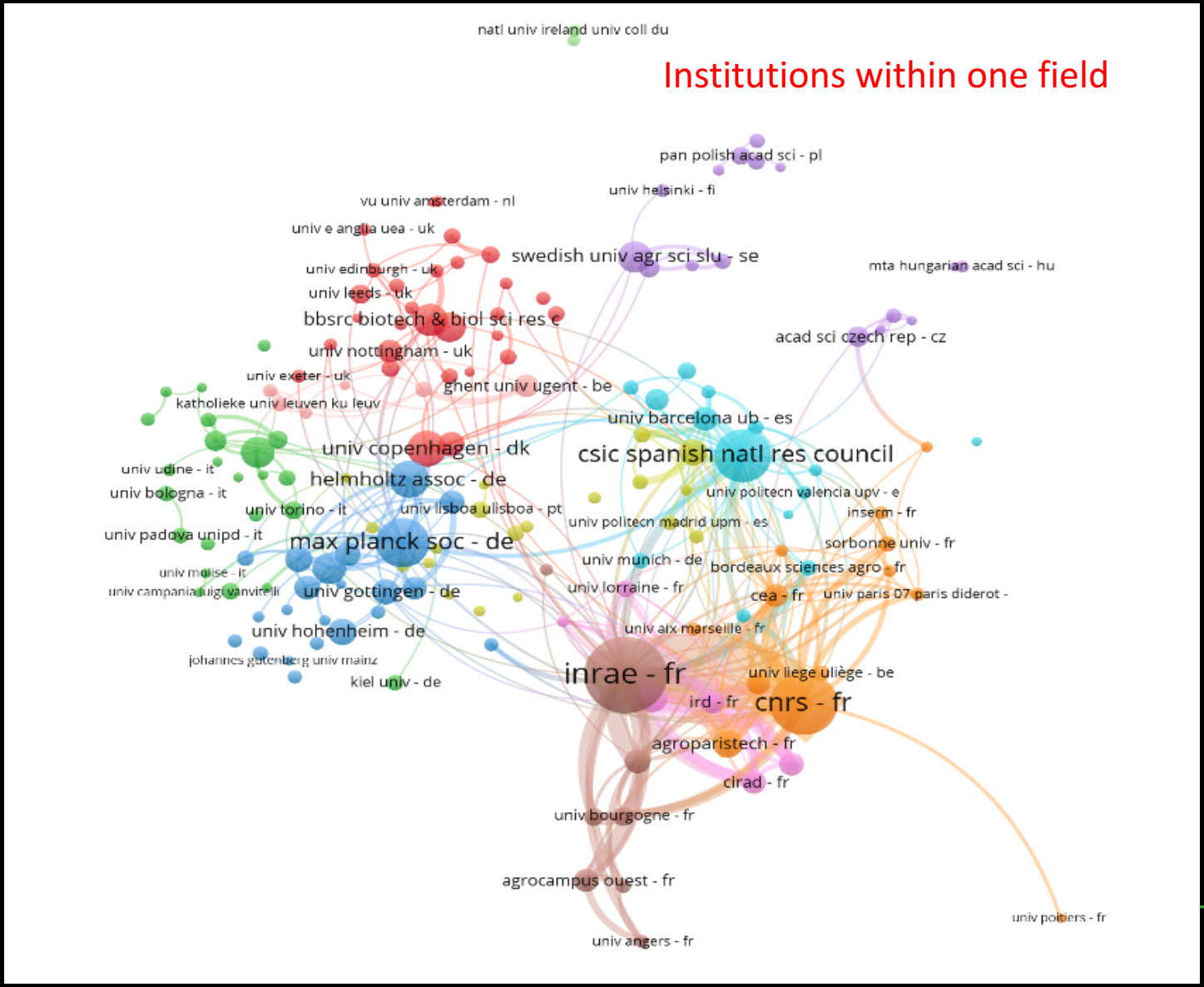
Etc...

UE28 institutions with other UE Institutions within a field
e.g. Biochemistry-Carbon-Assimilation
(threshold: 5 occurrences, links> 1)



Relative impact of UE Institutions and their interactions within a specific field

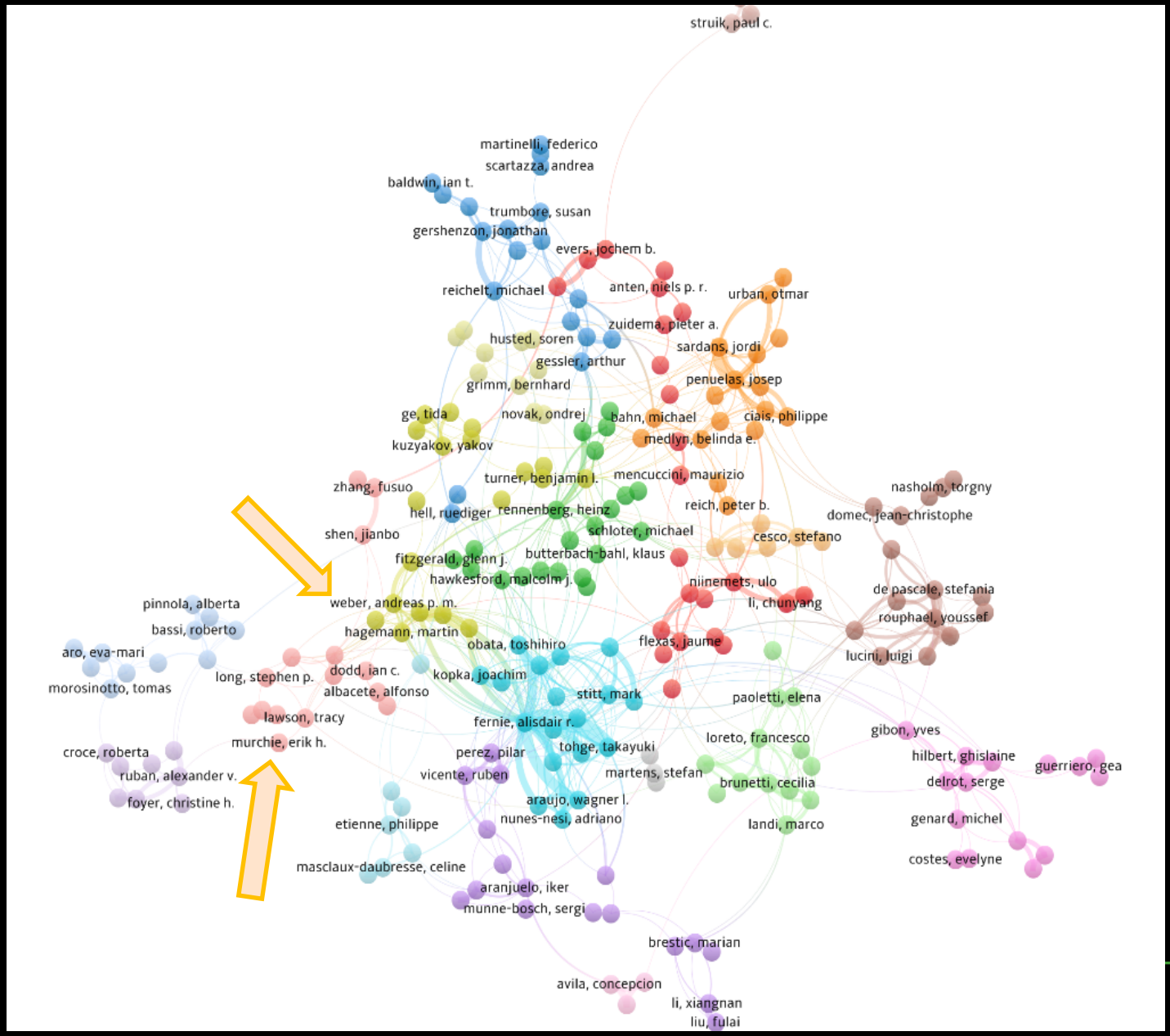
UE28 institutions with other UE Institutions within a field
e.g. Nutrient-metabolism-transport
(threshold: 5 occurrences, links> 1)



Relative impact of UE Institutions and their interactions within a specific field

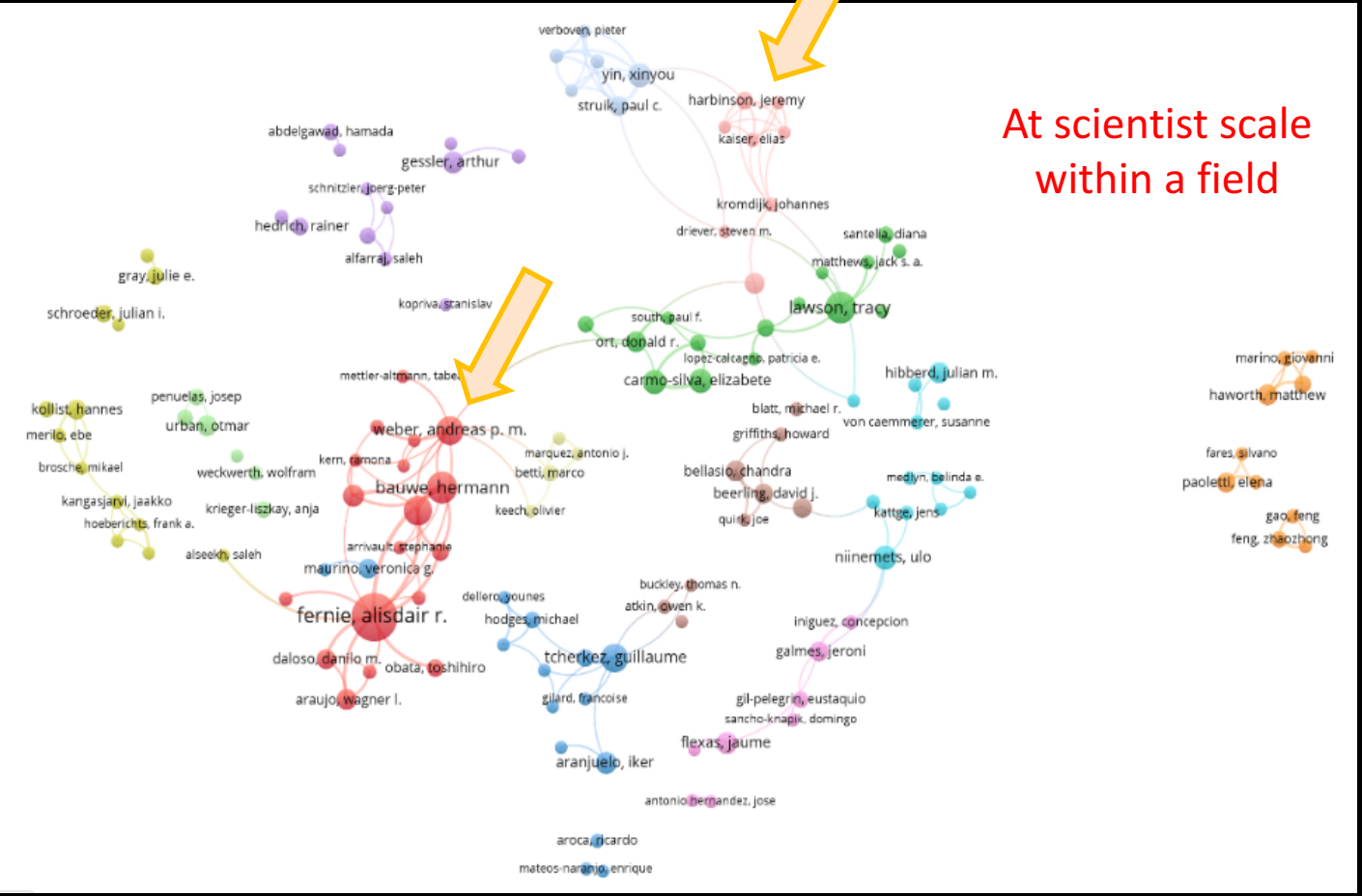
Etc...

Mains actors in all fields (Yield, sustainability) and their interactions



At scientist scale in all fields

Mains actors in a specific field and their interactions
e.g. Biochemistry-Carbon-Assimilation
(threshold: 4 occurrences, links> 1)



At scientist scale within a field

At scientist scale within a field: network of interaction in this field OK

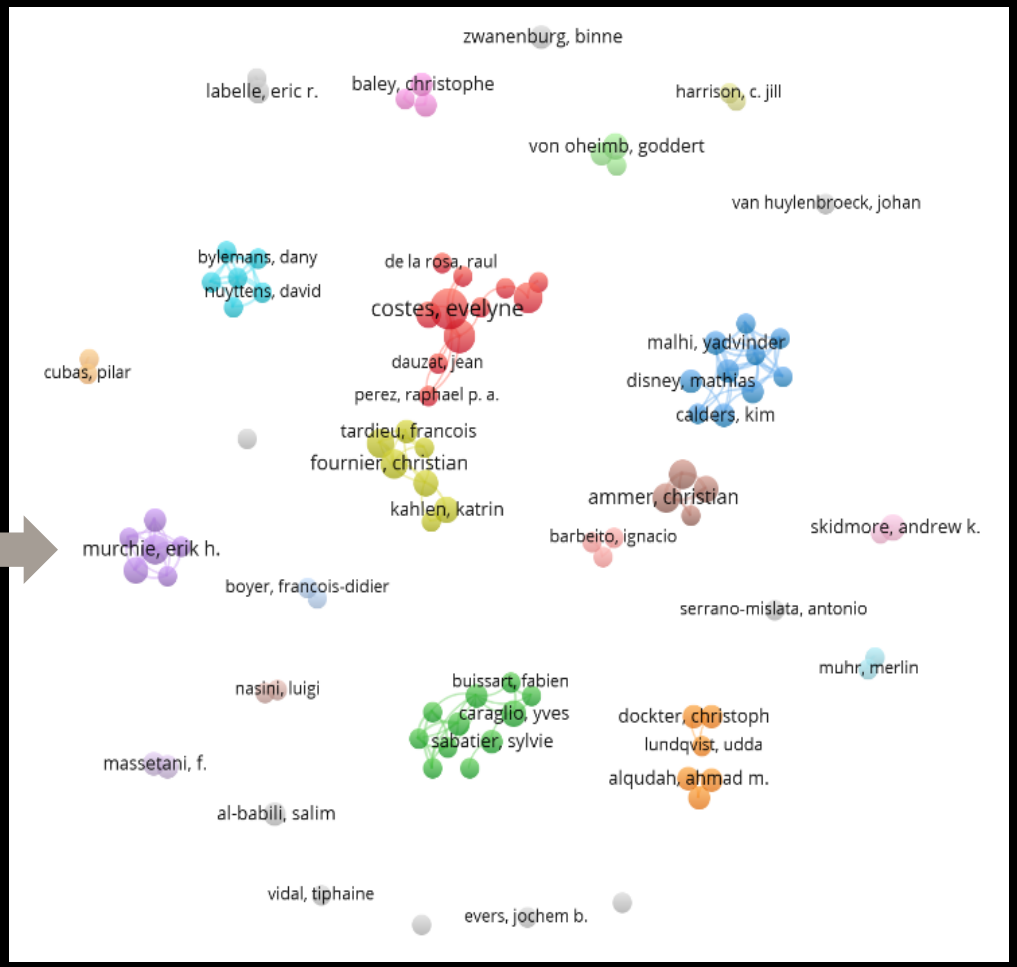
Enhancing photosynthesis by boosting light & carbon use efficiencies
–> Yield & Sustainability

Photochemistry
Biochemistry, carbon assimilation
Photoprotection

List of main actors within a specific field and their impact

Author	Documents	Citations	Total link strength
fernie, alisdair r.	39	614	74
ruban, alexander v.	38	774	64
croce, roberta	30	390	53
bassi, roberto	26	427	51
aro, eva-mari	23	471	51
van grondelle, rienk	23	200	34
bauwe, hermann	18	289	51
lawson, tracy	18	513	18
timm, stefan	16	298	51
weber, andreas p. m.	15	261	30
tikkanen, mikko	15	355	29
tcherkez, guillaume	15	147	15
aranjuelo, iker	14	80	4
suorsa, marjaana	13	377	36
dall'osto, luca	13	178	32
moustakas, michael	13	163	16
gessler, arthur	13	115	7
brestic, marian	12	547	23
zivcak, marek	12	547	23
niyogi, krishna k.	12	567	21
urban, otmar	12	84	18
morosinotto, tomas	11	127	33
centritto, mauro	11	87	32
chmeliov, jevgenij	11	147	30
valkunas, leonas	11	147	30
haworth, matthew	11	132	25
yin, xinyou	11	87	24
parry, martin a. j.	11	262	23
ballottari, matteo	11	125	22
garab, gyozo	11	133	20
carmo-silva, elizabete	11	195	17
long, stephen p.	11	393	10
niinemets, ulo	11	128	9
flexas, jaume	11	237	8

Mains actors in a specific field and their interactions
e.g. Shoot-Achitecture
(threshold: 2 occurrences, links> 1)

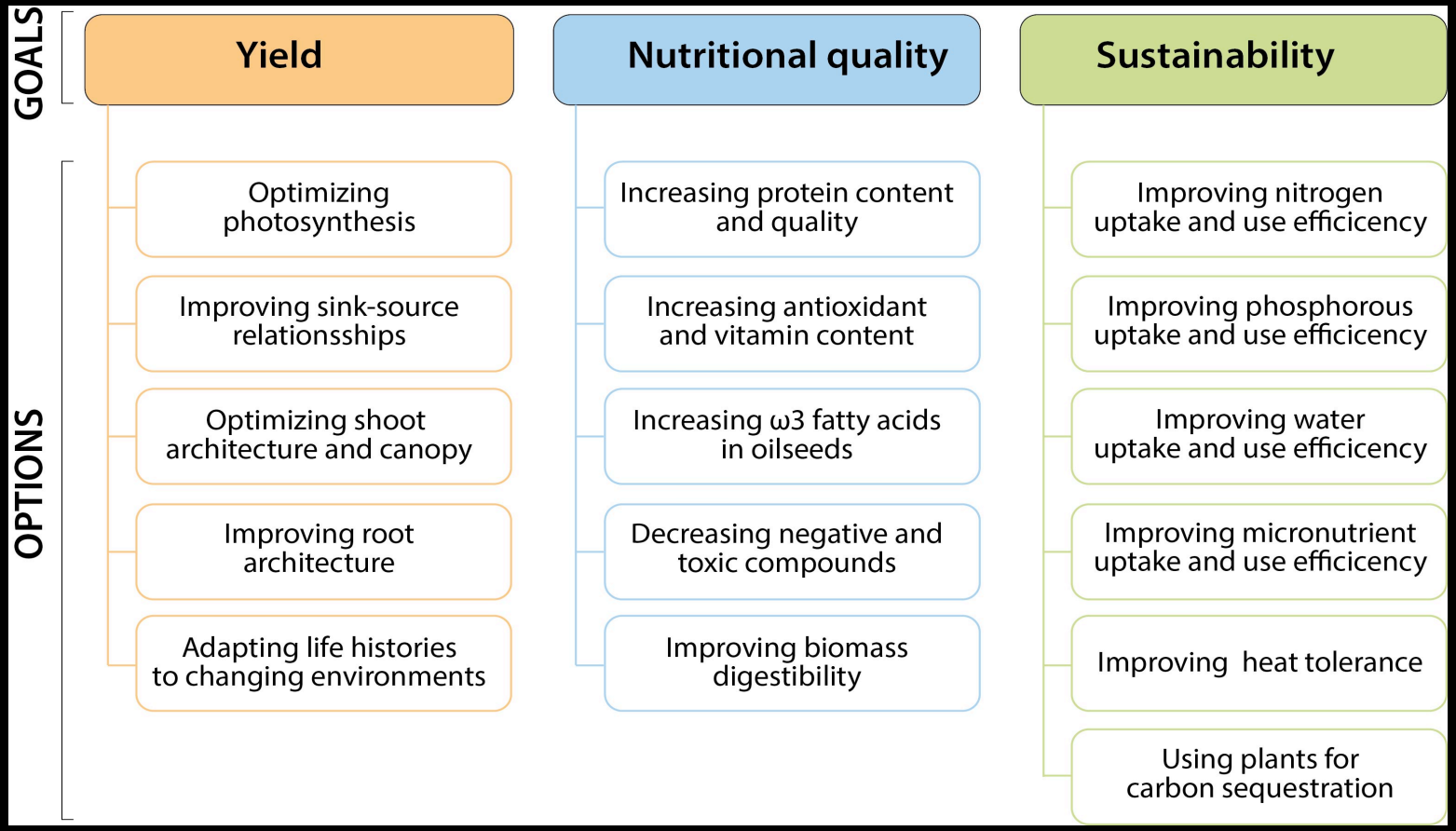


Etc…

Main actors within a field: lack of interaction in this field?

Selected traits for the literature screening (According to WP1)

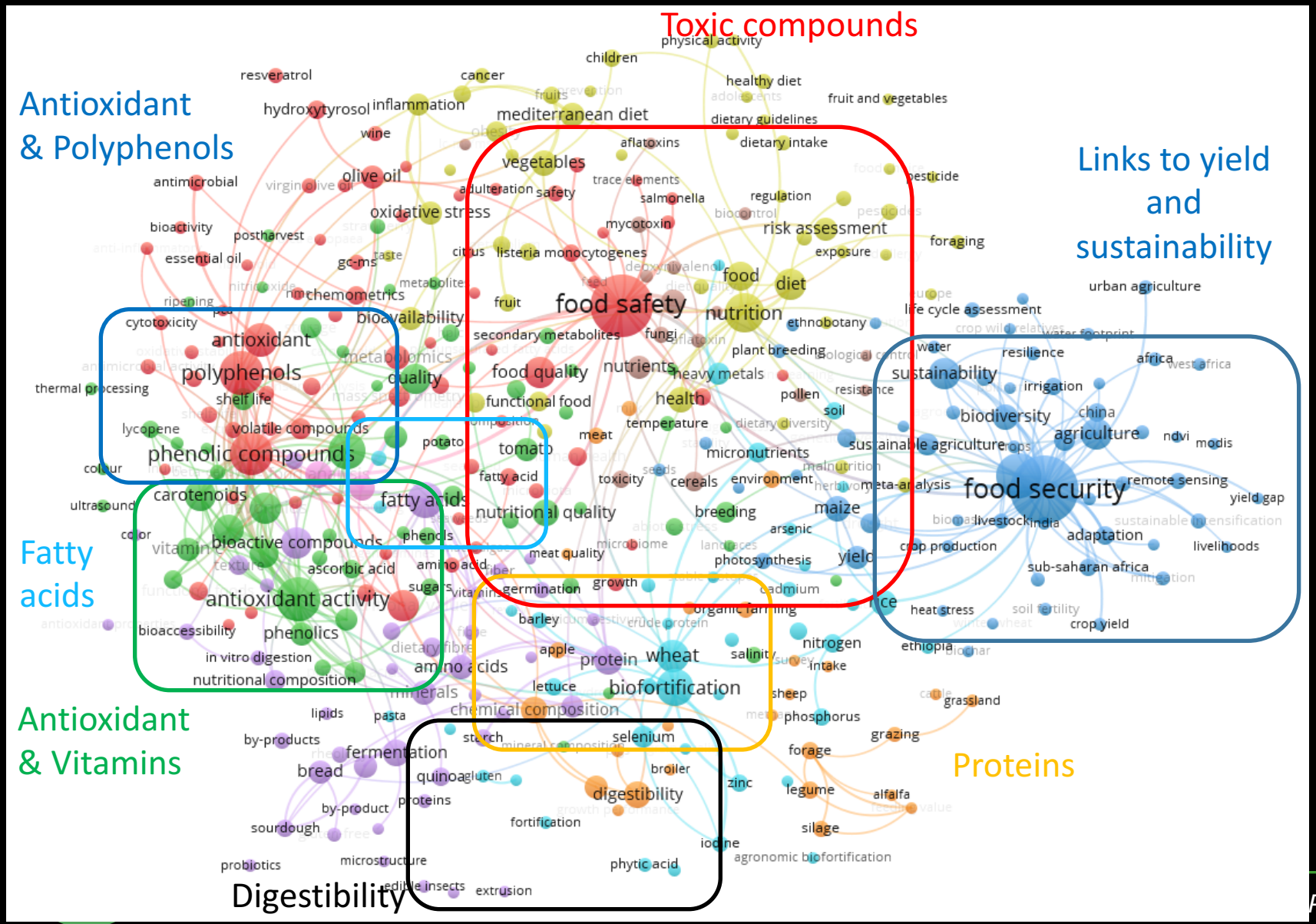
Step 2: Nutritional quality



Step 1 Step 2 Step 1

- ***Nutritional quality:* *General analysis (> 10,000 publications)***

Keywords Network of **keyword co-occurrence** define **research fields**



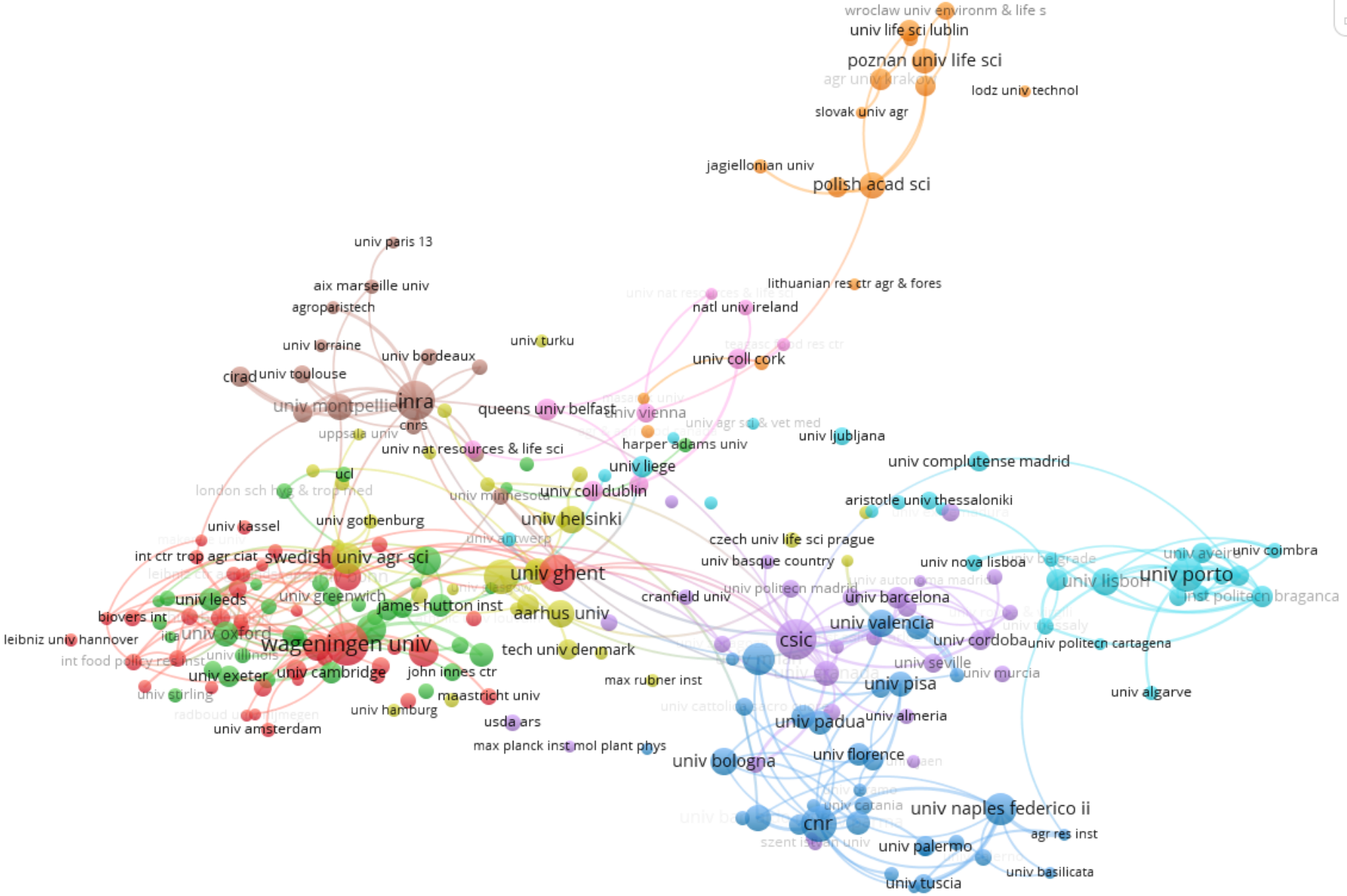
- ***Nutritional quality: General analysis***

*List of **main institutions** in **all fields** linked to **Nutritional quality***

Name	Rank	Country/Region	Web of Science Documents	Times Cited	Category Normalized Citation Impact	% Documents in Q1 Journals	% Docs Cited	% Documents in Top 1%
INRAE	1	FRANCE	473	6,262	1.95	64.37%	85.2%	4.65%
Wageningen University & Research	2	NETHERLANDS	431	6,079	1.98	70.87%	85.85%	5.8%
Consejo Superior de Investigaciones Cientificas (CSIC)	3	SPAIN	427	5,279	1.83	71.48%	82.44%	3.98%
Consiglio Nazionale delle Ricerche (CNR)	4	ITALY	266	2,768	1.5	55.56%	84.96%	3.01%
Centre National de la Recherche Scientifique (CNRS)	5	FRANCE	253	3,826	1.91	67.84%	82.21%	4.74%
Ghent University	6	BELGIUM	190	2,070	1.57	68.12%	85.79%	2.63%
University of Copenhagen	7	DENMARK	172	2,829	1.78	70.73%	86.05%	4.07%
Universidade do Porto	8	PORTUGAL	169	3,094	2.22	73.21%	85.21%	2.37%
University of Naples Federico II	9	ITALY	165	2,103	1.89	72.28%	81.82%	6.06%
Swedish University of Agricultural Sciences	10	SWEDEN	160	1,734	1.4	56.52%	85%	3.75%
Consiglio per la Ricerca in Agricoltura e L'analisi Dell'economia Agraria (CREA)	11	ITALY	157	1,424	1.34	52.21%	83.44%	1.91%
University of London	12	ENGLAND	153	3,638	2.56	73.83%	83.66%	3.92%
CIRAD	13	FRANCE	149	1,867	1.82	62.5%	83.22%	6.04%
University of Milan	14	ITALY	148	1,587	1.32	52.58%	85.14%	1.35%
Universite de Montpellier	15	FRANCE	139	1,459	1.68	61.73%	76.26%	5.76%
Universita degli Studi di Bari Aldo Moro	16	ITALY	136	1,495	1.6	54.95%	87.5%	2.94%
Instituto Politecnico de Braganca	17	PORTUGAL	128	1,489	1.36	79.78%	89.06%	2.34%
Helmholtz Association	18	GERMANY (FED REP GER)	126	3,762	3.55	75.58%	88.1%	11.9%
Rothamsted Research	19	ENGLAND	125	2,491	2.59	78.65%	90.4%	10.4%
University of Bologna	20	ITALY	120	1,288	1.5	61.18%	82.5%	2.5%

- ***Nutritional quality: General analysis***

Main institutions *in* ***all fields*** *linked to* ***Nutritional quality*** *and* ***their interaction***



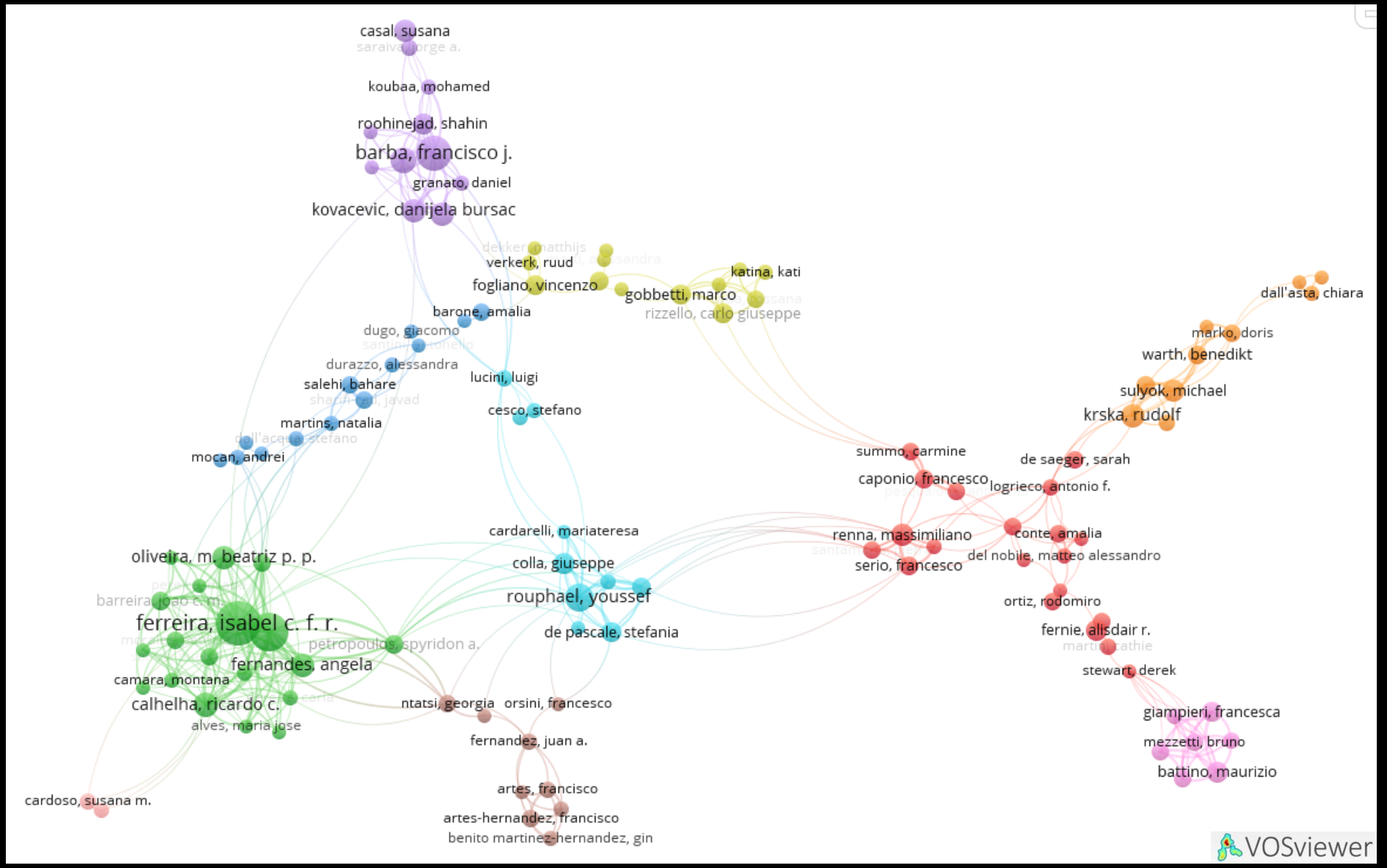
- ***Nutritional quality: General analysis***

*List of **main authors** in **all fields** linked to **Nutritional quality***

Name	Rank	Affiliation	Country/Region	Web of Science Documents	Times Cited	Category Normalized Citation Impact
Ferreira, Isabel C. F. R.	1	Instituto Politecnico de Braganca	PORTUGAL	77	906	1.51
Barros, Lillian	2	Instituto Politecnico de Braganca	PORTUGAL	60	746	1.59
Barba, Francisco J.	3	University of Valencia	SPAIN	46	778	2.21
Rouphael, Youssef	4	University of Naples Federico II	ITALY	31	568	3.47
Lorenzo, Jose M.	5	n/a		27	310	2.08
Calhelha, Ricardo C.	6	Instituto Politecnico de Braganca	PORTUGAL	23	150	1.14
Hercberg, Serge	6	Institut National de la Sante et de la Recherche Medicale (Inserm)	FRANCE	23	219	1.35
Hercberg, Serge	6	Hopital Universitaire Avicenne - APHP	FRANCE	23	220	1.52
Smolen, Sylwester	9	Agricultural University Krakow	POLAND	22	109	0.83
Oliveira, M. Beatriz P. P.	9	Universidade do Porto	PORTUGAL	22	324	1.6
Putnik, Predrag	11	University of Zagreb	CROATIA	21	396	2.21
Fernandes, Angela	11	Instituto Politecnico de Braganca	PORTUGAL	21	179	1.07
Kovacevic, Danijela Bursac	11	University of Zagreb	CROATIA	21	392	2.21
Hercberg, Serge	11	Universite de Paris	FRANCE	21	194	1.54
Hercberg, Serge	11	INRAE	FRANCE	21	219	1.48
Casal, Susana	16	Universidade do Porto	PORTUGAL	20	189	0.91
Kesse-Guyot, Emmanuelle	16	Institut National de la Sante et de la Recherche Medicale (Inserm)	FRANCE	20	219	1.22
Kesse-Guyot, Emmanuelle	16	INRAE	FRANCE	20	219	1.22
Zannini, Emanuele	19	University College Cork	IRELAND	19	253	1.21
Smith, Pete	19	University of Aberdeen	SCOTLAND	19	626	4.67
Arendt, Elke K.	19	University College Cork	IRELAND	19	274	1.17

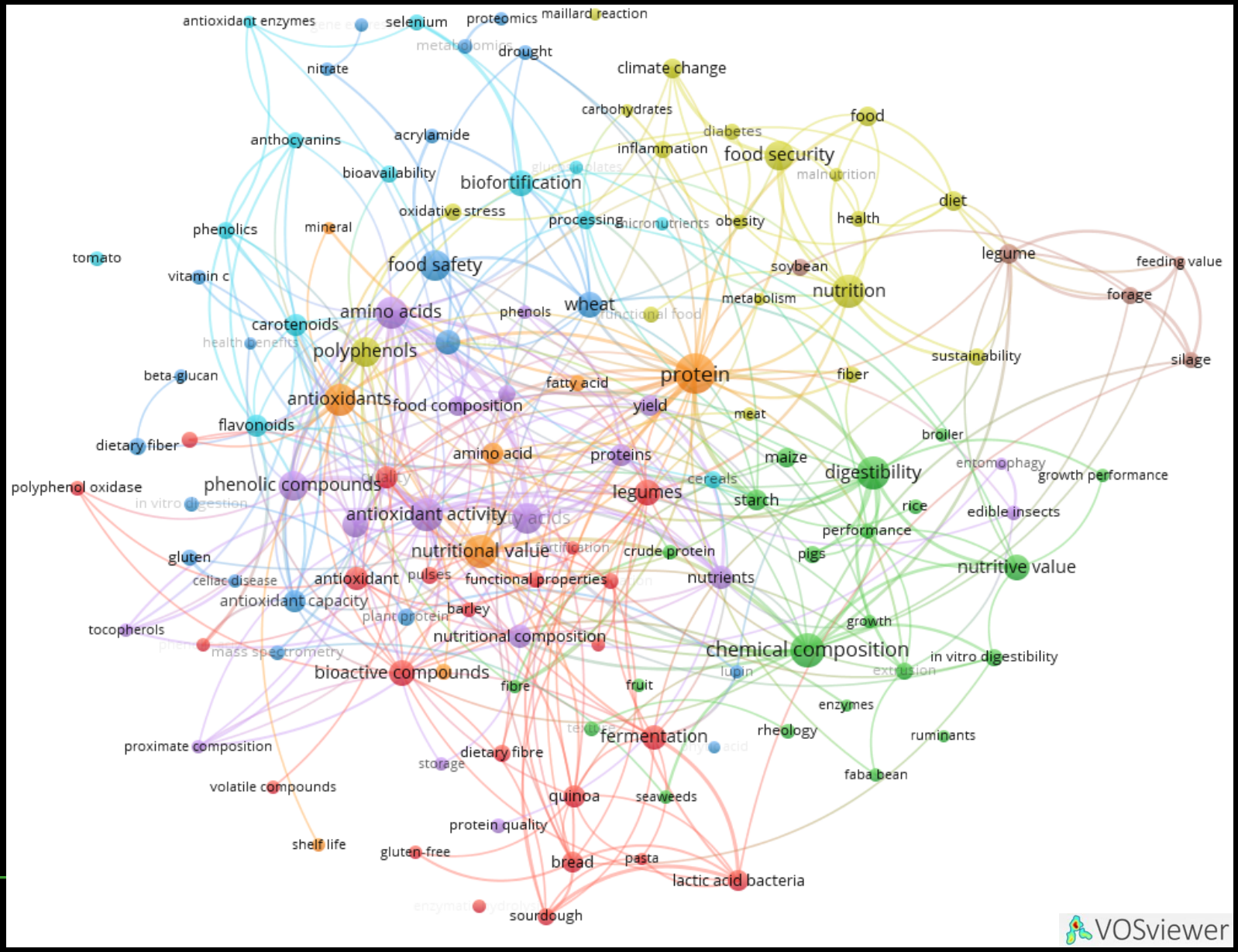
- ***Nutritional quality: General analysis***

Main actors *in* ***all fields*** *linked to* ***Nutritional quality*** *and* ***their interaction***



- ***Nutritional quality: Proteins***

Keywords Network of **keyword co-occurrence** *in* ***the field "Proteins"***



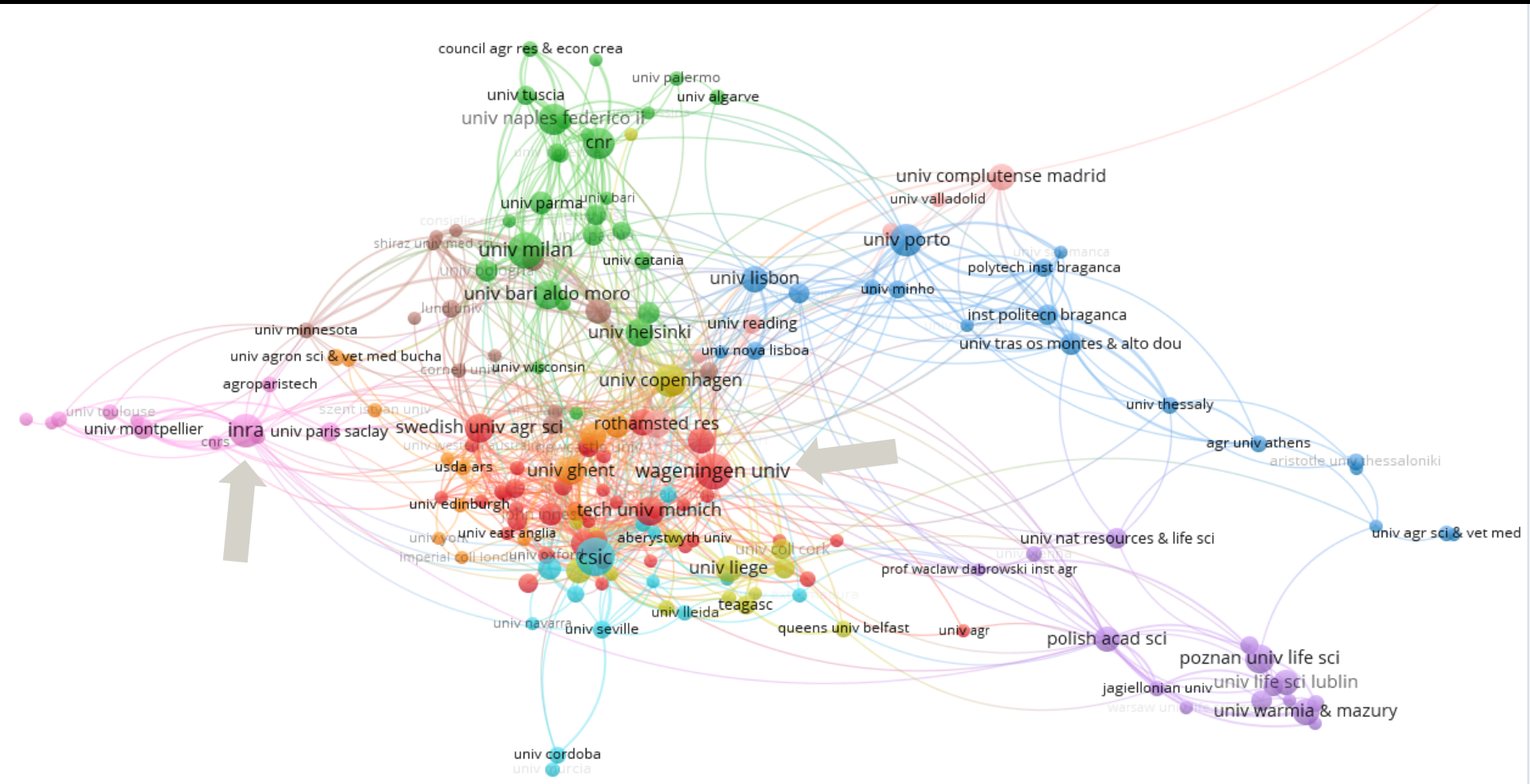
- **Nutritional quality: Proteins**

List of main institutions in the field "Proteins"

Name	Rank	Country/Region	Web of Science Documents	Times Cited	Category Normalized Citation Impact	% Documents in Q1 Journals	% Docs Cited	% Documents in Top 1%
Consejo Superior de Investigaciones Científicas (CSIC)	1	SPAIN	119	1,037	1.39	73.91%	74.79%	1.68%
INRAE	2	FRANCE	101	1,296	1.67	53.62%	80.2%	3.96%
Wageningen University & Research	3	NETHERLANDS	89	1,433	2	75.76%	87.64%	4.49%
Consiglio Nazionale delle Ricerche (CNR)	4	ITALY	55	555	1.74	60.61%	80%	3.64%
University of Milan	5	ITALY	54	576	1.49	42.42%	81.48%	1.85%
Consiglio per la Ricerca in Agricoltura e L'analisi Dell'economia Agraria (CREA)	6	ITALY	50	538	1.49	59.38%	74%	4%
University of Naples Federico II	7	ITALY	45	570	1.97	75%	71.11%	8.89%
University of Copenhagen	8	DENMARK	43	379	1.45	76%	76.74%	2.33%
Universita degli Studi di Bari Aldo Moro	9	ITALY	42	438	1.7	75%	85.71%	2.38%
Universidade do Porto	10	PORTUGAL	41	269	1.46	68.18%	85.37%	0%
Centre National de la Recherche Scientifique (CNRS)	11	FRANCE	39	582	1.28	71.43%	87.18%	0%
Poznan University of Life Sciences	12	POLAND	36	262	1.44	36.36%	77.78%	2.78%
Swedish University of Agricultural Sciences	13	SWEDEN	34	342	1.05	61.9%	73.53%	2.94%
Technical University of Munich	13	GERMANY (FED REP GER)	34	464	1.55	48.15%	88.24%	2.94%
Aarhus University	15	DENMARK	32	295	1.93	73.68%	75%	6.25%
University of Helsinki	15	FINLAND	32	492	1.72	64%	93.75%	0%
Instituto Politecnico de Braganca	15	PORTUGAL	32	268	1.49	73.68%	87.5%	6.25%
Rothamsted Research	15	ENGLAND	32	653	2.56	84.21%	81.25%	9.38%

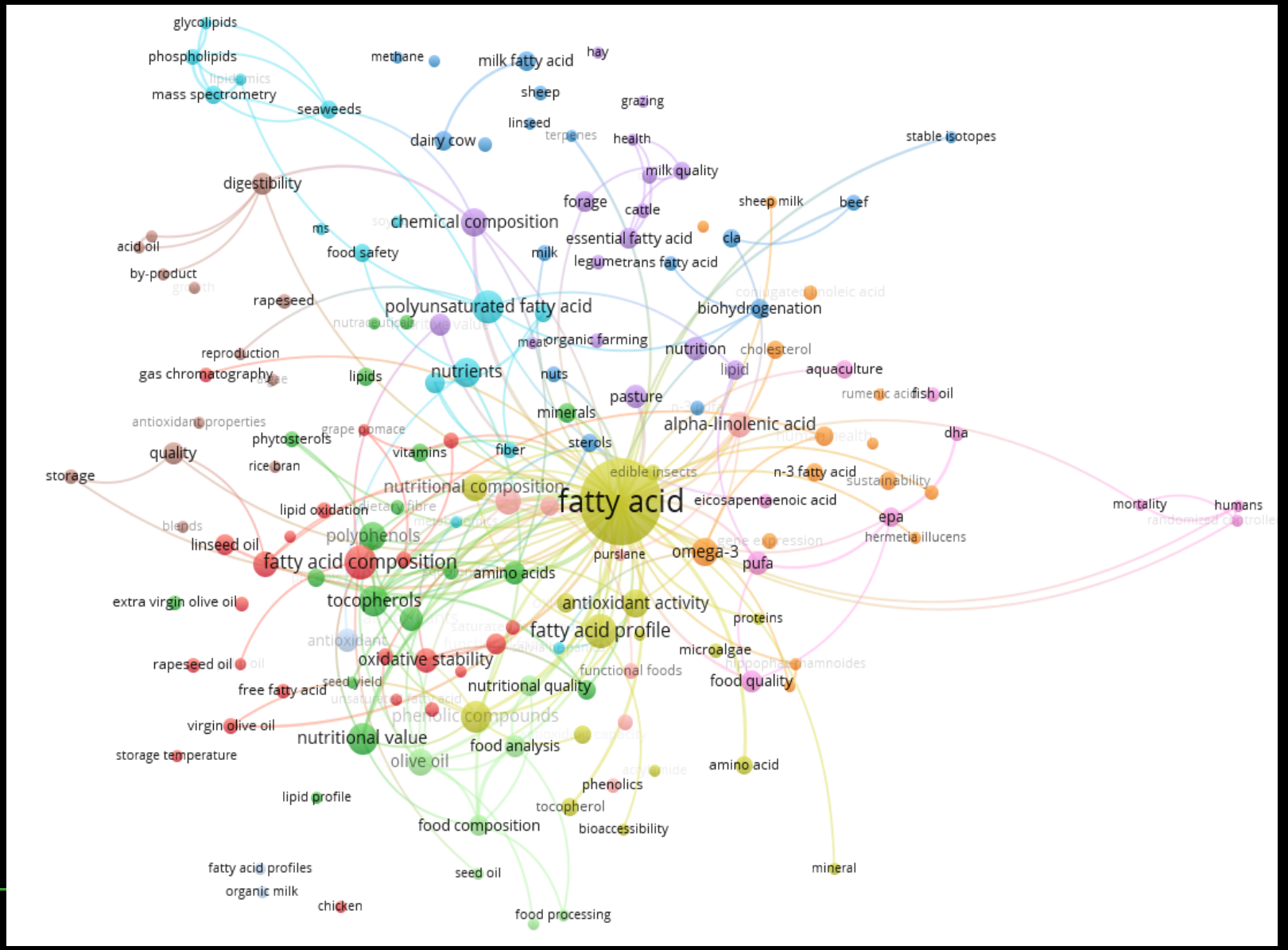
- ***Nutritional quality: Proteins***

Institutions** and their **interactions** in **the field "Proteins"



- ***Nutritional quality: Fatty acids – Omega3***

Keywords - Network of **keyword co-occurrence in the field *"Fatty acids – Omega3"***



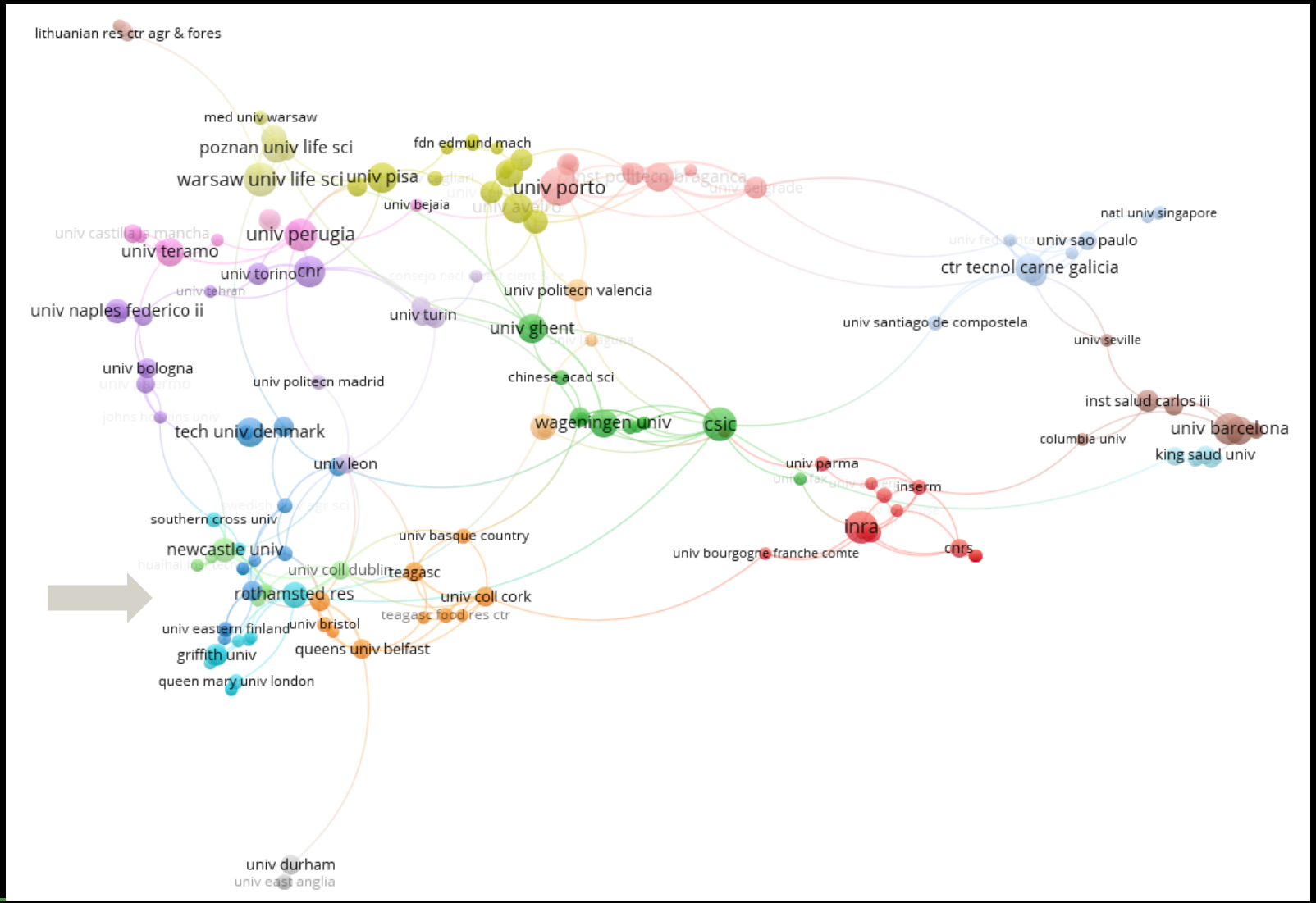
- **Nutritional quality: Fatty acids – Omega3**

Main institutions in the field "Fatty acids – Omega3"

Name	Rank	Country/Region	Web of Science Documents	Times Cited	Category Normalized Citation Impact	% Documents in Q1 Journals	% Docs Cited	% Documents in Top 1%	% Documents in Top 10%
Consejo Superior de Investigaciones Cientificas (CSIC)	1	SPAIN	32	236	1.53	60%	75%	3.13%	21.88%
INRAE	2	FRANCE	19	148	1.05	64.29%	78.95%	0%	15.79%
Warsaw University of Life Sciences	2	POLAND	19	128	0.71	12.5%	89.47%	0%	5.26%
Universidade do Porto	4	PORTUGAL	18	148	3.26	69.23%	94.44%	5.56%	33.33%
Instituto Politecnico de Braganca	5	PORTUGAL	15	130	1.09	62.5%	86.67%	0%	13.33%
Consiglio Nazionale delle Ricerche (CNR)	5	ITALY	15	105	1.74	25%	86.67%	6.67%	20%
Centre National de la Recherche Scientifique (CNRS)	7	FRANCE	14	271	3.05	33.33%	85.71%	7.14%	7.14%
University of Perugia	8	ITALY	13	118	2.4	60%	69.23%	15.38%	30.77%
University of Barcelona	8	SPAIN	13	70	0.66	70%	92.31%	0%	0%
University of Turin	10	ITALY	12	92	2.05	37.5%	75%	8.33%	25%
Universite Clermont Auvergne & Associes	10	FRANCE	12	86	0.89	66.67%	75%	0%	8.33%
University of Pisa	12	ITALY	11	92	1.2	33.33%	63.64%	9.09%	18.18%
Wageningen University & Research	12	NETHERLANDS	11	377	3.97	100%	90.91%	27.27%	45.45%
Universidade de Aveiro	12	PORTUGAL	11	169	1.42	62.5%	81.82%	9.09%	27.27%
Technical University of Denmark	15	DENMARK	10	63	0.77	60%	70%	0%	0%
Ghent University	15	BELGIUM	10	200	5.06	71.43%	90%	30%	30%
University of Naples Federico II	15	ITALY	10	103	1.55	87.5%	100%	0%	20%
Consiglio per la Ricerca in Agricoltura e L'analisi Dell'economia Agraria (CREA)	15	ITALY	10	70	1.04	25%	70%	0%	20%

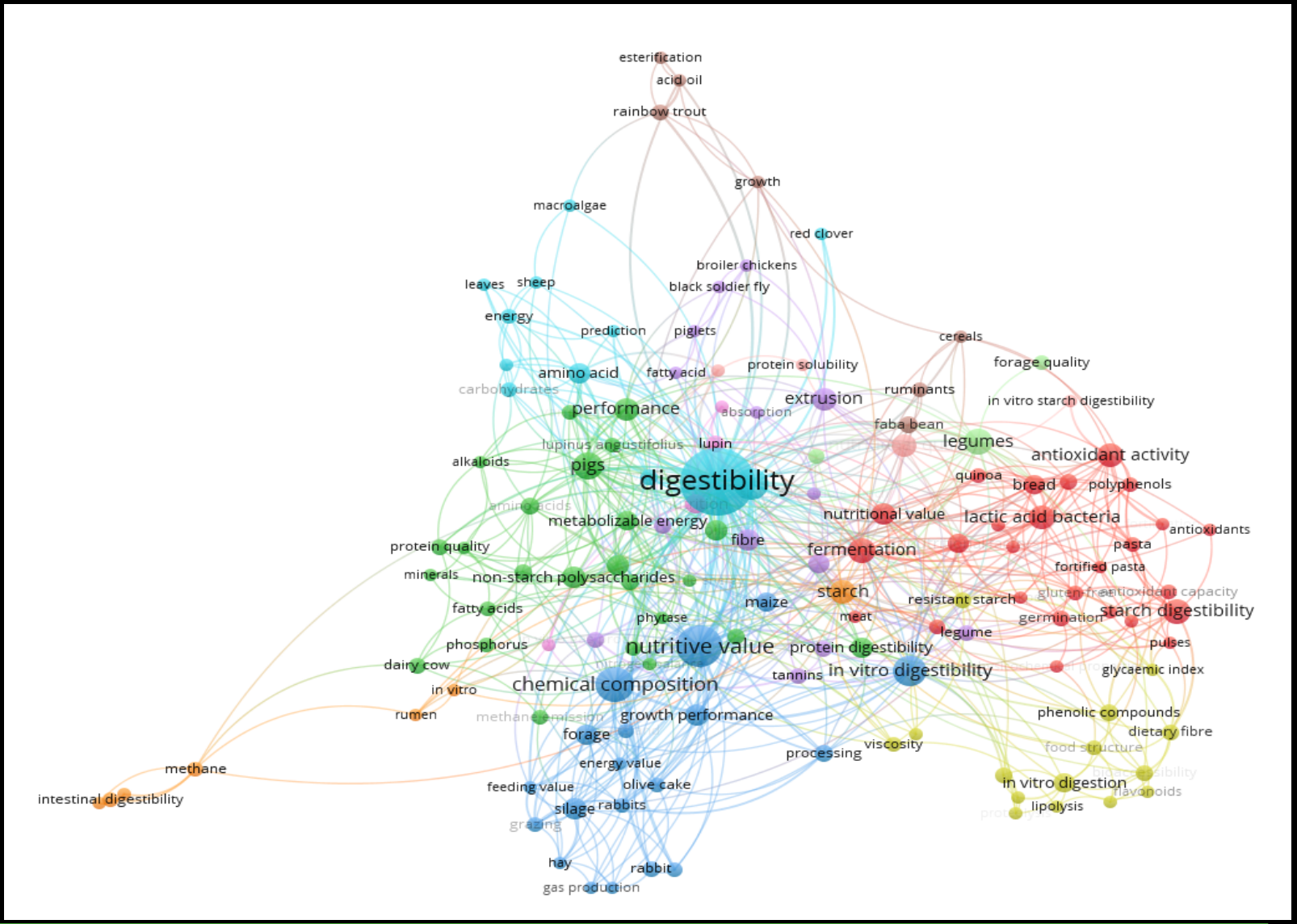
- ***Nutritional quality: Fatty acids – Omega3***

Main institutions and their interactions in the field ***"Fatty acids – Omega3"***



- ***Nutritional quality: Biomass digestibility***

Network of **keyword co-occurrence** *in the field* ***"Biomass digestibility"***



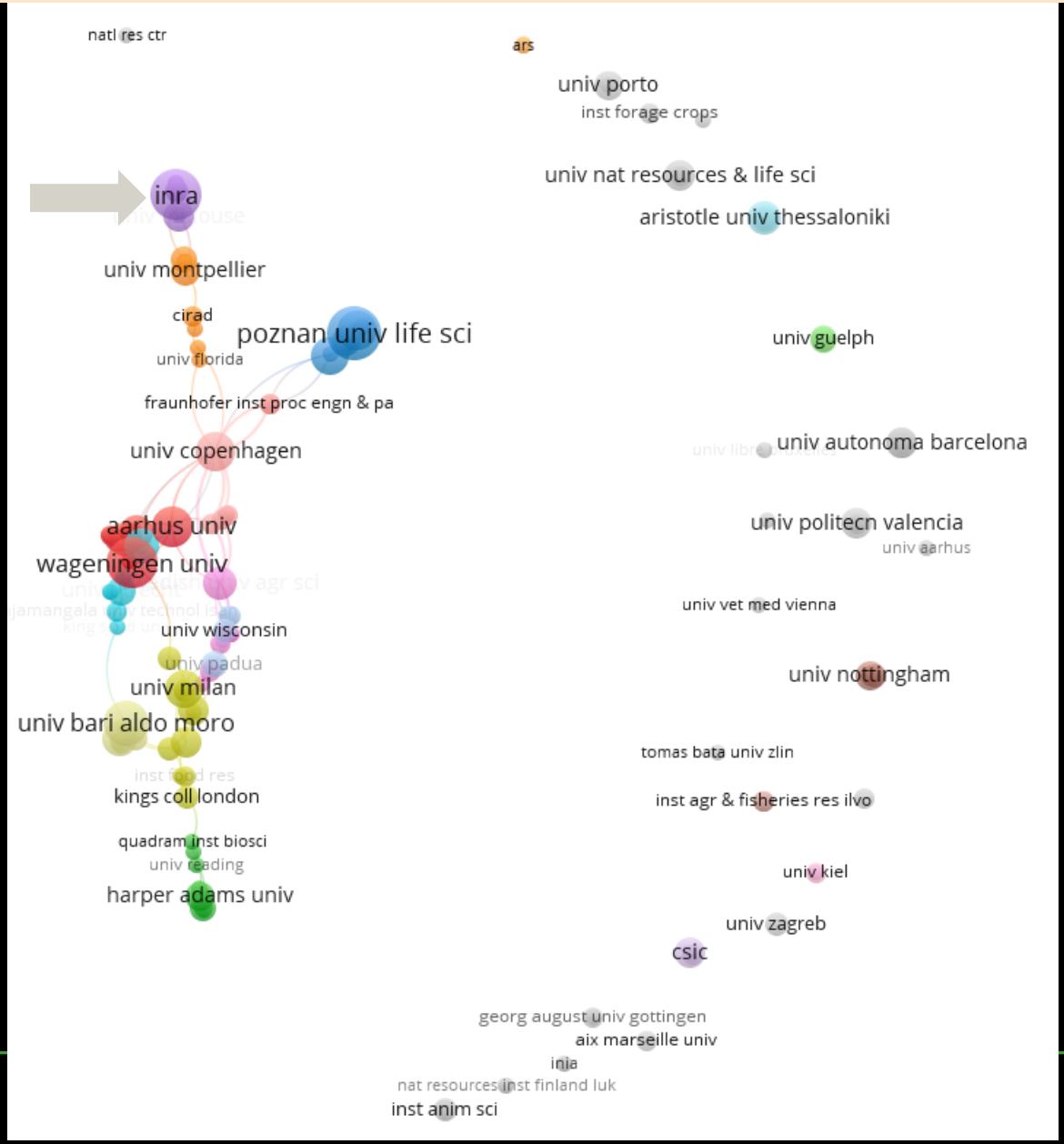
- **Nutritional quality: Biomass digestibility**

Main institutions in the field "Biomass digestibility"

Name	Rank	Web of Science Documents	Country/Region	Times Cited	Category Normalized Citation Impact	% Documents in Q1 Journals	% Docs Cited	% Document in Top 1%
Wageningen University & Research	1	29	NETHERLANDS	381	1.42	82.61%	75.86%	3.45%
INRAE	1	29	FRANCE	64	0.88	37.5%	55.17%	0%
Poznan University of Life Sciences	3	21	POLAND	134	1.8	25%	85.71%	4.76%
Consejo Superior de Investigaciones Cientificas (CSIC)	4	20	SPAIN	204	1.18	57.14%	95%	0%
Universita degli Studi di Bari Aldo Moro	5	16	ITALY	177	2.11	100%	75%	6.25%
Aarhus University	6	13	DENMARK	162	2.41	70%	84.62%	7.69%
Universite Clermont Auvergne & Associes	7	11	FRANCE	30	0.65	33.33%	63.64%	0%
Consiglio Nazionale delle Ricerche (CNR)	7	11	ITALY	94	1.23	44.44%	90.91%	0%
Swedish University of Agricultural Sciences	9	10	SWEDEN	102	1.36	60%	60%	10%
Polish Academy of Sciences	9	10	POLAND	39	0.87	66.67%	90%	0%
University of Copenhagen	11	9	DENMARK	97	0.78	66.67%	33.33%	0%
University of Liege	11	9	BELGIUM	43	1.01	16.67%	66.67%	0%
University of Helsinki	11	9	FINLAND	170	2.49	83.33%	100%	0%
Centre National de la Recherche Scientifique (CNRS)	11	9	FRANCE	51	1.25	50%	66.67%	0%
Aristotle University of Thessaloniki	15	8	GREECE	31	0.92	14.29%	100%	0%
University of Milan	15	8	ITALY	74	1.66	33.33%	100%	0%
Montpellier SupAgro	15	8	FRANCE	25	0.84	50%	75%	0%
University Hohenheim	15	8	GERMANY (FED REP GER)	28	0.74	80%	50%	0%
VetAgro Sup	15	8	FRANCE	24	0.54	33.33%	50%	0%
CIRAD	15	8	FRANCE	19	0.66	50%	75%	0%
University of Naples Federico II	21	7	ITALY	45	0.85	60%	85.71%	0%

Nutritional quality: Biomass digestibility

Main institutions and their networks in the field "Biomass digestibility"



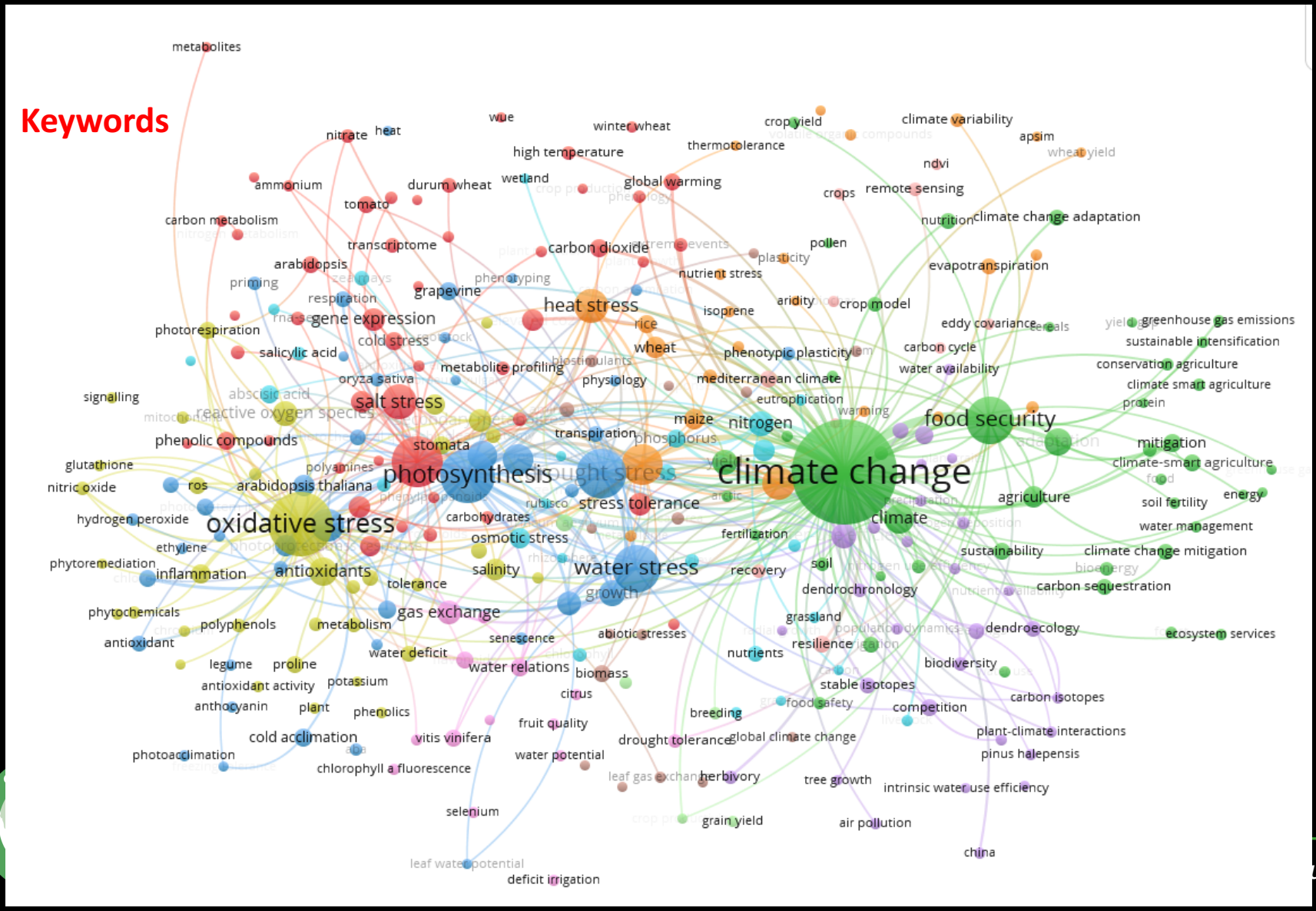
Etc...

Global analysis

–> Sustainability & Yield & Nutritional quality (*i.e.* >24,000 publications)

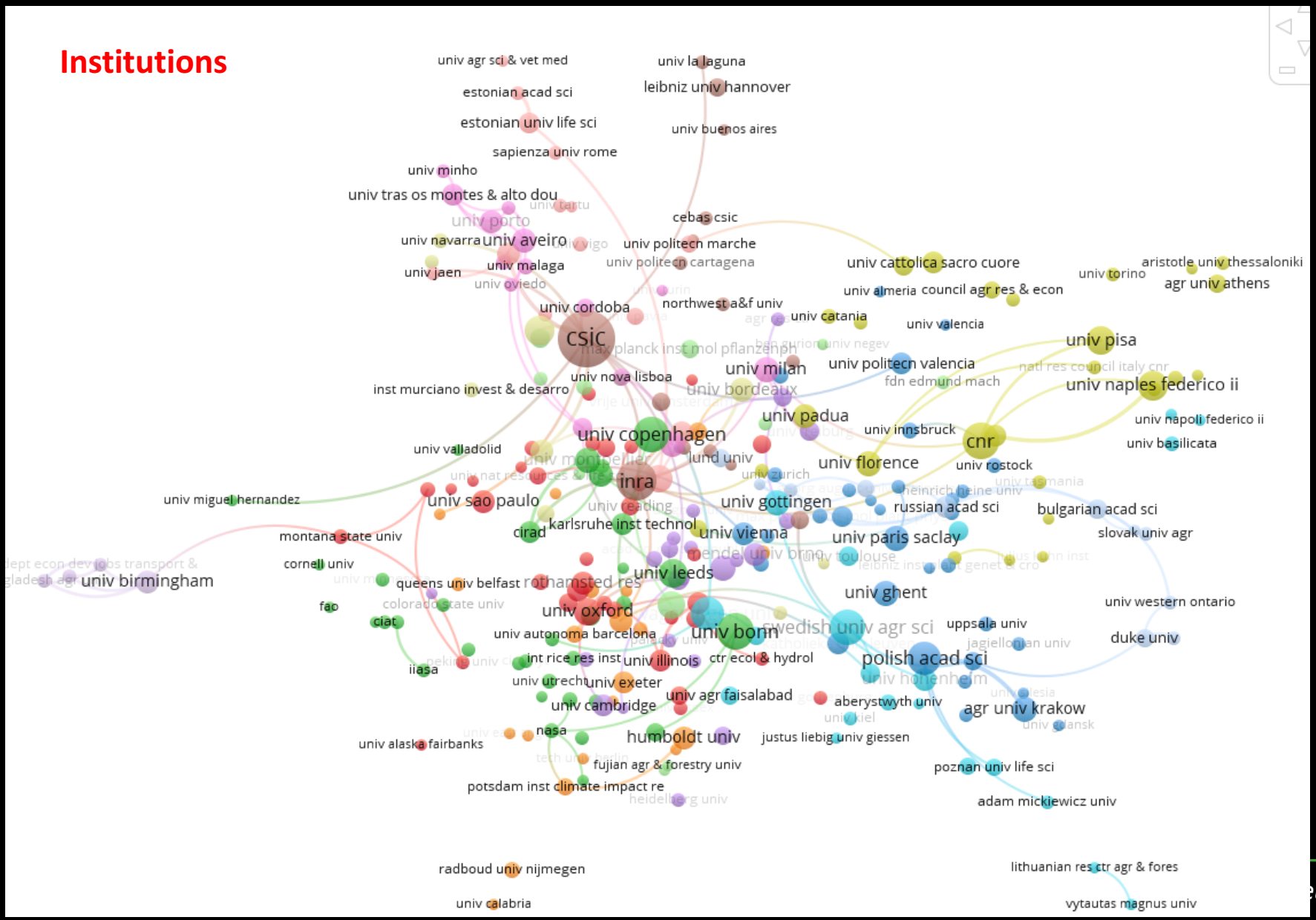
- **Climate change**
- **Stress**

Keywords: recent over-representation of keywords linked to climate change



Targeting "Mitigating the effects of global climate change"
–> Sustainability & Yield & Nutritional quality (*i.e.* >24,000 publications)

Institutions



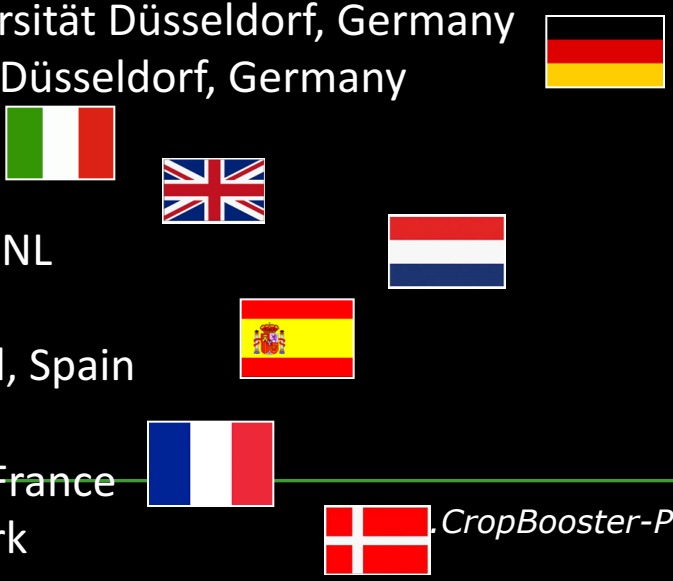
Major Players in Private-Public-Partnerships inside EU countries

- Applied Research communities (Private companies, R&D services of Cooperatives, Technical Institutes, networks of Experimental Stations etc.).

Method:

- Screening of the scientific production (**WoS**) during **five years (2015-2019)** (funding e.g. REMIX – H2020 – 727217, BACI – H2020 – 640176, FACCE SURPUS – H2020 – 652614, GoodBerry – H2020 – 679303, MycoKey – H2020 – 678781, PAPETS - FP7 – 323901, Innovine - FP7 – 311775, Watbio - FP7 – 311929…)
- List of actors coming from the biotechnology industries also inventoried using available **lists of previously funded projects by EU, DFG, ANR… + GABI** funded projects in Germany, **Biovegen** projects in Spain, private companies involved in the French Investments for the Future (**PIA**), private partners of the **French GIS-BV** (public private partnership for plant biotechnologies)…

Günter Strittmatter, Heinrich-Heine-Universität Düsseldorf, Germany
Peter Westoff, Heinrich-Heine-Universität Düsseldorf, Germany
Francesco Loreto, CNR, Roma, Italy
Erik Murchie, UNOTT, Nottingham, UK
Rene Klein Lankhorst, WUR, Wageningen, NL
Pablo Vera, IBMCP CSIC, Valencia, Spain
Gonzaga Ruiz de Gauna, Biovegen, Madrid, Spain
Peter Rogowsky, INRAE, Lyon, France
Norbert Rolland, INRAE/CNRS, Grenoble, France
Mathias Pribil, Univ. Copenhagen, Denmark



Major Players in Private-Public-Partnerships:
Inside Germany, and interaction of German PPPs with EU countries

1 Germany/Private Sector

- KWS SAAT SE & Co. KGaA
- Saaten Union Biotec GmbH
- BASF SE
- Norddeutsche Pflanzenzucht Hans Georg Lembke KG
- Bayer CropScience AG
- Nordasaat Saatzuchgesellschaft mbH

1 Germany / Public Sector

- Leibniz-Institut für Pflanzengenetik u. Kulturpflanzenforschung Gatersleben
- MPI f. Pflanzenzüchtungsforschung Köln
- MPI f. mol. Pflanzenphysiologie Golm
- Heinrich-Heine-Universität Düsseldorf
- Justus-Liebig-Universität Gießen
- Georg-August-Universität Göttingen
- Forschungszentrum Jülich
- Universität Hohenheim
- Christian-Albrechts-Universität zu Kiel
- Martin-Luther Universität Halle-Wittenberg

Major Players in Private-Public-Partnerships:
Inside France, and interaction of French PPPs with EU countries

2 France / Private Sector

- Bayer CropScience
- BASF SE
- Vilmorin
- Limagrain
- Innolea
- RAGT Semences
- Florimond Desprez
- Momont / KWS France
- Euralis/Caussade
- Syngenta
- Gautier Semences
- MAS Seeds
- Agri Obtentions
- Secobra
- Danone
- Nestlé
- Roquette
- Vegenov BBV

- Arvalis
- Vegepolys Valley
- Terres Inovia
- Sofiproteol
- Gnis

2 France / Public Sector

- **INRAE**
- **CNRS**
- **Cirad**
- **CEA**
- **IRD**
- **Institut Agro**
  (fusion of SupAgro and AgroCampusOuest in Montpellier)
- **Université Paris-Saclay**
  (incl. AgroParisTech + Université Paris-Sud)

Etc...

Public-Private-Partnerships in Europe: Summary

- Intensively used system in F, D, NL, DK, E, I, GB, B
- Strong interactions F/D, F/NL, F/E, NL/D, B/NL, D/GB, GB/NL, D/I, I/NL
- Independent organizations for steering in E and DK
- Major players visible in all countries, at public and at private level

Work package 4: International Cooperation [Months: 1-36]
INRAE, WR, VIB, WU, CNR, EPSO, UDUS, UNOTT, CNRS, UCPH, ULANC, USAMV CLUJ, ESA, ACTA

Task 4.1. This task aims to map the existing research communities using existing formal and informal EU networks **(M1-M18 ->M24).**
Task leader: UDUS; other partners: WR, VIB, CNR, EPSO, UNOTT, CNRS, UCPH, INRA, ULANC, USAMV, ESA, SORBONNE, ARVALIS

- Research communities (physiologists, geneticists, breeders, modellers, agronomists, socio-economists, pathologists, etc…) who are mostly coming from academic organisations (Research Institutes and Universities).

- Create a network model of existing or lacking interactions from the mapping of national or international communities and projects, and their distribution within Europe.

- Applied Research communities (Private companies, R&D services of Cooperatives, Technical Institutes, networks of Experimental Stations etc.).

- Selecting people from all partners at European level (including 13 SHG members) to assemble an expert panel (see later, focus groups).




Work package 4: International Cooperation [Months: 1-36]
INRAE, WR, VIB, WU, CNR, EPSO, UDUS, UNOTT, CNRS, UCPH, ULANC, USAMV CLUJ, ESA, ACTA

Task 4.2. This task aims to link research communities identified during task 4.1 by organizing joint meetings betweeen plant scientists **(M12-M24 ->M28).**
Task leader: INRAE; other partners: WR, VIB, WU, CNR, EPSO, UDUS, UNOTT, JKI, CNRS, UCPH, ULANC, USAMV, ACTA, ESA

- Organize networking activities with the different Research communities to identify experts for sustainable improvement of crop yield, and nutritional quality (link with WP1).

- Organize a joint meeting between European plants scientists from different disciplines and ongoing research programs to inventory areas of sustainable improvement of crop yield, and nutritional quality.

- Assemble an expert panel to review strategies (see task 4.3)

Focus groups

●Organize networking activities with the different Research communities to identify experts for sustainable improvement of crop yield, and nutritional quality (link with WP1).

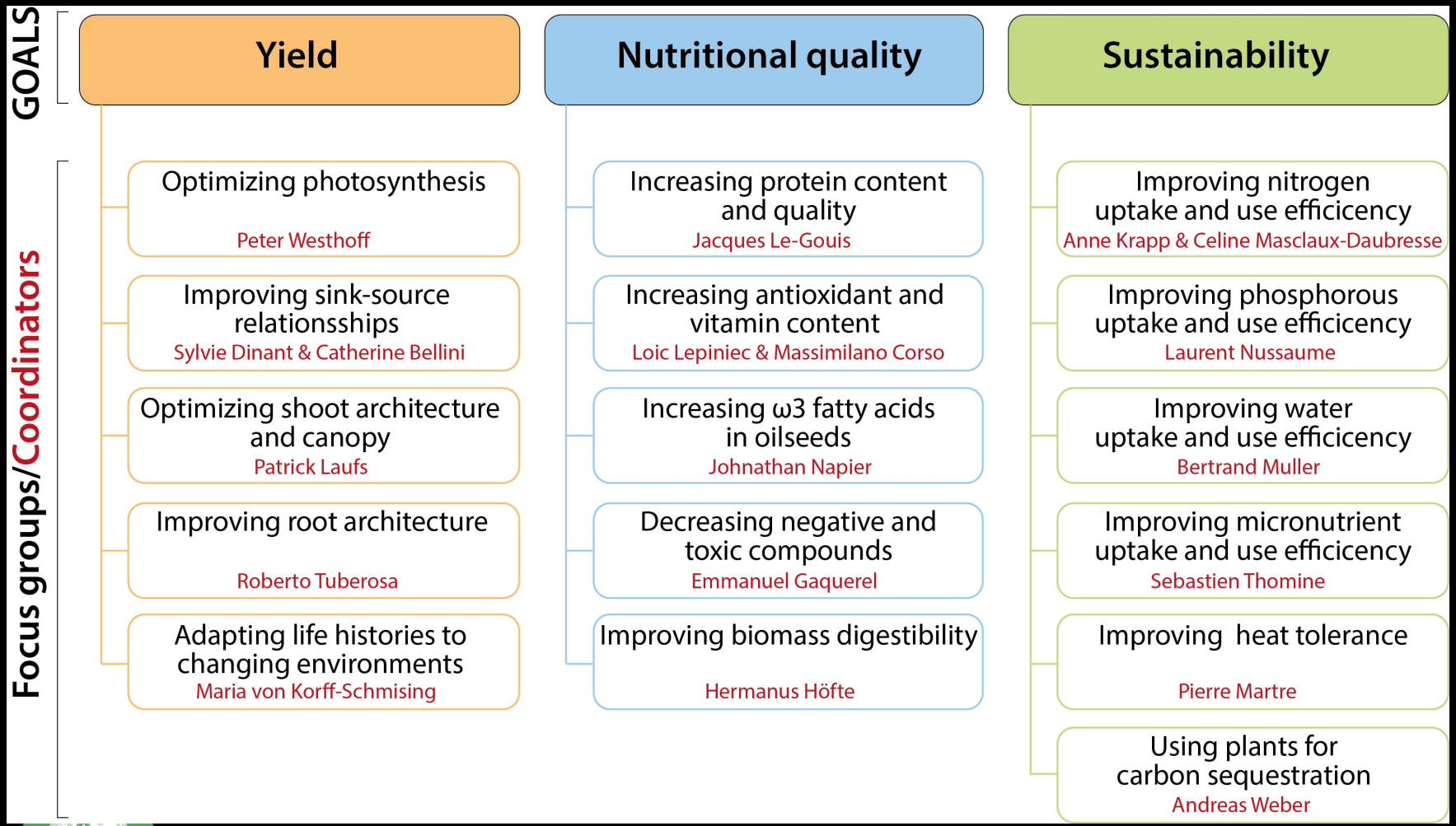
To limit the number of these "Focus groups", and thanks to the literature screening and to the work performed in the frame of the WP1, only seven "Focus groups" were originally planned:

- Nutrient use efficiency
- Water use efficiency
- Photosynthesis: light capture and carbon assimilation
- Nutritional quality and secondary metabolism
- Shoot and root architecture and the canopy
- Source/sink balance
- Environmental abiotic stresses due to climate change: adaptation and mitigation

However, first contacts performed at Germany and France (INRAE and CNRS) scale did not allow to identify experts able to coordinate groups combining both nitrogen and phosphorus assimilation, or even, shoot and root architecture…

Focus groups & their coordinators

(According to WP1, WP2, and literature screening in WP4)



Focus Groups: Tasks of Coordinators

1. **Gathering a team of experts**

- Organize networking activities with the different Research communities

2. **Report (end of January 2021)**

- Status quo of research in the field
  - Current know-how
  - Most relevant latest research results
  - Trends in research, new technology applied or potentially applicable

- Future challenges in the field to be addressed with high priority
  - What are the most relevant unsolved questions (questions scientific questions, societal and economic challenges)
  - Aspects/opportunities for application of research results

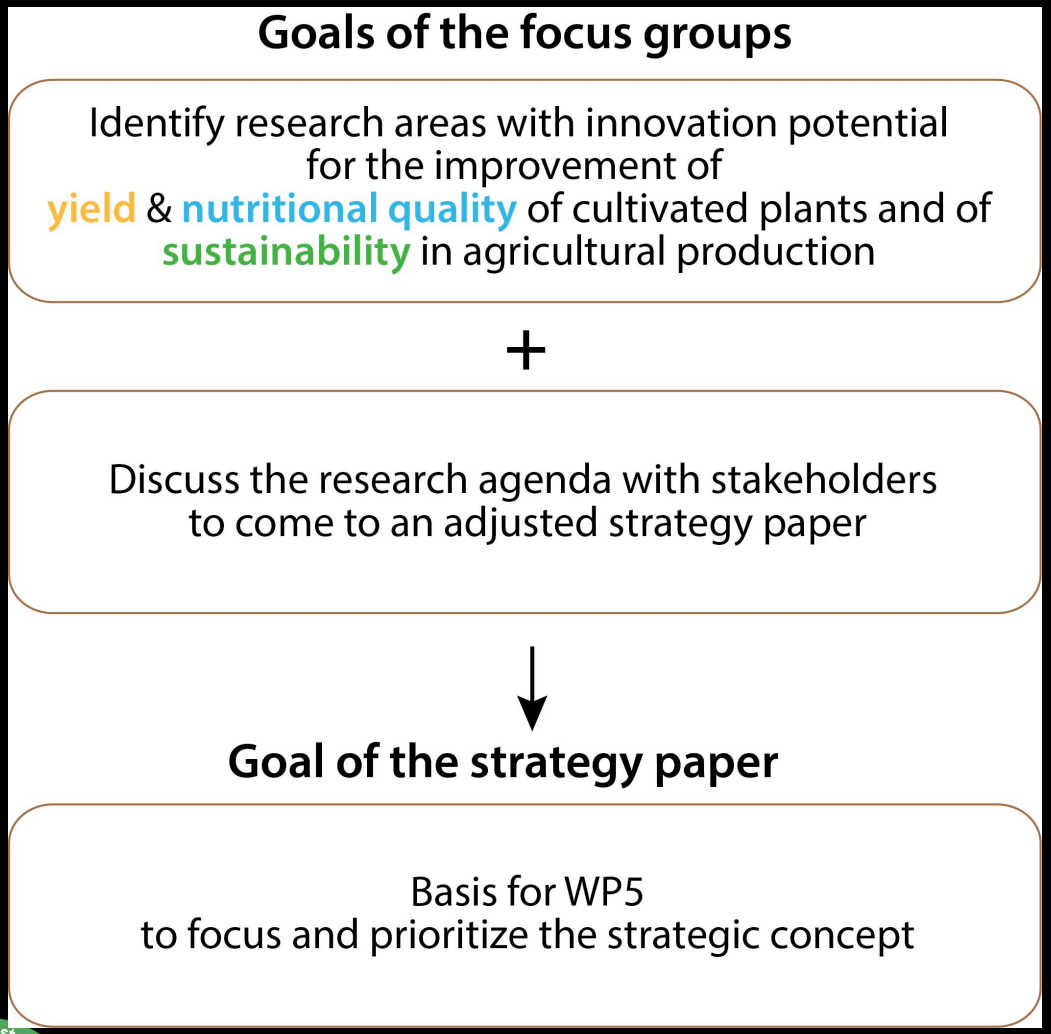
- Action points for a future research program in the field
  - What needs to be done to solve the scientific questions and to meet the societal and economic challenges ?
  - Projects with application relevance
  - What needs to be done to support the translation of research results into societal and economic value?

3. **Presentation/discussion of report at Versailles-Meeting (23-25 March 2021)**

- Organize a joint meeting between European plants scientists from different disciplines

4. **Coming to a joint proposal of action points adjusted between all Focus Goups**

Perspectives (WP4, tasks 4.2 and 4.3)



- Organize networking activities with the different Research communities
- Organize a joint meeting between European plants scientists from different disciplines
- Assemble an expert panel to review strategies (see task 4.3)

Participants

Task 4.1

- Dominique Fournier, INRAE, Montpellier, France
- Rene Klein Lankhorst, WUR, Wageningen, NL
- Francesco Loreto, CNR, Roma, Italy
- Jacqueline Martin-Laffon, CNRS, Grenoble, France
- Bertrand Muller, INRAE, Montpellier, France
- Erik Murchie, UNOTT, Nottingham, UK
- Philippe Nacry, INRAE, Montpellier, France
- Mathias Pribil, Univ. Copenhagen, Denmark
- Peter Rogowsky, INRAE, Lyon, France
- Norbert Rolland, INRAE/CNRS, Grenoble, France
- Gonzaga Ruiz de Gauna, Biovegen, Madrid, Spain
- Günter Strittmatter, Heinrich-Heine-Univ. Düsseldorf, Germany
- Pablo Vera, IBMCP CSIC, Valencia, Spain
- Peter Westoff, Heinrich-Heine-Univ. Düsseldorf, Germany

Task 4.2

- Catherine Bellini, INRAE, Versailles, France + UMEA Univ., Sweden
- Massimiliano Corso, INRAE, Versailles, France
- Sylvie Dinant, INRAE, Versailles, France
- Emmanuel Gaquerel, Univ Strasbourg, France
- Hermanus Höfte, INRAE, Versailles, France
- Anne Krapp, INRAE, Versailles, France
- Patrick Laufs, INRAE, Versailles, France
- Jacques Le-Gouis, INRAE, Clermont-Ferrand, France
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- Peter Westoff, Heinrich-Heine-Univ. Düsseldorf, Germany

Planning Milestones and Deliverables year 3

D4.1 Network map of research networks available for further scientific interactions. M22 (September 2020, End of November 2020)

MS10 (WP3) 1st social actor consultation. M24 (November 2020)

D5.4 Report describing the framework for expressing the moral correctness of the programme M24 (November 2020/February 2021)

MS18 (WP5) Research Plan Workshop organized. M25 (December 2020/May 2021)

D5.3 Report describing programme management structure M25 (December 2020/April 2021)

D3.1 Consultation report on the first consultation step. M26 (January 2021)

MS15 (WP4) Expert panel assembled to define scientific and technical strategies. M27 (February 2021 = Focus group coordinators Nov. 2020)

MS16 (WP4) Joint meeting organized between European plant scientists and expert panel identified. M27 (23-25 March 2021)

MS17 (WP4) Draft review papers and research visions to feed WP5. M27 (February 2021 = Reports of Focus group coordinators Feb. 2021 OK)

MS11 (WP3) 2nd social actor consultation. M28 (March 2021/April 2021)

MS19 (WP5) Draft report ready and sent for review. M28 (March 2021/September 2021)

D2.4 Integrated impact assessment outcomes report to the commission. M30 (May 2021/August 21)

D5.6 Research plan for a future European crop yield programme M30 (May 2021/November 2021)

MS20 (WP5) Draft white paper submitted to programme members and SHG for review. M32 (July 2021/January 2022)

D4.2 White paper and scientific basis of a strategic research agenda M33 (August 2021/November 2021)

D3.2 Consultation report on the second consultation step. M34 (September 2021)

MS21 (WP5) Revised version submitted to programme members and SHG for review. M34 (September 2021/February 2022)

D3.3 Recommendation dossier on mid-term outreach measures to increase public awareness and understanding of novel technologies. M36 (November 2021/February 2022)

D5.7 White paper describing the route to improved crop yields in Europe, including the future consortium M36 (November 2021/April 2022)