State of the art of existing breeding initiatives & actions planned to strengthen collaborations

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Summary

In order to strengthen organic breeding, it is important to know the state of the art when it comes to organic breeding, breeding for organic, and in what crops most organic breeding is currently conducted. Based on public information, input from LIVESEED partners and a survey, a list of in total 99 initiatives was compiled. Per breeding initiative, the list provides information of the activities, contact details, crops worked on, type of breeding approach and type of organisation, and interest in collaborative crop group work. The 99 initiatives include commercial breeding enterprises, SMEs, NPO's, farmer breeders, universities and other public institutions. Based on a descriptive analysis, an overview is provided on these 99 initiatives: type of organisation, way of breeding, crop types, and interest in type of collaboration. Activities and approaches are described to strengthen collaboration among these initiatives in various ways. This is done through a timeline with a focus on 1) crop specific network activities in Task 3.4 (supporting small breeding initiatives for White lupin, brassica, apple, winter wheat and tomato); 2 crop group-based breeding activities part of Task 6.1.2 (Capacity building for different crop categories) and 3) Concept of system-based breeding developed in Task 3.1 (Developing novel breeding concepts and modern strategies for organic and low-external input farming systems - from trait-based to system-based strategies). Initiatives and the results of their screening are summarized in Annex I.

1. Introduction

In order to strengthen organic breeding, it is important to know the state of the art of existing initiatives, programs and networks of organic breeding and breeding for organic, and in what crops most organic breeding is currently conducted. Although the number of organic breeding initiatives are growing, as a whole, organic breeding is still relatively marginal compared to conventional breeding. Next to more financial support, another solution to make organic breeding more effective is by improving collaborations. Collaboration can entail, amongst others, improved exchange of knowledge (breeding tools and approaches) or the exchange of material. In LIVESEED, several activities have been set up to improve collaboration, such as crop-specific breeding activities, crop-group activities and systems-based breeding approaches. For each of these activities, timelines have been developed to strengthen collaborations. This shall improve on one side the capacity building of existing organic plant breeding programs for respective crops and help to identify breeding gaps for those crops, where no activity could be mapped so far.

1.1. Definition of Organic Plant Breeding (OPB)

Organic Plant Breeding is defined by the IFOAM International norms of 2014 **Article 4.8 Breeding of organic varieties.** Organic cultivars are obtained by an organic plant breeding program which fulfils following requirements:

- 4.8.1 To produce organic varieties, plant breeders shall select their varieties under organic conditions that comply with the requirements of this standard. All multiplication practices except meristem culture shall be under certified organic management.
- 4.8.2 Organic plant breeders shall develop organic varieties only on the basis of genetic material that has not been contaminated by products of genetic engineering.
- 4.8.3 Organic plant breeders shall disclose the applied breeding techniques. Organic plant breeders shall make the information about the methods, which were used to develop an organic variety, available for the public latest from the beginning of marketing of the seeds.
- 4.8.4 The genome is respected as an impartible entity. Technical interventions into the genome of plants are not allowed (e.g. ionizing radiation; transfer of isolated DNA, RNA, or proteins).
- 4.8.5 The cell is respected as an impartible entity. Technical interventions into an isolated cell on an artificial medium are not allowed (e.g. genetic engineering techniques; destruction of cell walls and disintegration of cell nuclei through cytoplast fusion).

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Most important characteristics of OPB programs is that **all breeding steps** from crossing till final selections take place **under organic conditions** and that the applied breeding techniques are in accordance with the techniques listed in the Annex of the position paper of **IFOAM International for organic breeding** from November 2017. Moreover, cultivars derived from OPB shall also not be patented.

1.2. Definition of Decentralized Organic Plant Breeding (DOPB)

Programs for decentralized organic plant breeding are in line with OPB as described above. The main characteristic of DOPB is that breeding and selection is not done at a central breeding nursery, but **locally distributed (decentralized) with local actors and different forms of collaboration**.

1.3. Definition of Plant Breeding for Organic (BfO)

Breeding programs for organic are more product oriented and have a special focus on the breeding goals which are specific for organic agriculture (e.g. tolerance against seed born diseases, weed tolerance, nutrient use efficiency), they do not use critical breeding techniques and selection occurred at least partially under organic conditions. BfO programs fulfil following requirements:

- Plant breeders shall select their cultivars at least in the final selection steps under organic conditions. All multiplication practices except meristem culture shall be under certified organic management.
- Plant breeders for organic shall develop varieties only on the basis of genetic material that has not been contaminated by products of genetic engineering.
- The genome is respected as an impartible entity. Technical interventions into the genome of plants are not allowed (e.g. ionizing radiation; transfer of isolated DNA, RNA, or proteins).
- The cell is respected as an impartible entity. Technical interventions into an isolated cell on an artificial medium are not allowed (e.g. genetic engineering techniques; destruction of cell walls and disintegration of cell nuclei through cytoplast fusion).

Most important characteristics of OPB programs is that **derived cultivars are suited for organic production** and that the applied breeding techniques are in accordance with the techniques listed in the Annex of the position paper of **IFOAM International for organic cultivation** from November 2017.

Further information on OBP and BfO can be found in the position paper on organic plant breeding of the European Consortium for Organic Plant Breeding (ECO-PB (2012).

2. Short description of activities

First, a list of existing breeding initiatives with their respective activities was compiled based on existing knowledge of ECO-PB, DEMETER International and the input from all LIVESEED partners amended by literature and online research. This list was submitted in May 2018 (Milestone 3.2). In a second step, a survey was conducted from July to September 2019 to reach out to these breeding initiatives and unknown initiatives via partner contacts and social media. 27 new initiatives were identified and the list now contains a total of 99 initiatives (see Annex 1).

Per breeding initiative, the list gives a brief description of the activities, contact details, crops worked on, type of breeding approach and type of organisation, interest in crop groups to work on, interest to be involved in LIVESEED in Task 3.4. on supporting small existing breeding initiatives & initiating new collaborations to close gaps in various crops. In the survey, people working in organic breeding were also asked how they would like to be involved in LIVESEED besides Task 3.4. and if they want to become an official stakeholder of LIVESEED.

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3. Overview of the initiatives and their interest in collaboration

The 99 initiatives include commercial breeding enterprises, SMEs, NPO's, farmer breeders, universities and other public institutions. Most of the initiatives in the list were categorised as NPO, SME or public institution (Table 1).

Table 1: Organic breeding and seed initiatives organised per category (total N = 99)

Category	N = 99
Farmer breeder	7
Large enterprise	6
Non-Profit Organisation (NPO)	33
Public	26
Small & Medium Enterprise (SMEs)	27

Several of the respondents have indicated to be involved in several breeding activities, hence the total number of ways of breeding is higher than the number of initiatives in the list. For example, an initiative can do organic breeding (OPB) in one crop, but breeding for organic (BfO) for other crops. The list does not only include organic breeding initiatives, but also conventional enterprises breeding for organic or doing organic seed multiplication. The number of decentralised organic plant breeding initiatives (DOPB) is relatively high. The category "other" are initiatives that do, amongst others, variety testing under organic conditions, pre-breeding, research on organic breeding and education (Table 2).

Table 2: The breeding approaches of the initiatives in the list (N = 99)

Way of breeding	N = 132
Organic Plant Breeding (OPB)	56
Breeding for Organic (BfO)	26
Conventional breeding, organic seed production (CB OS)	8
Decentralised Organic Plant Breeding (DOPB)	21
Other	21

Together the initiatives cover a wide range of crops, with a strong focus on cereals, grain legumes and vegetables (Table 3).

Table 3: Crop groups that the initiatives work on (N= 70)

Crop group	N
Cereals (wheat, barley, oat, rye)	28
Maize/millet/sorghum	9
Grain legumes	17
Oil crops	3
Potato	8
Forage crops	5

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Vegetables	31
Fruits	10
Grapes	1
Others	8

Of the 99 initiatives listed in Annex 1, 35 initiatives indicated their interest in collaboration in breeding. Most of the interest is in cereals, grain legumes, vegetables and fruits (Table 4). Several of the respondents showed interest in multiple crop groups. Most of these respondents are not directly involved in LIVESEED (neither partner, nor stakeholder).

Table 4: Interest in collaboration in breeding per crop group (N = 35).

Crop group	N
Cereals (wheat, barley, oat, rye)	19
Maize/ millet/ sorghum	4
Grain legumes	13
Oil crops	4
Potato	3
Forage crops	5
Vegetables	22
Fruits	10
Grapes	2

Specifically connected to "collaboration in crop breeding networks" as part of Task 3.4 of LIVESEED, most interest was in winter wheat, tomato and various brassica (Table 5). The lower numbers can be explained by the fact that Task 3.4 is dealing with crop specific breeding networks, whereas Table 4 shows a more general interest in crop groups.

Table 5: Interest in collaboration in specific crop breeding networks part of Task 3.4 of LIVESEED (N = 35).

Crop breeding network	N
Apple	3
Brassica (cabbages: broccoli, cauliflower, head cabbage, kohlrabi)	11
Tomato	11
White lupin	4
Winter wheat	9

Of those 35 respondents, many are interested in multiple different approaches of collaboration, including setting up initiatives for the future (Table 6). The systems-based breeding approach got the lowest number of responses, which can be attributed to the fact that it is still relatively unknown.

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Table 6: Forms of collaboration in (organic) breeding respondents showed interest in (N = 35)

Form of collaboration	N =
Exchange of information digitally	25
Cross visits, mutual learning in person etc.	20
Systems based breeding	8
Collaborative/ participatory breeding etc. -* if it fits the timescale of project, or in the future	20
Participation in crop-specific working groups of LIVESEED	17
Initiating/ developing collaborative breeding proposals for the future	14
Participating at LIVESEED workshops/events etc on a crop-specific issue	20
Setting up joint trials	18
Exchange breeding material	15

4. Timelines to strengthen collaborations

Several activities are conducted to strengthen collaborations. Some activities are of a more practical nature, such as exchanging material or knowledge on breeding tools and methods, whereas other activities are about further developing breeding strategies, such as the systems-based breeding approach. The systems-based breeding approach is considered very important as a new approach to integrate the diversity of cultural and socio-economic aspects into breeding, leading to an increase in the plurality of breeding approaches used in practice, and eventually contributing to the maintenance and increase of agrobiodiversity and the development of a large range of cultivars suited for organic agriculture.

The following activities for collaboration are being worked on in LIVESEED:

- Exchange of information digitally
- Cross visits, mutual learning in person etc.
- Collaborative/ participatory breeding etc. (either within or after the timeframe of LIVESEED)
- Initiating/ developing collaborative breeding proposals for the future
- Participating at LIVESEED workshops/events etc. on a crop-specific issue
- Exchange of breeding material
- Setting up joint trials (either within or after the timeframe of LIVESEED)

4.1. Crop specific network activities in Task 3.4

In the Task 3.4 five crop specific networks are being developed: apple, brassica (cabbages: broccoli, cauliflower, head cabbage, kohlrabi), tomato, winter wheat and white lupin. Each network is being developed in a separate sub-task, as each network is dealing with crop specific breeding gaps. Each sub-task has developed its approach to organise meetings, set up trials and have a joint approach. Organisations not yet involved in the crop specific activities (partners, stakeholders and others identified through the survey) will be invited to join the activities. These activities can be cross-visits, setting up joint trials, exchange breeding material and to develop collaborative and/or participatory breeding.

Currently, the activities in the five subtasks are being compared and analysed, to understand what exactly are the key-elements to foster and support breeding networks. Some of the identified factors for building breeding networks so far are:

- Common interest / common need
- Goal /Focus (variety improvement / specific traits)
- Building trust among partners

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- Type of actors involved (level of congruency between skills, knowledge)
- Group size and diversity in backgrounds
- Crop type (reproduction system, annual/bi-annual crop, rate of reproduction)
- Crop specific related knowledge: the current status of knowledge on breeding
- Breeding approach (mass selection, cross breeding, molecular markers, GxE interaction, focused on homogeneous varieties, populations, participatory, decentralized, etc.)
- Type of material tested (population, breeding lines, varieties, landraces, etc.)
- Capacity and type of infrastructure for testing (on-farm trials, experimental plots, etc.)
- Possibility of combining / integrating / connecting different approaches
- Availability of methods for testing (visual, lab analysis, phenotyping tools etc.)
- Evaluation: set up of design, level of participation, sharing of templates
- Exchange of material (limited, free, etc.)
- Scale / economic importance of the crop
- Funding resources (licence, cross-financing, foundations, etc.)
- Timeline (manpower, congruency in time)
- Exchange of knowledge (facilitator can play an important role)
- Involvement of other value chain actors (facilitator can stimulate this)

This information will be further elaborated in Deliverable 3.4. This knowledge will be very important to effectively set up new breeding initiatives and networks. It will also help to initiate new collaborative breeding proposals for the future.

4.2. Crop group-based breeding activities across WPs of LIVESEED

In crop specific groups information will be shared through CIVI mails (Exchange of information digitally) and through digital conference meetings. Those initiatives who indicated to work on, or have interest in a particular crop groups will be invited for collaboration and information exchange. The aim of outreach to these initiatives is to strengthen networks and knowledge exchange. This will on one hand improve the capacity of the organic breeding landscape in Europe and inspire new initiatives to get involved in OPB, DOPB, or BfO. On the other hand, this will also improve efficiency of individual breeding programs through synergies, collaboration and co-development of knowledge. LIVESEED will also profit from the expertise and experimental knowledge of these initiatives.
Collaborative and/or participatory breeding approaches may be tools to facilitate the crop group based breeding activities among different actors. It is envisaged, that these activities will continue after the timescale of the LIVESEED project, as breeding takes many years (often more than 10 years) to produce results. Where possible, synergy with activities in Task 3.4 will be looked for. In those crop groups where good collaborations have developed another next step will be to initiate collaborative organic breeding proposals for the future. This will eventually result in joint trials, the exchange of breeding material and cross visits with mutual learning in person beyond the scope of LIVESEED.
Workshops and conferences organized or supported by LIVESEED or the related projects like DIVERSIFOOD, BRESOV and ECOBREED are good opportunities for peer to peer meetings and exchange.

The timeline for outreach and potential participation/collaborations are as follows:
2018 February: Nürnberg biofach 2018 in Germany

- Presentation of LIVESEED at the first common exhibition of organic animal and plant breeders

2018 February: Witzenhausen Organic Breeders Day in Germany

- Organic breeders from European initiatives present their work and breeding approaches and exchange with researchers
- Building a maize crop group working on population breeding and common proposal
- Installing young breeder – mentor (experienced older breeders) network run by ECO-PB

2018 July: Frick Organic Breeding Workshop in Switzerland

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- Presentation of results of ongoing OPB and BfO breeding activities in Switzerland to discuss closer collaboration

2018 December: Rennes DIVERSIFOOD final Congress

- Presentation of LIVESEED to reach out to a broad audience of breeders and researchers involved in organic and participatory breeding

2019 February: Nürnberg biofach 2019 in Germany

- Presentation of LIVESEED together with BRESOV and ECOBREED at the second common exhibition of organic animal and plant breeders with own booth to get in contact with the various breeding initiatives

2019 June: 10th Lets Liberate Diversity Forum in Denmark

- Presentation of LIVESEED network activities

2019 August: 2th Symposium on participatory research to foster innovation in agriculture in Switzerland

- Presentation of international case studies on participarory plant breeding
- Presentation of the multi-actor approach of LIVESEED

2020 August: Summer school on participatory breeding and sustainable seed systsems in The Netherland (need to be confirmed)

- Training in key elements of participatory plant breeding

2020 September: Seed Ambassador Preconference of the Organic World Congress (OWC) in France

- Develop international network of organic breeders and seed producers across continents, generations, and cultures to promote a diversity of breeding approaches and actors in order to develop cultivars suited for organic agriculture

2020 September: Workshop on the Organic World Congress on breeding for agroforestry (to be confirmed)

2020 November: sessions at the LIVESEED Project Final Conference in Brussels

2021 March: sessions at the final LIVESEED Scientific Conference in Latvia

4.3. Concept of system-based breeding

This concept developed by Lammerts et al (2018)[1] as part of the work in Task 3.1 will be a vehicle to further develop organic breeding from a holistic perspective integrating technological and socio-economic aspects. To further develop this concept in the scope of LIVESEED, a number of open workshops has been organised, and will be organised in the second part of the project, in addition to sessions at the annual project meetings.

The timeline for collaborations currently are as follows:

2018 February: Witzenhausen workshop in Germany

- Presentation of holistic perspective on organic plant breeding and sharing of ideas on further developments
- See Deliverable 3.10 for more information

2018 December: workshop linked to Diversifood Congress in France

- Further elaboration of the system-based breeding concept and next steps

2019 February: biofach 2020 workshop in Germany

- Working with the holistic perspective on organic plant breeding: how to implement it?
- Networking opportunity for organic plant breeders
- See Milestone 3.5 for more information

2020 September: preconference at OWC 2020 and workshop at the stakeholder forum

[1] Lammerts van Bueren, E. T., Struik, P. C., van Eekeren, N., & Nuijten, E. (2018). Towards resilience through systems-based plant breeding. A review. Agronomy for Sustainable Development, 38(5), [42]. https://doi.org/10.1007/s13593-018-0522-6

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- The preconference is titled ‘Seed Ambassadors: building an international network to advance organic seed systems’
- Involving other stakeholders in organic plant breeding: what is their role from a holistic perspective?

2020 November: sessions at the LIVESEED Project Final Conference in Brussels
2021 March: sessions at the final LIVESEED Scientific Conference is Latvia

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Annex 1. List of Organic Breeding Initiatives in Europe and other parts of the world

Name	Information	Country	Website	Type of Breeding: Organic Breeding (OPB), Breeding for Organic (BfO), Conventional breeding, organic seed production (CBOS), Decentralised Organic Plant Breeding (DOPB)	Planned contributions to different LIVESEED sub-tasks in WP 3 (black=planned by LIVSEED subtask leaders, green=organiation showed interest); capital letters= type of interaction, listed after the table on Page 19*)
FiBL Austria	The Research Institute of Organic Agriculture (FiBL) was founded in 1973 and is situated in Frick since 1997. It is one of the world's leading research and information centres for organic agriculture and employs over 175 experts. The close links between different fields of research and the rapid transfer of knowledge from research to advisory work and agricultural practice are FiBL's strengths. Outside Switzerland the Institute's competence is also sought after, and FiBL is involved in numerous international projects – not only in research, consultancy and training but also in development cooperation. Maintenance breeding and selection of traditional landrace "Schlägler Rye".	Austria	http://www.fibl.org/en/austria/work-areas-at/crop-and-vegetable-production.html	OPB, Other	
AGES	AGES has been performing variety trials in organic farming since 1996. In 2002 organic VCU-testing in winter wheat started. In 2019 organic VCU-trials and additional non-VCU organic trials were performed at the following species: winter barley, winter rye, winter triticale, winter wheat, winter spelt wheat, spring common wheat, spring oat and potato.	Austria	https://www.ages.at	Other	
Rein Saat	ReinSaat was established in 1998 and since then has been providing an extensive offer of varieties for commercial horticulture and domestic gardens which are adapted to the needs of organic farming methods. They combine quality which is reflected in appearance, taste and aroma with reliable yields. They focus on the development of regionally adapted open pollinated varieties which enable to improve the plants health and to coordinate the harvesting time more easily for the growers. They have over 30 propagation facilities which are located in varying climatic zones in Austria and the neighbouring countries.	Austria	https://www.reinsaat.at/	OPB	
Saatzucht Edelhof	Plant Breeding for Organic. Wheat breeding for low input and organic farming	Austria	https://www.saatzucht.edelhof.at/	BfO	
Saatzucht Donau GmbH &CoKG	Plant Breeding for Organic. Wheat breeding for low input and organic farming	Austria	http://www.saatzucht-donau.at/	BfO, CB OS	2.1 D, E
Netwerk Zelf Zaden telen	An informal network of farmers conducting selection and maintenance of open pollinated varietes on their own farms, with a focus on vegetables	Belgium	http://www.zelfzadentelen.be/	DOPB	
Novafruits	A new organic grower association in Northern France and Belgium works on participative apple breeding	Belgium	http://www.cra.wallonie.be/fr/novafruits-en-pommes-et-poires-des-varietes-creees-en-bio-et-bas-intrants	DOPB	
Agrologica	The key topic for Agrologica is organic seed production, in particular conservation of plant genetic resources, plant breeding, seed health and seed vigour, but we have also implemented projects related to relation between agricultural politics and environmental effects of production. However, with our long experience within organic farming and with our fine network within the sector, we are able to assist in all areas of the sector including trade, certification and production. Agrologica is involved in a number of projects, which along with a list of publications gives an impression of the expertise in the company.	Denmark	http://www.agrologica.dk/	OPB	4.5
Melholt Korn	A novice plant breeder.	Denmark	http://www.melholt-korn.dk/login/	OPB	2.1, 4.4 D, C, E

NGO Maadjas	We are a seed saver organisation that reproduce heritage varieties that we find in people's gardens. We make garden inventories and documentation for what we find.	Estonia	www.maadjas.ee	Other	2.1, 4.3, 4.4 D, M
Luomuliitto ry - Finnish Organic Farmers Association	We don´t have any activities at the moment going on, but we are interested in starting a development project to support farmers to breed landrace, heirloom and traditional cereals on the farms that could also be developed to become organic variaties that suit for farming in the Nordic countries.	Finland	www.luomuliitto.fi	OPB, BfO	1, 2.1, 4.4 D, M, C, I, P, S, E
HAMK University of Applied Sciences	I am the coordinator for the Finnish User Gene Bank, which is a fully voluntary approach. We have no finances for the approach but I coordinate it as a part of a study module and use the students in running some parts of the approach. There are 60 farmers in the network and we reproduce Finnish materials from the Nordic Gene Bank.	Finland	www.hamk.fi	OPB, BfO, DOPB	2.1 D, M, I, P
INRA	Decentralised plant breeding with farmers	France	http://institut.inra.fr/en	OPB, DOPB	1, 2.1, 2.3, 3.1, 3.2
Institut Technique de l' Agriculture Biologique-ITAB	ITAB coordinates research and experimentation in organic agriculture in France since 1982. It is the national interlocutor on all matters concerning research-experimentation and technology in organic agriculture. It works in network with the many actors involved in this field. ITAB mission is to: to identify needs and actions carried out in research- experimentation; to bring together research and experimentation players and to work with this network; to set up partnership projects; to promote the results of the research and to share the technical knowledge. ITAB is involved in organic plant breeding projects. Participatory breeding of wheat and maize	France	http://itab.asso.fr , http://bit.ly/2pxmIEn	DOPB	1, 2.1, 4.1
Michel Seed	An company specialised in forages, cereals and grain legumes	France	http://michelseed.com/index.html	OPB, Other	
Réseau Semences Paysannes	A movement of collectives anchored in the local territories that renew, diffuse and protect farmer seed, as well as the practices and knowledge related to it.	France	http://www.semencespaysannes.org/	OPB, DOPB	
Ubios	An organic seed cooperative, set up by several organic farmer cooperatives, and specialised in cereals and grain legumes	France	unionbiosemences.fr/	OPB	2.1, 4.1
Rémi Colombet	A farmer, working on organic seeds multiplication.	France		OPB, BfO, CB OS, DOPB	2.1, 4.5 D, M, P
Bayerische Landesanstalt für Landwirtschaft - LfL	Bavarian Research Institute for Agriculture, pre-breeding of open population breeding of maize, soybean, potato, wheat, with interest in organic.	Germany	http://www.lfl.bayern.de/	BfO, Other	
Culinaris - Saatgut für Lebensmittel	Culinaris is an organic seed breeding initiative offering a carefully curated selection of varieties that thrive under low-input conditions, including homestead and hOPBby gardens. Varieties include rarities and entirely new selections, some of them were developed in the context of research projects. A key area of the breeding work is the development of outdoor tomatoes varieties.	Germany	https://culinaris-saatgut.de/en/	OPB	4.5 D, M, C, I, P, S, E
Dottenfelderhof	The Dottenfelderhof, located in the north of Frankfurt on the southern edge of the Wetterau in a Niddaschleife, looks back on a more than a thousand-year history of agricultural use. Since 1968, the Dottenfelderhof has been managed by a business community of several families.	Germany	http://www.dottenfelderhof.de/forschung-zuechtung/aktuelles.html	OPB	4.4
Dreschflegel Saatgut	Dreschflegel Saatgut is a group of people who multiply and breed biological seed at fifteen gardeners' farms. Since 1990, Dreschflegel has devoted itself to the work on old vegetable varieties and various crops.	Germany	http://www.dreschflegel-saatgut.de/	DOPB, Other	
EuroPlant	EUROPLANT offers a large choice of seed potatoes from organic breeding. The production takes place in high qualified breeding stations, which belong to the well-known ecological associations of Germany. The production progress, storage and conditioning include analyzes of quality. Therefore, they follow the official mandated minimum condition, and develop further quality standards to improve their seed stock quality.	Germany	http://www.europlant.biz/en/home/	OPB, CBOS	
Georg-August-Universität Göttingen (Department of Plant Breeding/ Research Unit "Genetic Resources and Ecological Plant Breeding")	The Genetic Resources and Ecological Plant Breeding Unit was set up in une2013 in the Faculty of Agricultural Sciences to promote the development of high-quality plant cultivars for ecological cultivation and low-input conditions. The Software AG Foundation supports these concerns over a period of six years with 540,000 euros. The task of the specialist group is the improvement and development of breeding methods which can be used in practice to deal with important prOPBlem areas such as limited nutrient availability, regional needs and field resistance to harmful fungi. Important species in research are vegetables (tomato, brassica, cichorium) and	Germany	http://www.uni-goettingen.de/de/die+fakult%C3%A4t/16366.html	OPB, DOPB	

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	leguminous (lens, soy). They study genotype-environmental interactions and adaptation to specific sites. The research projects often involve the value chain. They are currently working on 8 projects.				
Getreidezüchtung Darzau	Under the umbrella of the 'Association for Goetheanistic Research' at 'Cereal Breeding Research Darzau' criteria for breeding cereals are developed under bio-dynamic farming. In particular, the focus is on the special situation of organic farming (soil fertility, natural manure, weed competitiveness, seed transmitted diseases) and nutrition of human being as an organism with spiritual skills. They work on projects for Winter Pea and Einkorn (*Triticum monococcum* L.). Especially for winter pea they have 5 breeding projects, 2 of which are conducted in cooperation with the University of Kassel.	Germany	http://www.darzau.de/	OPB	2.1, 4.4
Keyserlingk-Insitute	The Johanna and Carl Graf Keyserlingk Institute was founded in 1988 by Dr. Bertold Heyden and Elisabeth Beringer in collaboration with biologically dynamic farmers and it is located in Salem. The Keyserlingk Institute deals with questions of seed research as well as with the breeding of new regional grain cultivars for organic (biodynamic) farming. They mainly focus on the development of locally adapted winter wheat and rye varieties for the Lake Constance region and sites with similar conditions. They also do breeding of lentils and of the wild cereal *Dasypyrum villosum*.	Germany	https://www.saatgut-forschung.de/	OPB	
Kartoffel Vielfalt	Selection and maintenance breeding of potatoes.	Germany	https://www.kartoffelvielfalt.de/	OPB, other	
Kultursaat e.V.	In 1985 a number of biodynamic vegetable producers, who were involved in multiplication and breeding of open pollinated varieties, set up the “Initiativkreis für Gemüsesaatgut aus biologisch-dynamischen Anbau” (Initiative group for vegetable seeds from biodynamic farming). To promote their breeding work, raise funds and co-ordinate their breeding activities, members of the “Initiativkreis” established the (non- profit) association Kultursaat in 1994. + Preservation of proven op vegetable varieties (from conventional breeding companies) + Development of new vegetable varieties (from biodynamic breeding programs) + Publication of the developed varieties ("bio" of the various varieties; PR for biodynamic plant breeding, + Plant Breeding Research (plasticity of crops effected by special biodynamic measures like bd preparations, quality of breeding lines asserted by sensory assessment and so called holistic methods like copper chloride crystallisation).	Germany	https://www.kultursaat.org	OPB, DOPB	4.3
Saat:gut e.V. (incl. Apfel:gut)	Farmers, seed growers and fruit growers, supported by Bioland, Germany’s most influential organic farming association and organic certifier. Additional help comes from organic wholesalers, retailers, seed merchants and many private individuals like organic gardeners or people who simply love good food. If you share our aims you are very welcome to join us and become a member of Saat:Gut.	Germany	http://www.saat-gut.org/	OPB	
Saatzucht Schweiger GbR	Commercial breeding company interested in organic. They released in 2002 the first wheat cultivar Naturastar with "special suitability for organic agriculture". “Saatzucht Schweiger”.	Germany	http://saatzucht-schweiger.de/sorten/	BfO	
Stiftung Ökologie und Landbau	private foundation	Germany	www.soel.de	Other	2.1, 4.1, 4.4 D
Verein zur Erhaltung der Nutzpflanzenvielfalt	Maintain germ plasm of vegetable Varieties in conservation—rings (Erhalterringe)	Germany	https://www.nutzpflanzenvielfalt.de/	DOPB	4.4 D, C, I, E
University of Kassel	Development of composite cross populations of wheat.	Germany	https://www.uni-kassel.de/fb11agrar/fachgebiete-einrichtungen/oekologischer-pflanzenschutz/startseite.html	OPB, other	4.4
AEGILOPS	The focus of our mission is the preservation-recultivation of local varieties/heritage crops and the development of varieties and seeds adapted to local conditions and organic farming. Varieties from several crops are being evaluated and selected under organic participatory breeding schemes in various regions. AEGILOPS has close collaboration with Greek Gene Bank as well as universities and research institutes focusing on on-farm conservation and organic plant breeding	Greece	http://www.aegilops.gr/en	OPB	4.3
Centre for Agricultural Research -MTA-ATK	MTA ATK (Centre for Agricultural Research, Hungarian Academy of Sciences) located in Martonvásár (30 km southwest from Budapest, Hungary) has great achievements in the field of wheat and maize breeding dealing also with variety maintenance and prebasic sowing seed propagation. MTA ATK has more than 60 years’ expertise in cereal breeding and launched its organic breeding activities in 2004 based mainly on bread wheat,	Hungary	http://www.mta-atk.hu/en	OPB, BfO	

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	ancient cereal species (einkorn and emmer) and cereal populations. Beside the breeding work, MTA ATK is running performance trials on maize, forage crops and cereal-legume mixtures on its 6 ha certified organic field. In the case of ancient cereals, MTA ATK runs fully organic breeding program, while in other cases advanced breeding lines and test maize hybrids are tested in organic field (breeding for organic agriculture).				
Agribosco	In collaboration with the Institute of Cereal Cultivation in Foggia and other private research centres, we have been conducting a study for 16 years on two populations of emmer (Triticum Dicoccum) from the valleys of Gubbio and the surrounding area (PG), mon grain (Triticum Monococcum) and khorassan wheat (Triticum Turanicum), an ancient wheat species that some sell under various trade names.	Italy	http://www.agribosco.com/	Other	
Agrogreen Service Srl	We deal with the collection, conservation, multiplication and characterization of ancient varieties of legumes, cereals and vegetables	Italia	http://www.agrogreenservice.com/	CB OS	2.1, 4.3, 4.4 D, C, E
Arcoiris	The main commitment of Arcoiris is to multiply and select vegetable varieties, suitable for both the Italian and Mediterranean climate. They are meant for the biodynamic and organic cultivation systems. They create open pollinated varieties. They are meant for the biodynamic and organic cultivation systems. They are committed to the recovering of ancient Italian varieties. Arcoiris is the only Italian seed company having registered two ancient varieties (the anguria di Faenza – watermelon and the sedano gigante di Romagna – celery). Arcoiris was a partner at the EU project SOLIBAM.	Italy	http://www.arcoiris.it/en/home	OPB	
Council for Agricultural Research and Agricultural Economy Analysis - CREA	CREA's research centre for Animal Production and Aquaculture, based in Lodi, is responsible for breeding programmes of pea, white lupin, soybean and alfalfa targeted to organic and conventional systems of Italy. Its research work focuses, inter alia, on genetic resource exploitation, participatory plant breeding, evolutionary selection and other innovative selection schemes, breeding for intercropping, and genomic selection.	Italy	http://centroflc.entecra.it/	BfO, Other	1, 4.1
Rete Semi Rurali	Works on participatory tomato breeding.	Italy	https://www.semirurali.net/	DOPB	1, 4.5
Terrabio	Terra Bio is a group of 80 organic farmers and processors who decided in 1997 to unite their strengths and experiences by forming a cooperative society. They produce organic seeds for several plant species and recently started breeding. They don't only produce and sell raw materials (seeds) but also process them and have created Terra Bio brand products.	Italy	http://www.terrabio.eu/	OPB	
Leen organics	I am a grower and seed saver, currently breeding a tomato from a cross that was done at Irish Seed Savers	Ireland	Www.leenorganics.com	OPB	4.5 D, M, C, P, S, E
Institute of Agricultural Resources and Economics - AREI	AREI has a more than 100 years history in breeding of field crops. Breeding for organic farming was started with variety testing trials in 2003 and testing of breeding lines in 2005. Currently on the national variety list there are 49 crop varieties developed at AREI and 29 of them are recommended for organic production. More than 40 ha agricultural land in two locations is certified for organic farming and used for research and seed production purposes. Most of the work is done for spring barley (separate organic breeding program) followed by potato, grain legumes, winter triticale, oat, spring and winter wheat.	Latvia	http://www.arei.lv	OPB, BfO	2.1
Institute of Soil Science and Plant Cultivation - State Research Institute (IUNG-PIB)	IUNG-PIB (Institute of Soil Science and Plant Cultivation - State Research Institute) within its 55 years' activity has greatly contributed to agricultural and agro-environmental science progress in Poland. IUNG-PIB together with the Main Inspectorate of Plant Health and Seed Inspection (PIORiN) initiated in 2018 a national program of cereal variety field testing. This program includes testing about 20 varieties for 3 years and will develop a testing methodology to be consistent with accepted standards.	Poland	www.iung.pulawy.pl/eng/	CB OS	2.1
Instituto Politécnico de Coimbra - ESAC		Portugal	http://portal.esac.pt/portal/	OPB	1, 2.2. 2.2, 2.3, 3.2
LIVING SEEDS SEMENTES VIVAS	Organic seed company is founded 2015 and develops and sells seed of open pollinated varieties of a wide range of vegetables, herbs, flowers, millet, spelt, quinoa, amaranth in Portugal, and in Spain through its daughter company Semillas Vivas SL. For LIVESEED we are doing Brassica breeding.	Portugal	www.sementesvivas.bio	OPB	4.2
Agrimondo	Agrimondo was founded in Rumania in 2007, based on the big demand on behalf of well-known firms which produced organic fodder and organic alimentary products and which wanted to OPBtain their raw materials directly	Romania	http://www.agrimondo.eu/	OPB, other	
NARDI Fundulea - National Agricultural	National Agricultural Research and Development Institute from Fundulea it is recognised in Romania as the most important agricultural research unit especially for large field crops. Starting with 1995 inside the institute was established a Research, Innovation and Technical Assistance Centre for Organic Agriculture. The founder of the	Romania	http://www.incda-fundulea.ro/	OPB, other	2.2

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Research and Development Institute	Organic Research Centre had the initiative since the beginning to find the adapted varieties for organic farming, therefore it has made a pre-breeding work of OPBserving different varieties of cereals (wheat, barley, maize, millet), legumes (pea, lentils, lupine, soybean) , technical crops (sunflower, camelina, flax), medicinal plants in comparative fields.				
Red de Semillas	http://www.redsemillas.info/	Spain	http://www.redsemillas.info/	DOPB, Other	
University of Valencia	Works on breeding of tomato and sweet pepper	Spain	http://www.upv.es/ficha-personal/adrodbur	Other	1, 4.2, 4.5
SAT LLauradors de Somnis . ECOLOGICVAL	Our company is dedicated to the recovery of abandoned lands in the Huerta Valenciana, distributed in 5 municipalities (Silla, Alcasser, Torrente, Picassent, Almusafes) with a total of 70 hectares, dedicated to alternative crops to citrus, winter horticulture, all type of cabbages for export and extra-early pomegranates in summer. We grow all varieties of cabbages / brasic and cucurbitaceae, with novel varieties, always in organic farming. We carry out comparative studies with various subscriber systems, green roofs, pollinations, various preventive treatments, etc	Spain	https://ecologicval.com/	BfO	4.2 D, M ,I, P, S, E
SURINVER EL GRUPO SOCIEDAD COOPERATIVA	We produce a wide range of organic agricultural products for both national and international markets. We need to have a guarantee plant material to OPBtain the best productions.	Spain	WWW.SURINVER.ES	OPB, BfO	4.2 D, S
Centro de Educación Ambiental de la Comunitat Valenciana (Generalitat Valenciana)	The Center for Environmental Education of the Valencian Community, located in the surroundings of the Marjal dels Moros, wet area belonging to the Natura 2000 European Network, has a certified organic garden in organic farming for educational and didactic purposes. This orchard, approximately 1 hectare in area, is subdivided into 48 small plots where different varieties are grown.	Spain	http://www.agroambient.gva.es/es/web/ceacv/ceacv	Other	4.5 C
Mancomunidad de municipios del Rincón de Ademuz	A set of experimental crop plots adapted to the Rincón de Ademuz have been launched to test agroecological techniques against climate change	Spain	http://rinconimpulsa.rincondeademuz.es/	BfO	2.1, 4.3 ,4.5 D, M, C, I , P, S, E
AGRICOLA VILLENA COOP.V.	Recovery of traditional varieties Improvement of the organoleptic characteristics of our products (flavor ...) Varietal diversity Improvement of adaptation to our growing conditions	Spain	www.agricolavillena.com	BfO	4.2 S, E
Red de Semillas "Resembrando e Intercambiando!	The RdS is an organization that brings together more than 20 local seed networks in Spain. These organizations carry out a work of dynamic and community management of cultivated biodiversity in which they deal with majar selection works for the maintenance of local, traditional and exchange cultivars and populations (all of open pollination and in the public domain). all groups work in agroecological production systems	Spain	www.redsemillas.info	OPB	2.1, 4.2, 4.3, 4.4, 4.5 D, M, C, I, P, S
Red Andaluza de Semillas	Mass selection and participatory trials on local cultivated biodiversity in agroecological systems	Spain	www.redandaluzadesemillas.org	OPB	1 , 2.1 , 4.1, 4.2, 4.4, 4.5 D, M, C, I, P, S, E
EcoRegió	My team in Bioversity is working on on-farm testing of advanced breeding products and recently released varieties, in order to generate location-specific variety recommendations and adjust breeding product profiles (breeding priorities).	Spain, Catalonia	Www.ecoregio.cat	OPB, BfO	4.4, 4.5 D, M, C, I, P
Bioversity International	My team in Bioversity is working on on-farm testing of advanced breeding products and recently released varieties, in order to generate location-specific variety recommendations and adjust breeding product profiles (breeding priorities).	Spain	www.bioversityinternational.org	Other	1 , 2.1 , 4.1 D, M, C, I, P, S
CICYTEX	Evaluation of fruit cultivars under organic conditions. Cherry, berries, figs	Spain	Www.cicytex.org	BfO	D, C, I, P, S
Agroscope	Fruit Breeding (Apple and Apricot) The goal of apple breeding is to OPBtain fruit with outstanding fruit and tree quality. We develop apple varieties which can be easily cultivated, in an environmentally sound manner. Also Soybean breeding, wheat breeding for organic	Switzerland	https://www.agroscope.admin.ch/agroscope/en/home/about-us/organization/competence-divisions-strategic-research-divisions/plant-breeding.html	BfO	

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Agroscope Forage Breading	Breeding of Forage Grasses and Clover Species. The aims of diverse forage growing as the central component of sustainable production systems can only be achieved by using locally adapted, competitive, perennial varieties that are resistant to the main pests.	Switzerland	https://www.agroscope.admin.ch/agroscope/en/home/about-us/organization/competence-divisions-strategic-research-divisions/plant-breeding.html	OPB	2.2
FiBL Switzerland	The Research Institute of Organic Agriculture (FiBL) was founded in 1973 and is situated in Frick since 1997. Lupin Pre-Breeding and support of organic breeders. FiBL is particularly involved in the breeding projects of crop plants where the varieties do not meet the needs of the organic sector, where the supply of organically propagated seeds is too low or the number of varieties is too limited. We are increasingly seeking cooperation with organic farmers in order to jointly evaluate and develop varieties. We are involved in pre-breeding of white lupins, participatory soybean breeding, selection tools for pea, lupin, apple resistance breeding, and participatory cotton breeding in India	Switzerland	http://www.fibl.org/en/switzerland/location-ch.html	OPB	1, 2.1, 3.2, 4.1
Getreidezüchtung Peter Kunz	Under the name Getreidezüchtung Peter Kunz, Verein für Kulturpflanzenentwicklung is an association with the following purposes: Research of new breeding methods (breeding research), Breeding of adapted varieties for sustainable agriculture; Conservation, extension and sustainable use of crop diversity.	Switzerland	http://www.getreidezuechtung.ch/aktuell	OPB	2.1
Poma Culta	Non-profit association for the promotion of research in the field of biodynamic fruit growing Poma Culta was founded in 2004 with the aim of supporting the apple cultivation of Niklaus Bolliger.	Switzerland	http://www.pomaculta.org/	OPB	4.3
Realisation Schmid	Founded in 2016, Realisation Schmid plans and implements projects of all kinds in the fields of nature, agriculture, food and horticulture. The peach breeding project aims to cultivate rOPBust and tasty varieties for the speciality market using the classical method (according to organic guidelines).	Switzerland	https://www.realisation-schmid.ch/	OPB	2.2 C
Sativa Rheinau AG	The Sativa Rheinau was founded in 1999 to ensure an independent and “gene-free” seed supply for organic farming. Sativa mainly breeds vegetable varieties, for which there are hardly any viable alternatives to hybrid varieties. As a starting material, they mainly use hybrids that are currently available on the market and for which modern breeding has achieved qualities which are also important for organic farming. They have created (or currently breeding) organic varieties for eggplant, broccoli, Chinese cabbage, fennel, carrots, kohlrabi, celeriac, courgette, sweet corn and onion.	Switzerland	http://www.sativa-rheinau.ch/, http://bit.ly/2chBFlO http://bit.ly/2bOeT7k	OPB	4.2
Varietas	Varietas mainly works with wild and domesticated tomatoes and potatoes, as well as some other vegetables, trying to cross resistance to diseases or pests from wild forms into our more productive varieties.	Switzerland	http://www.varietas.ch/	BfO	
Zollinger	Since the early 1980s, the Zollingers are focusing on specialities and traditional varieties. the varieties often have long familiy histories, having been selected over generations. They are perfectly adapted to local climates, and reflect their breeders' tastes and preferences. Zollinger sells mainly their products through our website, allowing full control over the offer.	Switzerland	https://www.zollinger.bio/en/home	OPB	
Bejo Seeds	Bejo is an internationally operating plant breeding company which develops new vegetable varieties. In their breeding program they also include requirements for the organic market. They have been working since the early 1990s to offer a wide range of organically produced vegetable seeds, which fully meet the organic seed requirements as recognized by all European certification bodies. Currently, they are investing a lot of effort in widening their range.	The Netherlands	http://www.bejoseeds.com/	BfO	4.2
De Bolster	Sells a wide range of organic vegetable seeds and is active in the development of vegetable varieties for professional growers, mostly F1-hybrids	The Netherlands	https://www.bolster.eu/en/	OPB	
De Beersche Hoeve	Most cauliflower varieties used in professional gardening nowadays are hybrids, many bred with CMS technology (Cytoplasmatic male sterility). René Groenen is working on the alternative: Open pollinated cauliflower varieties for professional organic gardening. Since 2000, Groenen is full time dedicated to the propagation of vegetable seeds and breeding of varieties	The Netherlands	http://www.debeerschehoeve.nl/biodynamic-market-garden-11.html	OPB	1, 2 ,3, 4
De Zaderij	A newly established cooperative of farmers producing and developing seed of Open Pollinated vegetable varieties.	The Netherlands	http://www.zaderij.nl/	DOPB	
Louis Bolk Instituut	The Louis Bolk Institute is a private organisation which offers research, advice and development in the field of organic and sustainable agriculture, nutrition and health care. It operates as a not-for-profit foundation, and derives all its income from contract research, project subsidies and donations. The Institute links social	The Netherlands	http://www.louisbolk.org/	OPB, DOPB	1, 2.1 , 4.1

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	issues with pioneering research, and bridges the gap between scientific OPBjectivity and personal involvement. Research at the Institute follows a participatory approach that is both practical and holistic. Louis Bolk Institute works on projects related to organic plant breeding: Divers en Dichtbij ('Diverse and locally produced') (2013-2015)- http://bit.ly/2nwg0OU; Farm Seed Opportunities (FSO) (2006-2009) http://bit.ly/2nSPA58, Bio Impuls: Organic Potato Breeding (2009-2013) http://bit.ly/2pjC2kn				
Mart Vandewall	Organic apple breeder	The Netherlands	http://www.puurvandewall.nl/	OPB	4.3
Rijk Zwaan	Rijk Zwaan is a plant breeding company which develops new vegetable varieties and sell the seeds produced from them all over the world. They have been working since 1992 to offer a wide range of organically produced vegetable seeds, which fully meet the organic seed requirements as recognized by all European certification bodies. Currently, they are investing a lot of effort in widening their range.	The Netherlands	https://www.rijkzwaan.com/	CB OS	
Vitalis Organic Seeds	Vitalis Biologische Zaden was established in 1994 and is one of the world's leading companies in organic seed production. They produce organically grown seeds of reliable varieties that meet the specific demands of both consumers and organic farmers. For this OPBjective, they breed and select an increasing number of varieties in trials, worlwide, through organic breeding and breeding for organic. In 1998, Vitalis joined the Enza Zaden Group, operating as an independent company/ unit within the group. Rijk Zwaan is a plant breeding company which develops new vegetable varieties and sell the seeds produced from them all over the world. They have been working since 1992 to offer a wide range of organically produced	The Netherlands	http://eu.biovitalis.eu/	OPB, BfO	3.1, 4.2
Bioimpuls, Louis Bolk Instituut & Wageningen University & Research	The Bioimpuls breeding program deals with 40,000 seedlings a year, divided over the central breeding program and the associated farmer breeders and breeding companies. In the breeding program, next to late blight resistance, extra attention is paid to the traits: nitrogen efficiency, early maturity, tuber dormancy, and resistance against early blight, potato virus Y, black scurf, silver scurf and taste by using specific crossings parents.	The Netherlands	https://www.wur.nl/en/Research-Results/kennisonline/Bioimpuls-2.htm	DOPB	
Walter de Milliano	Sorghum breeding for organic	The Netherlands	https://www.walterdemilliano.nl/	BfO, CB OS	2.1 D
Organic Research Centre (ORC)	The Organic Research Centre (ORC) is the UK's leading independent research centre for the development of organic/agroecological food production and land management solutions to key glOPBal issues including climate change, soil and biodiversity conservation, and food security. Established in 1980 by David Astor, the Progressive Farming Trust Ltd., ORC's parent educational charity, has continued to pursue the visionary sustainability goals of its founders. They are involved in 10 plant breeding projects including composite cross populations of wheat.	United Kingdom	http://organicresearchcentre.com/	OPB	1, 2.3
The Seed Cooperative	The Seed Co-operative is the UK's community owned seed company. They grow seeds for everyone, and for the health and well being of people and planet and believe passionately in breeding open pollinated seeds that everyone can grow, everyone can save for the next year, and everyone can afford	United Kingdom	https://www.seedcooperative.org.uk/	DOPB	
The UK and Ireland Seed Sovereignty Programme in Scotland (The Gaia Foundation)	Encouraging and supporting crofters and small-scale farmers to re-introduce grain growing and to test and select heritage and landraces on their suitability for local growing conditions and to start producing seed. This includes testing Scottish landraces from the Outer Hebrides for mainland Highland growing conditions. Since these are novice growers, it also includes education about the genetics of breeding and understanding the difference between mono-line varieties and mixed populations and landraces. Furthermore, husbandry and machinery of grain and seed production are part of the experiment and learning process. All of this under low-input growing conditions.	Scotland	www.seedsovereignty.info	Other	2.1, 4.2 M, C, P, S, E
SRUC	We have developed several multi-parental populations of spring barley using landrace and modern material. We have been growing this material under field conditions for 6 years without selection. We want to use this material for participatory breeding under organic conditions. We are open to collaboration using this material.	Scotland	www.sruc.ac.uk	Other	2.1, 4.1, 4.2, 4.4 M, C, I, P, S, E
Doughies	Rye-volution - redeveloping a landrace cereal rye on crofts in the highland & island region of Scotland.	Scotland	doughies.blog	OPB	2.1 D, M, C, S

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FABIA CSB	Conservation and Managing Plant GE etic Diversity for Food and Agriculture in Macedonia	Macedonia	http://www.melholt-korn.dk/login/	OPB, BfO, DOPB	1, 2.1, 4.2, 4.5 D, M, C ,I ,P
Faculty of Agriculture and Food Technology Univesrity of Mostar	Collection and maintenance of old varieties in Herzegovina. We work on survey and evaluations on local varieties of fruits and vegetables.	Bosnia and Herzegovina	http://aptf.sum.ba/hr/	Other	3.4 M, C, S
Akdeniz university		Turkey		OPB, BfO	4.5 C
Azad university	Phd student	Iran	tnbu.ac.ir	CB OS	- P
University of Manitoba	We run a national organic participatory wheat and oat breeding initiative with funding from USC-Canada. We've worked with approximately 75 organic farmers ranging from 50 acres to 5000 acres. We are currently conducting yield trials and hope to analyze the lines under phosphorus stress and alternative phosphorus sources. We also hope to analyze the lines using key genetic markers. I am aware that this is not European, but there is very little of this type of work happening in North America and we would like to stay in touch with those who are doing similar work!	Canada	http://umanitOPBa.ca/outreach/naturalagriculture/ppb.html	OPB, BfO, DOPB	2.1 D, M, I, P
Organic seed Alliance	Organic Seed Alliance advances ethical seed solutions to meet food and farming needs in a changing world. We envision organic seed systems that are democratic and just, support human and environmental health, and deliver genetically diverse and regionally adapted seed to farmers everywhere.	USA	https://seedalliance.org/	OPB	1, 2, 3, 4
Wild Garden Seed	We are an organic seed farm in the Pacific Northwest, established in 1994, owned and operated by Frank and Karen Morton. We are known for farm-original varieties of many salad greens, vegetables, herbs, and flowers. All of our seed is Organically Grown by Shoulder to Shoulder Farming cooperation with allies at Avoca and Gathering Together Farms, in the heart of Oregon's Willamette Valley.	USA	https://www.wildgardenseed.com/	OPB, DOPB	
Johnny's selected seeds	An organic seed company specialised in vegetables, fruits and herbs. 100% employee owned.	USA	https://www.johnnyseeds.com/	OPB	
High Mowing seeds	High Mowing Organic Seeds began in 1996 with just 28 varieties, many of which originated in founder Tom Stearns' backyard. Since then, our company has grown exponentially, and what started as a one-man operation is now a thriving business making available to home gardeners and commercial growers over 600 heirloom, open-pollinated and hybrid varieties of vegetable, fruit, herb and flower seed. True to our roots, High Mowing Organic Seeds continues to source many of the varieties we sell directly from independent, passionate organic seed farmers, including from the 40 acre working farm owned and operated by Tom Stearns here in northern Vermont.	USA	https://www.highmowingseeds.com/	OPB, DOPB	
Open seed source initiative	The Open Source Seed Initiative (OSSI) is dedicated to maintaining fair and open access to plant genetic resources worldwide in order to ensure the availability of germplasm to farmers, gardeners, breeders, and communities of this and future generations.	USA	https://osseeds.org/	Other	
Cornell University	Eastern Broccoli Project	USA	easternbroccoli.org	BfO	4.2 D
Jim Meyers	We develop improved vegetable varieties with the main focus being to support gardeners, growers and processors in the Pacific Northwest (PNW). This region of the United States has a unique growing environment, and varieties developed elsewhere may not necessarily be optimally adapted to the PNW. We have breeding programs on snap beans, snap peas, broccoli, tomatoes and cucurbits. My academic interests include breeding for disease resistance, enhanced human nutrition, and adaptation to organic production systems. We use a combination of traditional plant breeding techniques combined with genomics and bioinformatics tools.	USA	https://horticulture.oregonstate.edu/users/james-myers	BfO	
Julie Dawson	Urban and peri-urban farm enterprises are diverse in their marketing and management strategies, and we provide research support for small-scale farm and food enterprises serving regional markets. We welcome input on research priorities and ideas for projects. If you are interested in participating in research or education projects, please contact me! – Vegetable varieties selected for flavour and quality. Collaboration with other plant breeders, seed producers, farmers, chefs and local food consumers to test varieties for local food systems.	USA	https://dawson.horticulture.wisc.edu/	BfO, Other	

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	– Use of genetic diversity and genetic resources in plant breeding for organic agriculture: better methods of screening germplasm collections and identifying promising accessions. – Participatory research methods and statistics for analyzing decentralized and unbalanced experiments or breeding projects				

*Letters are referring to the following activities for collaboration with LIVESEED:
D: Digital exchange of information
M: Mutual learning in person, cross visits, in person etc.
C: Collaborative/ participatory breeding etc. (either within or after the timeframe of LIVESEED)
I: Initiating/ developing collaborative breeding proposals for the future
P: Participating at LIVESEED workshops/events etc. on a crop-specific issue
E: Exchange of breeding material
S: Setting up joint trials (either within or after the timeframe of LIVESEED)

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