

DIVERSIFIED FOOD SYSTEM: POLICY TO EMBED CROP GENETIC DIVERSITY IN FOOD VALUE CHAINS



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Booklet #5

This booklet presents policy recommendations to embed crop genetic diversity in five areas of action.



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DIVERSIFOOD aims to embed diversity in the food supply chain and to foster multi-actor networks to promote local high quality food systems.

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SUMMARY

Current food systems and associated agricultural practices have led to a loss of crop diversity. The widespread adoption of genetically uniform crop varieties may also increase the vulnerability of production systems and reduce their adaptability to new environmental challenges. DIVERSIFOOD has explored different approaches aimed at increasing crop genetic diversity, and as a result, make biodiverse food available to consumers. These approaches have the potential to promote sustainable, locally adapted farming systems, provide autonomy to farmers, support local short and fair supply chains and

reconnect farmers and consumers. In order to support these approaches, the following policy changes are needed:

The legal status of heterogeneous cultivars for food diversity needs to be secured to increase the resilience of our food system. Current European seed regulations need to be more inclusive to enhance and promote the management and use of crop genetic diversity by farmers. One relevant backbone is the fulfilment of Farmers' Rights as set out in the International Treaty on Plant Genetic Resources for Food and Agriculture.

This will create the conditions needed to develop locally-adapted and resilient farming systems. The new Organic Regulation (EC/848/2018 due to come into force in 2021) recognises the importance of diversity to improve resilience and the need for the development of organic varieties and 'heterogeneous material' for organic production. Here, the important decision is to broaden our definition of 'heterogeneous materials' to include not only cross composite populations (CCPs), but also landraces, heritage varieties and farmer breeds in the innovative framework of this legislation.

The Common Agricultural Policy - CAP should be the main driver of sustainable and resilient food systems across Europe. **Policies for more diverse cropping and food systems in the current CAP reform and national implementation are needed.** In particular, certain aspects of seed genetic diversity and *in situ* conservation are missing, while such diversity is the backbone required to adapt food production to climate change, evolve towards resilient food systems and ensure healthy nutrition and diets.

Networks of multiple actors are crucial to **embedding crop genetic diversity in food value chains.** Such networks promote collaboration between farmers, researchers, processors, retailers and consumers and their potential of innovation must be

acknowledged. Networks engaged in the sustainable use of crop genetic diversity depend on support and on long-term programmes for diversity, including help in improving communication, organizing training sessions and mutual learning events.

Investment is required in raising the awareness about biodiverse food of all actors of the agri-food system. The needed shift towards more diverse, resilient food systems requires skilled farmers, well-informed citizen-consumers and, in general, a new food culture, involving society at large. Education and training for farmers and other professionals about crop genetic diversity, and on-farm participatory breeding should be provided along with related knowledge about biodiverse food and the skills required for processing and marketing.

The re-introduction of diversity in the agri-food systems is a complex process that involves a variety of realms, the mobilisation of multiple forms of knowledge and the active participation of all the diverse actors involved. To understand and support this process **a multi-actor and integrated research approach is needed**, based on **participatory and democratic methods, inter- and trans-disciplinarity, and a systemic approach.**



DIVERSIFOOD

A MULTI-ACTOR PROJECT TO INCREASE DIVERSITY IN FOOD SYSTEMS



Today's food system is rooted in a productivity paradigm in which food is considered as a commodity, where the target is product and process uniformity. In addition, the current linear structure of food supply chains and the underlying power relations rely mainly on the contribution of a limited number of actors. This has led to widespread not only loss of crop genetic diversity but also to uniform food, agriculture, culture, gastronomy, landscapes, economies and society.

DIVERSIFOOD partners are engaged in recovering and enriching crop diversity in food systems by reintroducing underutilised and forgotten species and working on newly bred lines from participatory plant breeding, and by promoting community management of agrobiodiversity to empower local farming systems and collective approaches. DIVERSIFOOD partners demonstrate how diversification takes places from seed to plate and with a diversity of actors involved. The DIVERSIFOOD consortium is convinced that these activities support the transformation towards a diversified, resilient, sustainable and fair food system.

Moreover, we are currently observing increasing interest in diverse and nutritious food to counteract climate change and diet-related illnesses. Farmers and consumers are striving for greater autonomy when taking decisions concerning seeds, crops, varieties and food. We are witnessing growing interest in food policies rooted in principles of food democracy, quality and diversity. These realities are evidence that a change towards more diversified food systems is already underway. However, the shift towards more diverse food systems requires skilled farmers and processors (e.g. millers, bakers or cooks) well-informed consumers and, in general, a new food culture involving society as a whole.

Public institutions should create enabling conditions to embed crop genetic diversity in diversified food systems, practices and culture. There is a need to assess policy making and implementation processes at all levels and in all sectors in order to avoid incoherent policies regarding support for agrobiodiversity and biodiverse food, and introduce conducive measures. There are many potential areas for action, some of which are highlighted in this booklet.

1

SECURE THE LEGAL STATUS OF HETEROGENEOUS CULTIVARS FOR DIVERSIFIED FOOD SYSTEMS

As the prevailing food system requires uniform seeds, agronomic management and processing, a reduction of diversity in crops and varieties (inter- and intra-specific agrobiodiversity) is inevitable.

To increase the genetic diversity of crops, different strategies are possible including the use of populations, seed mixtures and cultivars arising from participatory on-farm breeding (1). The resulting seeds have a higher level of phenotypic and genotypic diversity that would not fulfil the current requirements

for variety registration (Distinctiveness, Uniformity and Stability - DUS criteria). Such 'heterogeneous material's often do not have a valid legal status, and thus cannot officially be marketed as seeds, but they could be shared and swapped in limited volumes.

The current seed legislation has been criticised and evaluated as not being conducive to the management of crop genetic diversity (2, 3, 4). A proposed new seed legislation failed to find the required support in the EU.



FURTHER READING

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- (2) **Regulation of the European Parliament and of the council on the production and making available on the market of plant reproductive material** (plant reproductive material law), **proposal**.
- (3) **Winge T. Seed Legislation in Europe and Crop Genetic Diversity. 2015.** vol 15, p.: 1-64.
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Concerning populations, a temporary experiment is underway in the EU (*Decision 2014/150/EU*) for the **marketing of composite cross populations** (CCP) of wheat, barley, oats and maize. Participants can market material that does not meet the restrictive criteria set out in DUS protocols. The experiment involves six Member States (the United Kingdom, Denmark, France, Germany, the Netherlands and Italy) and will last until 2022. It avoids registration of populations in some countries and allows for the relaxation of the rules regarding variety registration in others, but defines the maximum quantities of seeds that can be marketed.

Other exceptions are the provisions for **conservation varieties and amateur varieties** (*Directives 98/95/EC; 2008/62/EC; 2009/145/EC; 2010/60/EC*). In national registries or Common Catalogue varieties, there is the opportunity to include varieties which do not fulfil «classical» criteria as conservation varieties or as so-called amateur varieties with no intrinsic value for commercial crop production. However, limitations regarding the origin, production, marketing and quantity also limit the exchange of seeds.



The new **European Regulation on Organic Agriculture** (*EC/848/2018, due to come into force in 2021 for certified organic producers*) recognises the importance of high level phenotypic and genotypic diversity to improve resilience (*Recital 36-38*) and underlines the importance of a high level of biodiversity in the objectives (*Article 4*) and specific principles (*Article 6*) of organic production. The regulation also recognises the need for research and development of **organic varieties suitable for organic production**, taking into account the specific needs and objectives of organic agriculture such as enhanced genetic diversity, disease resistance or tolerance and adaptation to diverse local soil and climate conditions (*Recital 39*).

In the frame of this regulation, the marketing of **organic 'heterogeneous material'** will be allowed after simple notification, without the need to comply with the requirements for variety registration, and the certification categories of pre-basic, basic and certified material or with the requirements for other categories set out in several Council Directives (*Article 13*). It is envisaged that from 2021 another temporary experiment on organic varieties suitable for organic agriculture will be set up, which will help establish the criteria for the description of the characteristics of such material and determine their production and marketing conditions for the future (*Preface*).

FINDINGS FROM DIVERSIFOOD

In some marginal conditions, the performance of participatory plant breeding (PPB) varieties, populations or mixtures is better than the performance of conventional varieties which are not adapted to local growing conditions. Diversified crops are valuable options especially in areas that would be abandoned if only conventional seeds can be used (5). In addition, the results of the temporary experiment with composite cross populations (2014-2018) confirmed the positive effects and good performance of genetically diverse crops under low input and organic conditions.

Current directives for diverse seeds are implemented differently in each country; in Italy and Hungary, the registration of conservation varieties requires defining a region of origin, which is not always easy to do; in Germany, France and Switzerland, many conservation varieties are registered for which a nation-wide region of origin was declared. The fees for registration, and seed exchange between gardeners and farmers are regulated differently depending on the country (6, 7).

Many innovative value chains and networks based on crop diversity have already been established (8). However, our research revealed that the availability of the seeds needed to sustain initiatives involving underutilised and diversified crops is limited and/or unstable. Some opportunities exist to legally sell and buy seed, but the people involved in such initiatives perceive the seed laws regarding conservation/amateur varieties, heterogeneous populations and participatory bred varieties as restrictive, and as a result, the marketing of related seeds and diversified food remains limited (9).

POLICY RECOMMENDATIONS

Evolution of the European policy framework is needed and should include coherent seed regulations to enhance and promote the management of crop genetic diversity for diversified food systems (10). Especially needed is:

- legalisation on the status of cultivars originating from participatory plant breeding and on 'heterogeneous material's (in the broad sense) for all crops and different types of cultivars;
- transparent notification including pedigree (parental lines), breeding techniques, the history of selection, and maintenance, not allowing patents;
- scientific support for the incorporation of specific rules concerning seeds in new organic regulations to help identify and evaluate pathways being explored, such as alternatives to current cultivar registration;
- the fulfilment of Farmers' Rights as set out in the International Treaty on Plant Genetic Resources for Food and Agriculture to support the use of genetic diversity on farms and to create the conditions required for locally adapted and resilient farming systems.

For detailed recommendations specifically on community seed bank related policies, see DIVERSIFOOD booklet #4.



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2 ENSURE COHERENT POLICIES FOR MORE DIVERSE CROPPING AND FOOD SYSTEMS



The Common Agricultural Policy (CAP), the main driver of European food and farming systems, shapes farming practices, production patterns, commodity markets, and consequently has enormous influence on the availability of agricultural plant diversity for our diets. Despite numerous reforms and the introduction of environmental considerations linked to crop rotation and crop diversification, this policy continues to create and support an all-purpose food and farming system which, since it is largely based on major crop species, is neither resilient nor sustainable.

Currently, crop diversification appears in Pillar 1 of the CAP only as part of Greening. Greening is mandatory, but leaves room for flexible implementation in Member States. Moreover, the direct impact of Greening on crop diversity has been marginal.

Some aspects of diversification can also be addressed in the agro-environmental schemes in Pillar 2 of the CAP. Under Article 28, sub-measure 10.2 provides “support for conservation and sustainable use and development of genetic resources in agriculture and forestry” and the implementation is characterised by a wide variety of different approaches to genetic conservation, covering both plants and animals and *ex situ* as well as *in situ* approaches. Sub-measure 10.1 allows

for knowledge exchange activities on such topics (11).

The latest reform proposal for the CAP, submitted by the European Commission in July 2018 (12), is largely silent on the topic of crop genetic diversity, except for some mentions in the recitals. The proposal relies heavily on the development and implementation of National Strategic Plans to deliver on the nine general objectives at national level and the monitoring of policy outputs through a common set of agreed result indicators. For implementation, Member States can choose flexibly from a toolbox of measures that can be adapted to specific needs, including, if chosen as a national priority, designing support measures for farmers who increase crop diversity.

FINDINGS FROM DIVERSIFOOD

DIVERSIFOOD has explored the diversity of more than 15 species, and has shown how to broaden the genetic base of cultivated plants, from landraces or underutilised species to new farmers’ varieties (13).

Evaluation of field performance of the studied crops produced variable results, but revealed the potential of different varieties of species like einkorn,

emmer or rivet wheat to become valuable alternatives to mainstream crops under marginal conditions. Moreover, these results underline the need to assess the productive performance of cultivars in the specific environment to be able to evaluate their real potential (14). The research highlighted the importance of active involvement of farmers and of other players engaged in the initiatives and of paying attention to the interrelations among the various actors in (local) food systems.

The continued development of these approaches increases farming opportunities and adds value to sustainable rural development. Some initiatives were able to benefit from rural development policies in a broader sense or to benefit from CAP support measures, but others feel sidelined by CAP (15).

POLICY RECOMMENDATIONS

The forthcoming reform of the Common Agricultural Policy (CAP) offers opportunities to embed crop genetic diversity from the seed to the plate. It could:

- strengthen seed genetic diversity and *in situ*/on-farm conservation and evolution by including an obligation for member states to specifically address this topic in the National Strategic Plans in order to mitigate risks of climate change and secure healthy food and diets;

- co-develop and introduce indicators that evaluate crop diversity in general and crop genetic diversity in particular. One example to think about is the “Agrobiodiversity Index” developed by Bioversity International (16);
- design support policies that fairly compensate farmers for the costs involved in maintaining and increasing genetic agrobiodiversity, by linking crop diversification to the design of the eco-schemes and implementing ambitious rural development schemes that recognise these benefits;
- provide public support, including access to capital and on-going funding for participatory research, knowledge exchange, extension, facilitation and training to encourage farmers’ experimentation and innovation to regenerate and increase crop genetic diversity. Funding criteria should ensure that such support is also accessible to actors in short supply chains;
- introduce the principle of agrobiodiversity conservation and enhancement in food policies at all levels.

The development of crop genetic diversity can also be supported through appropriate research and innovation policies, including multi-actor approaches (see Chapter 5), and by fostering interactive dialogue between *ex situ* conservation (through gene banks) and *in situ* (on-farm) conservation and management.

- Research funding at all levels (EU, national and regional) should be specifically dedicated to identifying and developing sustainable systems of *in situ* and on-farm collaborative management and local adaptation of crop genetic diversity. This should include participatory breeding and on-farm research and reconsider the need for public investment in breeding and the development of biodiversity-based varieties.



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- (16) The Agrobiodiversity index website: <https://www.bioversityinternational.org/abd-index>.

3

EMBED CROP GENETIC DIVERSITY IN FOOD VALUE CHAINS



The choice of seeds determines farming practices and influences all the other steps along the food chain including consumption. Today, the supply of food diversity on markets is limited. Locally adapted and diverse crops are undervalued in the global North. This mirrors the lack of attention paid to agrobiodiversity in the current agri-food system, where attention is focused on standardisation, uniformity and productivity. As a result, crop genetic diversity has been lost across European crops and diets, but high yields are not synonymous with good nutrition.

Recently, the EU, national and regional governments, municipalities and cities have increasingly promoted local short food supply chains. Governments have discovered that short supply chains help consumers become conscious citizens who care about the impacts of food production. But even though their policies may grant relief to local farmers, support for associated actors, artisanal processors for instance, is still limited.

EU quality labelling schemes may provide a certain protection for producers and processors linked to a specific tradition or territory, but not all producers or processors want to be limited to a specific tradition or a geographical location.

FINDINGS FROM DIVERSIFOOD

DIVERSIFOOD showed that there are many initiatives for crop genetic diversity across Europe, which led to the creation of new, innovative value chains for food diversity and markets where biodiverse food is appreciated. Often, behind these value chains are networks built on shared beliefs and visions and awareness of the cultural and social dimensions of seeds and plants (heritage, taste, tradition, autonomy) (10, 17).

The networks investigated in the DIVERSIFOOD project not only provided access to diversified food systems, but also to social relationships, knowledge and learning. The relationships in the networks are based on reciprocity, trust and fairness. In many cases, local authorities (municipalities, regional governments) play a crucial role in determining the success of such initiatives (18, 19).

Obtaining consumer approval is crucial for the development and sustainability of food systems based on crop genetic diversity. DIVERSIFOOD revealed the important role of effective communication, aimed at conveying the often hidden values of biodiverse food, through face-to-face relationships and other strategies and tools. In this regard, EU

quality labelling schemes do not play a relevant role, as the people who belong to these networks perceive themselves as innovators and developers of new food systems (20).

POLICY RECOMMENDATIONS

Policies can support the development of food systems based on crop genetic diversity by:

- creating an enabling environment for diversified seed production and circulation (see Chapter 2);
- introducing/reinforcing incentives to cultivate diversified varieties in low input and organic farming systems (see Chapter 1);
- providing support for stakeholders and actors involved in the collective management of cultivated diversity;
- providing support, such as programmes and funding schemes, for initiatives and networks involved in the marketing of biodiverse food, including support to improve communication, training and mutual learning;
- recognising, through support actions, the innovative potential of networks in creating and sharing new knowledge and practices of agrobiodiversity.

Improve the information available to consumers by:

- supporting/enforcing traceability systems in the food supply chain, i.e. providing information on the origin of the ingredients, or other tools to target different audiences;
- fostering point of sale information about the genetic origin of the food, type of variety, breeding approach and assessing the potential of labelling for diversity;
- fostering communication events such as field days or markets for food diversity.

Encourage further research on:

- the relevance of diversified diets based on biodiverse products for health;
- the potential benefits of local value chains built around biodiverse food;
- the potential of craft/artisanal processing of diversified produce;
- community-led local research through regional/national and EU level programmes to facilitate and connect actors/agents engaged in agrobiodiversity.



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4

INVEST IN AWARENESS RAISING OF BIODIVERSE FOOD AMONG ALL ACTORS IN THE AGRI-FOOD SYSTEM



Mainstream plant breeding mainly aims at improving productivity and creating uniformity and stability to meet the needs of the agro-industry. Uniformity, which has invaded all levels of modern society, now includes overall food production and has broken the long lasting direct connection between agriculture and food. In parallel, consumers have no link to farming, limited knowledge of food processing or sensitivity towards agrobiodiversity.

Today, farmers, processors and consumers have little or no awareness of seed/plant genetic diversity, and the related qualitative properties, taste, shape or colour.

The enhancement of agrobiodiversity requires increasing the awareness of all the actors involved, from seed to plate, as well as that of other actors indirectly involved in the food chain, including public authorities and policy makers, researchers, advisors and educators.

FINDINGS FROM DIVERSIFOOD

DIVERSIFOOD promotes organic farming and agroecological farming systems based on diversity and on respect for biological processes and societal needs. Enriching the diversity of food systems requires developing new knowledge about varietal characteristics, seed management and farming techniques, processing technology, qualitative attributes of food products (e.g. nutritional and health properties), marketing and communication practices. Moreover, it requires developing new relationships within food value chains and beyond, as well as conditions to enable active participation and learning processes.

During the DIVERSIFOOD project, the knowledge, perspectives and needs of a diverse range of stakeholders (farmers, consumers, processors, researchers) were involved in an interactive and iterative process of mutual learning in and across all the work packages.

The main findings of this research are that networks of farmers, consumers and processors are interested in re-acquiring autonomy and learning about breeding methods, but they are also

eager to exchange and develop knowledge and skills in farming and in producing and marketing diversified crops (processing and improvement of product quality, sensory testing, food labelling) (10, 21).

POLICY RECOMMENDATIONS

Education and training for farmers and other professionals involved in crop management and food processing should convey the following knowledge and associated skills:

- awareness on the importance of the genetic diversity of crops;
- the capacity to use/get involved in participatory approaches (e.g. provided by DIVERSIFOOD) in breeding for local adaptation;
- the competence to develop innovative marketing strategies within farmer-consumer-processor networks;
- the ability to facilitate interactions among different actors and associated different domains of knowledge and experience.

In order to raise awareness among citizens, governments at all level should implement:

- public campaigns to create social awareness of agrobiodiversity across Europe;
 - public dialogue about society's responsibility to increase agrobiodiversity and embeddedness in farming and food systems, considering agrobiodiversity (and consequently seeds) as a common good for future generations.
- Improved education and training, and new curricula are needed, from school, apprenticeship to university level, that:
- include agrobiodiversity, diversified/alternative farming systems and breeding for local adaptation in educational programmes and materials;
 - allow inter- and transdisciplinary learning and exchange between biological, technological and social sciences in connection with agrobiodiversity, and between scientists and practitioners.



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5

FOSTER MULTI-ACTOR AND INTEGRATED RESEARCH APPROACHES IN SUPPORT OF AGROBIODIVERSITY



For many years, research on agrobiodiversity mainly focussed on a sectorial and technological approach, while links with agriculture and food production, interactions with the environment and local adaptation were lost. A few actors belonging to private or public research and public bodies, have driven these activities, addressing mainly *ex situ* conservation of “genetic materials”.

Recently, new research and support initiatives involving a significant change of paradigm have started to emerge and spread. Aimed at re-embedding agrobiodiversity in farming and food practices, they build on more active involvement of farmers and examine the use of the products of diversified crops by supply chain actors and consumers.

FINDINGS FROM DIVERSIFOOD

DIVERSIFOOD based its research activities on the belief that re-introducing diversity in the agri-food systems is a complex process which demands a comprehensive, integrated approach, able to take into consideration a variety of aspects - including ecological, agromonic, organisational, economic, institutional, social, cultural, ethical, legal and political aspects. Research needs to address and integrate all these aspects, mobilise all available knowledge and experience, and, to that end, interact with all the diverse actors involved.

DIVERSIFOOD conceived this research approach as a multi-actor, systemic approach. It builds on interactions and cooperation among different actors who provide complementary perspectives, resources, methods and tools, depending on the specific research question and agro-ecological and socio-cultural contexts concerned. It thus implies combining different disciplines, as well as integrating scientific knowledge with knowledge and know-how originating from experience (inter- and trans-disciplinarity) (6, 22, 23, 24). Facilitation actions support these multi-actor interactions and the adoption of a systemic approach.

This approach resulted from the direct engagement and the collective reflection of all the partners on a wide range of experiences within DIVERSIFOOD, from plant breeding to valorisation strategies.

POLICY RECOMMENDATIONS

To facilitate the dissemination and strengthening of multi-actor, systemic approaches to the issue of increasing diversity in farming and food systems, interventions to orient and support research and related facilitation actions are needed. Based on the characteristics of such approaches, this means fostering research projects and organisation of research within public and private institutions that:

- investigate network opportunities and synergies, both at local and broader scales (considering networks as crucial for learning and innovation, as also recognised by the European Innovation Partnership in Agriculture - EIP Agri), and are able to enter this network dimension (e.g. participation of researchers in collective organisations outside research institutions);



- create enabling conditions for the full and active participation of the actors involved (e.g. by adopting truly participatory methods, overcoming time and budget constraints and power imbalances in decision making);
- address context-specific processes, capture the real conditions in which actors interact and develop their practices with respect to agrobiodiversity;
- implement adaptive management of the research process to account for all the necessary adjustments;
- grasp all the dynamics underlying the development and dissemination of suitable practices, looking beyond purely technological or economic aspects, and paying attention to social, cultural, institutional and legal factors in local contexts as well as in relation to broader dynamics;
- facilitate integration of different scientific disciplines and other sources of knowledge (beyond sectorial and specialist knowledge), while renewing the working methods (e.g. foster genetic diversity in the field by facilitating better communication between gene banks, farmers and researchers);
- investigate and invest in the crucial role of intermediation and facilitation;
- train students and teachers (at various levels) to adopt inter- and trans-disciplinary approaches, also through direct interactions with non-academic actors (e.g. through apprenticeship), and to discuss project hypotheses and results using a multi-dimensional and systemic approach;
- implement a model of research embedded in reality and with a transformative role: based on a multi-actor evaluation of research projects and institutions; based on iterative processes between knowledge co-creation and incorporation in new practices; open to sharing its achievements outside the research institutions, in order to have them validated socially and to increase their impact; building on collective reflexivity to support its transformative potential.

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This **booklet #5** presents policy recommendations to embed crop genetic diversity in five areas of action.

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ITAB • Institut Technique de l'Agriculture Biologique
RSP • Réseau Semences Paysannes
IT • INRA Transfert

UK

ORC • Organic Research Centre

Switzerland

FiBL • Forschungsinstitut für biologischen Landbau
PSR • ProSpecieRara

The Netherlands

LBI • Louis Bolk Instituut

Portugal

IPC • Instituto Politécnico de Coimbra
ITQB NOVA • Instituto de Tecnologia Química e Biológica-Universidade Nova de Lisboa

Italy

UNIBO • Alma Mater Studiorum Università di Bologna
UNIPI • Università di Pisa
RSR • Rete Semi Rurali
FORMICABLU • Science communication agency

Cyprus

ARI • Agricultural Research Institute

Finland

LUKE • Natural Resources Institute Finland

Spain

CSIC • Agencia Estatal Consejo Superior de Investigaciones Científicas
RAS • Asociación Red Andaluza de Semillas Cultivando Biodiversidad

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