DYNAVERSITY

DYNAmic seed networks for managing European diVERSITY

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☐ **PU:** Public (must be available on the website)

X CO: Confidential, only for members of the consortium (including the Commission Services)

☐ **CI:** Classified, as referred to in Commission Decision 2001/844/EC

Prepared by Daniel Traon (Arcadia International) with contributions from: Stephanie Klaedtke (SEED), Corentin Hecquet (SEED), Rocanne Mosse (SEED).

Abstract

This deliverable provides the first draft version of practice abstracts for the DYNAVERSITY project.

In line with the H2020 policy on multi actor research projects involving the agricultural community, DYNAVERSITY contributes to sharing solutions/opportunities ready to further develop *in situ* valorisation activities in the field of genetic resources.

Two sets of practice abstracts (about 50 in total) are expected to be produced during the 42 months of the project involving the *in situ* communities in genetic resources.

The first set of practice abstracts (17) are presented in this deliverable. The remaining ones will be produced during the second part of the project and will be presented at the end of the project (Nov. 2020).

Communicating about projects, activities and results is much easier through the use of practice abstracts. The EIP-AGRI common format for interactive innovation projects facilitates knowledge flows on innovative and practice-oriented projects from the start till the end of the project. The use of this format also enables farmers, advisors, researchers and all other actors across the EU to contact each other. The EU template for reporting practice abstracts will be completed and sent according to the instructions.

1. DYNAVERSITY as a tool to increase the visibility of *in situ* valorisation activities in the field of genetic resources in the EU

Conservation of Plant Genetic Resources for Food and Agriculture (PGRFA) is an arena populated by composite players which, often, are active at local and regional level. These actors are organised in specific project without enough understanding of other similar activities and projects even if several networks, specific in form and nature, have been set-up during the last two decades. Acknowledging the diversity of the actors involved in the conservation of biodiversity, DYNAVERSITY proposes a dynamic management and governance aiming at enhancing interactions, complementarities and synergies across initiatives. Based on a better understanding of organisational and relational dynamics, including the institutional barriers and enablers, DYNAVERSITY aims at facilitating co-construction between actors and establish new forms of seed networking and socio-environmental knowledge and practices. DYNAVERSITY also aims at facilitating exchange and integration of scientific as well as practical knowledge on how to best manage diversity in agriculture and in the entire food chain. By creating the Sharing Knowledge and Experience Platform (SKEP), representing actors coming from research, ex situ networks and communities of practice, DYNAVERSITY facilitates exchange and integration of scientific as well as practical knowledge, during and after the project, on how to best manage diversity in agriculture and in the entire food chain, restoring evolutionary and adaptation processes.

2. DYNAVERSITY: The hub to share, improve and learn about *in situ* valorisation of genetic resources at local level

To date it can be assumed that the frequency of peer-to-peer learning and exchanges between farmers outside its original boundaries is limited and depends on two variables: the proximity of farms, and the good communication among farmers who are working on similar genetic resources. Through the development of a European online mapping solution, DYNAVERSITY acts as a hub that will facilitate and improve this learning process through the EU, across regional projects. This platform will contain a large list of valorisation projects and initiatives, particularly those oriented to practitioners and local farmers. This mapping solution will be a live repository of maps with inventoried initiatives presenting good practices. In addition, the solution will be an opportunity for farmers and local promotors to overcome the barriers of distance and communication. Likewise, the users will have filters and search functions (filtering information by project and initiative functionalities) and will, also, have the opportunity to add new projects online, and therefore, to promote their own activities. All in all, the mapping solution aims to improve knowledge and enhance project-to-project learning, concentrating information that is not synthesised formerly yet, and also creating a virtual community of valorisation initiatives and projects.

3. DYNAVERSITY to understand mechanisms on how networks set-up and develops through the running of 21 case studies

The transformative potential of 21 particular cases is analysed in the framework of DYNAVERSITY to better understand what it is that allows different people and groups, having different approaches to in situ and on farm conservation of PGRFA, collaborate despite their differences. The case studies consider technical, economic, social and environmental incentives and barriers to the networking of different initiatives. This also involves tracing the interactions between human and non-human elements which comprise in situ and on farm PGRFA management. In order to make different approaches to PGRFA compatible and enable collaboration between initiatives, different framings of the problem have been made intelligible. This implies, at least, to make framings explicit, but also to make the effort to deconstruct them. Additional cases from North America help to understand how networks are developing in other parts of the works and offer concrete and suitable approaches that could be used in the EU. Studying these case studies by putting a great emphasis on social characteristics allows to assess and understand what can be put in place to intensify the links and collaborations between different actors and organisations. It is not only a question of describing the various cases but, more, an issue to understand the social dimensions of each individual projects by analysing the incentives and expectations from each project participant.

4. Growing importance of informal seed networks in the EU

Thanks to their experience in the construction of diverse and sustainable agricultural systems centred on dynamic management of PGRFA, European seed networks have the potential to be a critical partner in efforts to integrate the “wild dimension” into their portfolio of on-farm activities. The farming communities engaged within the networks, as many organic or biodynamic farmers anywhere, are already likely to be contributing to CWR conservation in their fields, thanks to their continuous efforts to reduce the impacts of their production systems on the environment and construct sustainable and diverse agro-ecosystems. However, their contribution to wild plants’ conservation is likely to be happening haphazardly and not in a coordinated or systematic manner. Through the networks, opportunities may exist to more systematically work with farmers to protect locally prioritised species in hedgerows, conservation easements, and other open spaces. Dialogue and exchange with natural parks or protected area managers will be important to ensure synergies or complementarities, or even close collaboration when “diversity-rich” farming occurs within a nature reserve, alongside a formally organised in situ conservation of CWRs. Any of the activities envisaged should be conducted in parallel to continued scientific assessments of CWR conservation priorities and in synergy with their ex situ conservation, which makes them readily accessible to interested breeders. To this end, a multi-actor, interdisciplinary and decentralized, locally based approach will be crucial to devise means to support this integration technically and politically.

5. Genetic erosion and the *ex situ* conservation era

Breeders themselves and scientists got increasingly concerned about the phenomenon of “genetic erosion” that accelerated in the 1970s as new high-yielding cultivars replaced many landraces. New varieties guaranteed higher yields thus contributing to hunger alleviation in many areas but failed to serve the needs of the many farmers in more marginal areas and with less access to finance and technology, who still found the best response to food security and stability of production in their local landraces and mixtures. Breeders themselves were well aware of the importance of landraces, mixtures and crop wild relatives as reservoirs of important genetic diversity and traits for breeding itself. Two important FAO technical conferences on plant genetic resources (PGR) in 1967 and 1973 set the technical and financial (donor-based) bases for kick-starting global conservation actions. The establishment in 1974 of the International Board for Plant Genetic Resources (IBPGR) within the framework of the CGIAR allowed the organisation of collection missions worldwide over the following ten years, contributing to the collection and ex situ storage in national and international (CGIAR) genebanks of a great deal of material as well as to the production of guidelines, descriptors and protocols. Since then, the issue of seeds became not only a technical-scientific problem, but also a political one, entailing a tug of war between the diversity-rich countries of the global South (from which many key resources were being collected) and the technology-rich countries of the North (which were those mostly exploiting those resources for research and development, and benefiting from commercial and IP outcomes).

6. The evolving concept of genetic resources conservation - Early years and the dominant ex situ conservation paradigm

The development of international frameworks around PGR was certainly driven by rapidly evolving global commercial interests and was informed by scientific discussions on the most appropriate conservation models and strategies, which coevolved alongside the trajectory of policies. During the early decades of international PGRFA conservation efforts, most scientists and policy makers assumed that farmers had no interest nor incentive to keep conserving and managing the traditional agro-ecosystems in which landraces and crop wild relatives prospered as the use of these resources was linked to underdevelopment and low production. Based on these assumptions, they saw no possibility or advantage in involving them in dedicated in situ conservation programmes for PGRFA. Furthermore, most stakeholders at the time were aware that setting up an in situ conservation program for PGRFA would mean providing for an active involvement of farmers, introducing a social variable that would be difficult to manage within scientific projects. Under the ex situ paradigm, PGRFA were kept in controlled environments, removed from their place of origin and from the dynamic effects of natural and human selective pressures. Many CWRs of particular interest for breeding and which could be stored in genebanks and regenerated easily were also collected and used in breeding, but this is an overall small proportion compared to the cultivated PGRFA which ended up in ex situ collections. Furthermore, there was little evidence that the in situ conservation of wild relatives has advanced significantly. Various authors agree that the handful of active genetic reserves for CWR conservation maintain an even smaller proportion of CWR diversity than is conserved *ex situ*.

7. Examples of conservation of CWR in protected areas

The Lizard Peninsula in southwestern England was found to be particularly rich in CWRs, conserving 93 CWR species out of the total 148 found in England. Examples are e.g., wild chives (Allium schoenoprasum), wild garlic (or ramsons). Since this assessment, the managers of the protected areas which already existed on the island included the active conservation of CWR in their management plan, with a view to enable and favour future use of the resources. In Germany, the “100 fields for biodiversity” project focuses on the conservation of wild plant species (including CWR) outside protected areas through the establishment of a nationwide conservation network for wild arable plant species. Other types of nature protection and traditional management systems at a landscape scale are community conserved areas. These are defined as natural and modified ecosystems, containing significant biodiversity resources, both wild and cultivated, and providing ecological services and cultural values. They are voluntarily conserved by indigenous peoples and local and mobile communities through customary laws or other means. Examples of these areas are found in various countries, such as in the Western Terai Landscape Complex in Nepal where community biodiversity registers have been developed. Particularly in the face of unprecedented climatic disasters, social conflict, and political uncertainty, many authors recognize the need for integrating in situ and ex situ strategies to effectively conserve CWR. Recently, the concept of trans situ conservation has been introduced which aims at dynamically integrating multiple in situ and ex situ measures, from conservation to research to education, spanning local to global scales.

8. Questioning ex situ conservation and the rise of in situ/on farm approaches

The dominant ex situ approach to PGRFA conservation started to be questioned in the late 1980s, as the results of research performed by rural sociologists and anthropologists demonstrated the relative in-effectiveness of a purely static means of conservation which removed the plants from their natural and cultural environment. The shift was supported by the renewed in situ emphasis contained in the discussions leading to the CBD and by the increasing criticism which was being moved against “Green Revolution” approaches. This shift was rapidly accompanied by the idea of widening the conservation focus from single varieties to entire agroecosystems, with all their complex biological and human interconnections. This idea established a link between sustainable rural development and maintenance of not only PGRFA but of all agrobiodiversity by farmers, including landraces, CWRs and useful wild plants. The focus of the former is the conservation of individual PGRFA and their specific phenotypic and genotypic identity within on-farm systems. PGRFAs are used directly by the farmers who maintain such resources, but they also have potential for use by breeders or other outside users interested in exploiting the diversity. It essentially provides for a more static form of on-farm conservation which is thus closer to ex situ approaches, while being carried out in the field. In contrast, on-farm management focuses on maximizing the diversity of PGRFA held within any on-farm system. The diversity is maintained to maximize direct benefit to the local farmers, particularly those in marginal environments, and potential use by breeders or other users is of less importance.

9. Widening the on-farm conservation approach

Over time, on farm conservation became the terrain in which other important activities around PGRFA developed, among which participatory, decentralised breeding, restoration of maintenance of informal seed systems. The climate crisis has contributed to strengthen attention paid to using crop diversity within production systems as a way to reduce risk due to biotic and abiotic changes. A greater understanding of the amount and distribution of genetic diversity on-farm and of the role of informal seed systems in maintaining such diversity is also accumulating. One of the challenges for the future is related to achieving greater integration across ex situ/in situ/on farm conservation strategies and collaboration among relevant actors from each field. One aspect of this challenge relates to how to better harmonise and coordinate the on farm management of cultivated genetic resources with in situ conservation of CWRs. Until recently, indeed, in situ conservation of CWR has been almost exclusively carried out through the identification and creation of genetic reserves whose management has somehow fallen between the cracks of the environmental and agricultural sectors. On the contrary, CWRs often occupy transition ecosystems between the wild and the cultivated and in so doing coexist with the latter in field margins or within fields themselves. The other aspect of this challenge is how to integrate the even more contrasting models of ex situ on the one side and in situ/on farm on the other, which also translates into creating better links between the so-called formal and informal development systems. While there have been recent efforts at mutual acknowledgment and collaboration, this is a field that still needs to be developed.

10. Seed and plant varieties - What are the differences between various types of seeds and plant varieties?

Plants and people have co-evolved over centuries. Different types of plant varieties have been developed over time through the interaction of human and natural selection processes. Human knowledge surrounding seeds, plant varieties, and local food systems has developed over time, resulting in landraces and farmers' varieties which are often location specific. Farmers have been selecting and saving seeds with the best characteristics for use the following planting season for thousands of years. The resulting varieties are often called landraces, traditional varieties, or local varieties, which are the product of mass selection and local adaptation. Farmers' landraces are population varieties or open pollinated varieties, rather than a uniform variety, as the genetic diversity at the population level helps provide insurance against unforeseen conditions (drought, flood, etc.). Crop populations can also sometimes interbreed with crop wild relatives but, as far as possible, farmers try to avoid such crosses because it will decrease crop quality. It is by positive (choosing the best plants) or negative (removing plants with undesired characters) mass selection that farmers developed all forms of population varieties (see mass selection). Farmers have, also, started to collaborate with researchers in participatory breeding projects to develop new population varieties called "peasant varieties". In addition, many home gardeners prefer population varieties e.g. landraces, heirloom varieties, old varieties or heritage seeds, which exhibit distinctive colours, tastes, and other traits. Specialised plant breeding is a relatively recent development in the longer history of the evolution of different seeds and plant varieties.

11. Conventional vs informal plant breeding

Plant breeding began as a scientific enterprise in the late 1800s, became widespread in public institutions in the 20th century before turning dominated by commercial enterprises. In the 1930s, breeding companies started to produce F1 hybrid seeds, which are linked to high-input, productivity-oriented agriculture. FI seeds require that farmers keep purchasing seeds in order to ensure the same seed characteristics year after year. Varieties bred by plant breeders using specialised breeding techniques are sometimes called “modern” or “improved” varieties. In the 20th century, together with the spread of modern varieties such as pure lines and F1 hybrids, crop diversity has decreased. In addition, the vast majority of “modern” and “improved” seeds are now owned by a handful of private corporations. Genetic diversity has been dramatically reduced as breeders began relying upon fewer plant parents for increasing yields and productivity, resulting in a process of genetic erosion of varieties with other valuable traits. Nevertheless, many farmers have continued to save and select seeds of farmers’ varieties for generations. Framing plant breeding through the lenses of “modernisation” and “improvement” posit all other types of seeds and varieties as backwards and inferior. Yet too much reliance on plant breeding in laboratories, at the expense of farmer management and selection systems, has devalued farmer knowledge and practices and deskilled farmers. But in the case of on-farm plant breeding, farmers and gardeners develop new skills of seed saving and selection methods, which are completely different from modern plant breeding.

12. Seed networks

Both farmers and specialised breeders possess important knowledge and engage in key practices to save, manage, and reproduce seeds and plant varieties. Tensions exist between “formal” seed systems, which are often associated with large-scale conventional and industrialised agricultural systems, and “informal” seed systems, which are associated with small-scale production, and more likely to be based on agroecology and organic agriculture methods. Stakeholders in these different systems often hold different visions of the future of agriculture, which makes cooperation difficult. Both “formal” and “informal” seed systems rely on different context-based knowledge; it is not only the contexts that differ (laboratory versus farm) but the overall paradigm: one is based on the market, while the other is based on a more holistic understanding of life. Framing seed systems as “formal” or “informal” gives an impression of the latter as less important, or as producing seeds of lesser quality, which is inaccurate. Complementary seed networks can be considered as an important mode of organising social relations around seed exchange that can help maintain genetic diversity and agrobiodiversity, as long as there is transparency about breeding methods.

13. Informal seed systems

In contrast to formal seed systems, the “informal seed system” is often associated with indigenous local knowledge (ILK)/traditional knowledge/traditional ecological knowledge (TEK) and indigenous research. Farmers experiment with different seeds to see which will work best in various conditions. Through this they gain knowledge about seed characteristics in the context of in situ or on-farm seed production and conservation, and the performance of seeds in particular locations. Such information is gained by interaction and experience in living with and using seed and is often associated with specific groups of local people living in a particular environment, tied to the cultural heritage and history of these groups. In this way seeds are themselves part of cultural heritage. These diverse varieties are constantly evolving and adapting to local conditions and climate change, increasing the adaptive capacity and resilience of farmers and ecosystems to climate change. Despite prevalent misconceptions that position informal farmer seed systems as disappearing, about 80 percent of the world's seed stock still comes from these systems.

14. Formal seed systems

In contrast to informal seed systems, "formal seed systems" are thought to circulate "modern" and "improved" seeds, which are bred to meet seed certification and variety registration requirements that arise from national and EU seed legislation. Plant varieties must be proven to be "distinct, uniform and stable" ('DUS' tests) and seeds are tested for germination rates and phytosanitary health. This maintains varieties as static, rather than dynamic entities. These criteria are important for commercial seed marketing. Farmer varieties and farmer-saved seeds, which are often grown as a population, don't need and cannot meet these requirements. These criteria also serve to remove seeds from the contexts and social networks through which they have gained significance. In the service of "modern" and "formal" seed systems, seeds of, for example, landraces, heirloom and old varieties, are transformed from holistic living organisms into plant genetic resources, valued for their potential to be used in future breeding work. Referring to seeds as resources is controversial, because it can lead to a mechanistic and reductionist view of life and a sense of human domination over nature.

15. Conservation of Plant Genetic Resources - *in situ* vs. *ex situ*

Seeds and plant varieties developed by farmers over generations are currently valuable both as living organisms and as PGR. The diversity of these plant genetic resources together constitutes the agrobiodiversity of our food systems. The preservation of plant genetic diversity for future generations is now through either ex situ or in situ conservation approaches. Both in situ and ex situ approaches to conservation require specific knowledge and practices in order to develop (in situ) and to maintain (ex situ) PGR for the future. Genebanks are also called ex situ (off-site) conservation of PGR. Each seed or plant included in a gene bank is called an accession. Once in a genebank, the plants and seeds are sometimes regarded as germplasm or genetic material, valuable for their specific genes or alleles, rather than the plant as a whole. New breeding techniques sometimes use only certain genes from a plant, rather than the whole. Farmer continued management and use of their seeds, breeding their own varieties on their farms and in their communities, is an alternative way of in situ (or on-farm) conservation. These varieties, most often plant populations, are locally adapted and constantly evolving along with the climate and growing conditions. Farmers may use each variety for different uses (culinary, ritual, ecological, social, etc.) and even may create new uses for our contemporary society. It is through their continued use and circulation that they are conserved, called sustainable use. Dynamic management of PGR is an alternative strategy to both in situ and ex situ, which aims to conserve not only specific genes, alleles, or plants, but rather the environments in which genetic diversity can continue to evolve at the population level.

16. Agrobiodiversity governance

Legislation governing seeds and plant varieties reflects the uneven power dynamics between farmers, gardeners, consumers, scientists, researchers, breeders, and government officials. The ongoing struggle between breeders' rights and farmers' rights is part of a larger environmental justice and food sovereignty issue, whereby not all parties have the same rights to have their ways of life recognised, the right to participate in decision-making, or to benefit from access to environmental goods, such as agricultural biodiversity. The debate over which kind of seed regulations should be put in place is largely a debate over whether seeds should be governed as a common pool resource, private property, or a protected common. The goal is to define ways to provide access to and protect agricultural diversity without allowing anyone to appropriate it for their exclusive benefit. One innovative approach of defining seeds as a protected common is the Open Source Seed Initiative (OSSI), modelled on open source software. Anyone may use the open source seed varieties for any purpose, but only if they pledge to not apply intellectual property rights to them, or any new varieties derived from them, in the future. In addition, access to PGR and the sharing of benefits derived from them remains uneven. Laws often favour expert knowledge and the products that result from breeding over the knowledge of farmers and gardeners; and even criminalise seed exchange practices. Farmers are framed as end users of seeds as resources rather than actual or potential breeders and managers of seeds and PGR. Seed networks are actively involved in negotiations over legislation and in developing new ways of organising social relations surrounding seeds as resistance to unjust laws.

17. The role of diverse seeds and plant genetic resources in broader

Differences in knowledge and practices surrounding seeds and plant varieties undergird differences in visions of agricultural sustainability and of plant breeding approaches. The 20th century has resulted in an unprecedented industrialisation of agricultural systems based on monocropping, increasingly based on biotechnologies, and high use of inputs of agrochemicals and fossil fuels. In these industrial agricultural systems, seed is just one of many commercially produced input, rather than produced on the farm. The large use of these systems has resulted in important social and environmental consequences, such as soil degradation, genetic erosion, water contamination, overuse of fossil fuels, decreasing rural population, and others. In response to the growing trend toward industrial-scale farming and the increasing homogenisation of crops and genetic erosion, Via Campesina has initiated an international alliance of organisations of peasant and family farmers, farm workers, and rural women and youth, popularising the concept of food sovereignty. Many peasant and small farmers rely on practices of “agroecology”, or organic agriculture, focusing on food quality and creation of healthy food. These systems produce food while fostering agrobiodiversity, creating space for many different life forms to inhabit, and assuring human interactions based on communality, reciprocity, equity, grassroots or democratic processes and many knowledge systems as a way to move toward food democracy. Directly addressing the trend of homogenization in agriculture, a diversified food system is part of a sustainable food system/eco-agri food system.

18. DYNAVERSITY: The hub to share, improve and learn about *in situ* valorisation of genetic resources at local level

To date it can be assumed that the frequency of peer-to-peer learning and exchanges between farmers outside its original boundaries depends on two variables: the proximity of farms, and the good communication among farmers who are working on similar genetic resources.

Through the development of an European online mapping solution, DYNAVERSITY acts as an hub that will facilitate and improve this learning process through the EU, across regional projects.. This platform will contain a large list of valorisation projects and initiatives, particularly those oriented to practitioners and local farmers.

This mapping solution will be a live repository of maps with inventoried initiatives presenting good practices. In addition, the solution will be an opportunity for farmers and local promotors to overcome the barriers of distance and communication. This will allow actors to improve and disseminate their activities and knowledge across the EU. Likewise, the users will have filters and search functions (filtering information by project and initiative functionalities) and will, also, have the opportunity to add new projects online, and therefore, to promote their own activities.

All in all, the mapping solution aims to improve knowledge and enhance project-to-project learning, concentrating information that is not synthesised formerly yet, and also creating a virtual community of valorisation initiatives and projects.

19. DYNAVERSITY to understand mechanisms on how networks set-up and develops through the running of 20 case studies

The transformative potential of 20 particular cases is analysed in the framework of DYNAVERSITY. The objective of these case studies is to better understand what it is that allows different people and groups, having different approaches to *in situ* and on farm conservation of PGRFA, to collaborate despite their differences. The case studies consider technical, economic, social and environmental incentives and barriers to the networking of different initiatives. This also involves tracing the interactions between human and non-human elements which comprise *in situ* and on farm PGRFA management.

A broad set of European initiatives has been collected in an "exploratory portfolio" in order to gather a diversity of initiatives – individuals or groups operating at different scales - which may potentially be of interest for the case studies. In order to make different approaches to PGRFA compatible and enable collaboration between initiatives, different framings of the problem have been made intelligible. This implies, at least, to make framings explicit, but also to make the effort to deconstruct them.

Studying these case studies by putting a great emphasis on social characteristics allows to assess and understand what can be put in place to intensify the links and collaborations between different actors and organisations.

20. NOVAFRUITS In Belgium and France, from a regional to an European project

The project NOVAFRUITS aims at creating new fruit varieties adapted for organic and low-input farming. These varieties are created via a participatory breeding approach (the selection of varieties is performed by the organic farmer themselves).

The two main actors of the project which are the Regional Center of Genetic resources (CRRG) in Nord of France and the Center of Agricultural research in Gembloux–Wallonia (CRA-W) in Belgium that both want to develop production and sales of novel varieties cultivated in the Nord of France and Belgium.

The first activities related to this participatory work date back to 1989, when researchers at the CRA-W in Gembloux (Belgium) decided to start a new fruit breeding programme, mainly on apples and pears. For about 30 years now, these genetic resources have been used in crossing programme with other old varieties or more recent ones. In 2003, the CRA-W started a new collaboration with the CRRG in Villeneuve d'Ascq in France in the context of an European Interreg III project. Therefore, organic producers from the two sides of the French-Belgium border are associated to the breeding and testing effort. This mutual work between parties allows to move faster through the breeding process.

This collaboration materialised in 2014 by the creation of the association called NOVAFRUITS which aims to be the exclusive maintainer of the varieties created through the participative process. By doing so, the project leaders aimed at bringing competitive advantages to producers while guaranteeing high quality organic products to consumers. This valorisation process leads to further conservation work on patrimonial and local neglected genetic resources over national boundaries.