EUROPEAN

POLICYBRIEF

AGROBIODIVERSITY AS MEDITERRANEAN AGRARIAN HERITAGE

MEDITERRANEAN MOUNTAINOUS LANDSCAPES
an historical approach to cultural
heritage based on traditional agrosystems
MEMOLA

This policy brief summarises the MEMOLA project findings regarding the role agrobiodiversity has in reactivating Mediterranean agricultural systems. Traditional varieties are the best ambassadors of the landscape in which they are cultivated. Preserving them by intergenerational knowledge transfer may be a way to reactivate traditional agroecosystems creative cycles and to improve social and cultural resiliency. The brief also presents policy development recommendations to establish mechanisms and criteria to define its values and for their protection.

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December 2017

INTRODUCTION

Agrobiodiversity is the biological variation at all levels (from genes to agrosystems) and in its every expression (natural and cultural), which plays a key role in agriculture and human nutrition. It is the result of millenary interaction between man and the environment (biotic and abiotic) modifying plants and animal genetics and transforming ecosystems to better exploit natural resources necessary for humankind. Agrobiodiversity originates from the process of plants and animals domestication – started in the Near East around 9.5 kacal BC – and the beginning of agriculture, and further selection of genotypes that led to new varieties.[1]

Since the first agricultural revolution, occurred during the Neolithic, agriculture has expanded through farming and breeding systems, originating different agricultural systems associated to different environmental conditions. These systems have changed over time, starting from plants selection processes (agrarian archaeophytes) and changing waves in relation to migrations, commerce, and the introduction of new species (agrarian neophytes). Co-evolution processes between human culture and agrobiodiversity has favoured a symbiotic growth and mutual expansion. It is no coincidence that the Mediterranean area, due to its biogeographical characteristics, is a plant biodiversity hotspot and a cultural diversity hotspot.The result of these historical relationships between man and nature is the extraordinary biocultural richness of the area (Fig. 1).

[1]The words "variety" in English, "variété" in French, "variedad" in Spanish, "variedade" in Portuguese, "varietà" in Italian, "ras" in Dutch, "Sorte" in German, "sort" in Scandinavian languages and Russian, "pinzhong" in Chinese, "engei-hinshu" in Japanese, and corresponding terms in other languages, have sometimes been used as common or vemacular equivalents to a *cultivar*." (By: Brickell, C. D., Baum, B. R., Hetterscheid, W. L., Leslie, A. C., McNeill, J., Trehane, P., &Wiersema, J. H. (2009). *International code of nomenclature for cultivated plants.* Eighth Edition. International Society for Horticultural Science.

Mediterranean landscapes are the physical expression of these complex interactions between biodiversity, in any form and at every level (genetic, species, ecosystem), and cultural diversity, in all its forms, material and intangible, including local knowledge, rituals, symbols and traditions concerning crops, harvesting, fishing, animal husbandry, conservation, processing, cooking, and particularly the sharing and the consumption of food.

Today, most of the varieties we consume, and compose the "Mediterranean diet" are very different biological entities if compared with their wild progenitors, both in their shape and organoleptic characteristics. They are the living expression of specific Mediterranean biocultural diversity, since farming communities have gradually transformed these varieties to adapt to their environment, respond to their needs and their taste. Resulting from this diversity, in 2013, the Mediterranean diet was included in UNESCO List of Humanity Intangible Cultural Heritage.

The association between traditional varieties and agrosystems is inseparable. Protecting traditional varieties and associated farming methods, implies the preservation of the landscapes they inhabit. Safeguarding this heritage, especially through intergenerational exchange , represents a rooted strategy for sustainability that nowadays is gaining a new impulse.

Fig. 1 – "Ovaletto di Calatafimi" is a variety of Citrus typical of Calatafimi Valley in the Monti di Trapani area (Photo by: R. Corselli)

THE VALUE OF AGROBIODIVERSITY

The definition of agrobiodiversity

FAO (1999)[2] defines Agrobiodiversity as "The variety and variability of animals, plants and microorganisms that are used directly or indirectly for food and agriculture, including crops, livestock, forestry and fisheries. It comprises the diversity of genetic resources (varieties, breeds) and species used for food, fodder, fibre, fuel and pharmaceuticals. It also includes the diversity of non-harvested species that support production (soil micro-organisms, predators, pollinators), and those in the wider environment that support agro-ecosystems (agricultural, pastoral, forest and aquatic) as well as the diversity of the agro-ecosystems" (Fig.2).

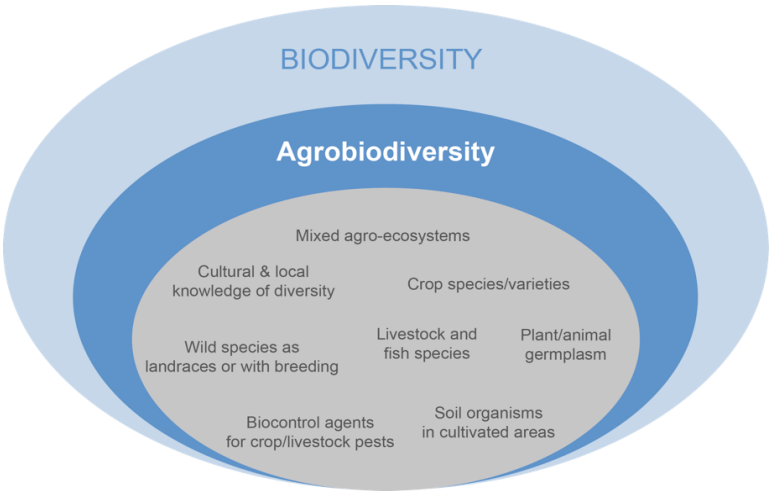

Fig. 2 –Components of Agrobiodiversity (Adapted from: FAO, 2005).

According to the Biodiversity Convention (CBD), agrobiodiversity includes the following dimensions:

1) Genetic resources for food and agriculture: Plant genetic resources, including crops, wild plants harvested and managed for food, farm trees, pasture and rangeland species, animal genetic resources, including domesticated animals, wild animals hunted for food, wild and farmed fish and other aquatic organisms, and microbial and fungal genetic resources, among others. These constitute the main agricultural production units, including cultivated and domesticated species, managed wild plants and animals, as well as wild relatives of cultivated and domesticated species.

2) Components of biodiversity that support ecosystem services upon which agriculture is based. These include a diverse range of organisms that contribute, at various scales to, inter alia, nutrient cycling, pest and disease regulation, pollination, pollution and sediment regulation, maintenance of the hydrological cycle, erosion control, and climate regulation and carbon sequestration.

3) Abiotic factors, such as local climatic and chemical factors and the physical structure and functioning of ecosystems, which have a determining effect on agricultural biodiversity.

4) Socio-economic and cultural dimensions. Agricultural biodiversity is largely shaped and maintained by human activities and management practices, and a large number of people depend on agricultural biodiversity for sustainable livelihoods. These dimensions include traditional and local knowledge of agricultural biodiversity, cultural factors and participatory processes, as well as tourism associated with agricultural landscapes.

[2]FAO (1999). *Agricultural Biodiversity, Multifunctional Character of Agriculture and Land Conference*. Background Paper 1. Maastricht, Netherlands. September 1999.

Historical dimension of agrobiodiversity

The Mediterranean region has a high richness of cultivated plants by the apportion of germplasm coming from different geographic regions and by millenary activities of genetic improvement . In the Near East, the process of fruits domestication started during the 7th millennium B.C. as cereal farming was established[3]. In the Mediterranean, olive tree, grapevine and fig tree farming dates back to the 4th millennium B.C.[4,] while species such as apple, cherry, pear and plum where between the 3rd and 2nd millennium BC.[5]
The introduction of new species, their selection process and breeding led to fruits with more efficient agrarian and nutritional characteristics[6,] that spread on a larger scale as grafting techniques were developed, after the first millennium[7](Fig. 3).

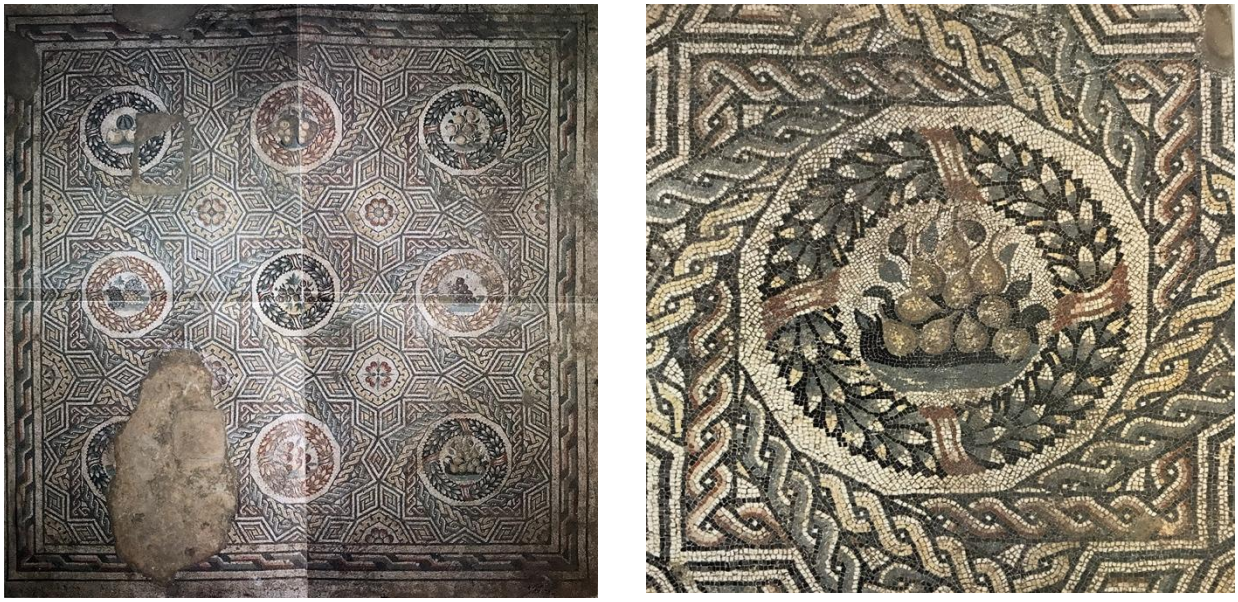

Fig. 3 - Outstanding mosaic of Cubicle of Fruits in the Villa del Casale (Piazza Armerina, Siciliy) representing a glimpse of agro-biodiversity of the early 4th century AD[8].

Travels to the American continent and its extraordinary species richness changed agriculture and nutrition in Europe. Fruit crops became crucial outside of their places of origin and even characterized the landscape of areas in which farming had a commercial role (i.e: the prickly pear in Sicily).

The history of agrodiversity is an expression of human history, marked by people´s migration introducing new species and new farming techniques. This process is dynamic and ongoing (i.e: kiwi farming in Europe started in the 70s). Migration, commerce and new species introduction have increased richness in terms of species. At the same time, selective pressure exerted by farmers has increased intraspecific biodiversity. New varieties have been selected to adapt to the environmental characteristics of very restricted areas, to particular farming and subsistence needs, as well as to economic purposes.

Historically, enormous number of local varieties, or etnovarieties[910], proliferated in the Mediterranean to meet the needs of agrosystems, based on optimal local resources exploitation, natural fluxes and cycles. High

[3]Zohary, D., & Spiegel-Roy, P. (1975). *Beginnings of Fruit Growing in the Old World.* Science, 187: 319-327. Weiss E (2015) "Beginnings of Fruit Growing in the Old World" two generations later. Israel J Plant Sci 62:75–85.
[4]Costantini L. & Costantini Biasini L. (1997). *La domesticazione vegetale. Piante spontanee e piante coltivate in Prima Sicilia.* — Alle origini della società siciliana(a cura di S. Tusa), Palermo.
[5]Zohary, D., Hopf, M., & Weiss, E. (2012). *Domestication of Plants in the Old World: The origin and spread of domesticated plants in Southwest Asia, Europe, and the Mediterranean Basin*. Oxford University Press on Demand.
[6]Clement, C. (2012). *Fruits* in Prance, G., & Nesbitt, M. (Eds.). (2012). *The cultural history of plants*. Routledge.
[7]Spiegel-Roy, P. (1986). Domestication of fruits trees. *The Origin and Domestication of Cultivated Plants*, 201-211.
[8] Photo by: Carandini, A., Ricci, A., & De Vos, M. (1982). *Filosofiana, la villa di Piazza Armerina: immagine di un aristocratico romano al tempo di Costantino* (Vol. 1). SF Flaccovio, Palermo.
[9] Rivera Núñez D., Obón De Castro C., RíosRuíz S., Selma Ferrández C., MéndezColmenero F., Verde López A., CanoTrigueros F. (1997). *Las variedadestradicionales de frutales de la Cuenca del RíoSegura. Catálogoetnobotánico*

internal genotype variability allowed these plants to resist environmental stress and diseases. Moreover, they had the nutritional properties needed by farming communities that depended on them.
Plant knowledge has always been linked to local names allowing to reconstruct land historical periods, and sometimes identify ways of life and beliefs of a distant past[11] (Fig. 4).

Fruit varieties, agrobiodiversity and traditional agrosystems.

Fruit plants have an important role in agro-diversity. Apparently, fruits are only a small part of the plants, 20% according to statistics[12,] that feed the human population. This statistic is, with all probabilities, not representative since family farming is usually not included as it is often developed for self-consumption and small local commerce.

In fact, fruit farming production has always been an important food source and a significant supplementary income. This kind of fruit farming was usually not specialized, mixed and rich in species and varieties, with the purpose of obtaining good preservation and a steady supply for self-consumption. Excess produce was sold on local markets or offered as a gift.

Fruit farming in traditional agrosystems has had a key role until post WWII period. These plants are often unique and in precarious state, hence the need to propagate them as soon as possible, so that the variety is not lost[1314].

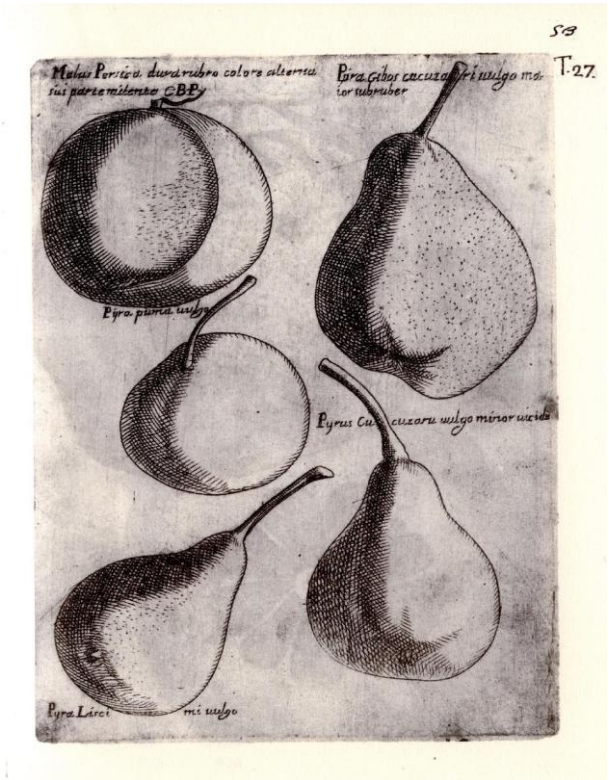

Fig. 4 – Varieties of apple and pear in the book "*PanphytonSiculum*" (1713) by Sicilian botanist F. Cupani.[15].

(1): frutossecos, oleaginosos, frutales de hueso, almendros y frutales de pepita. – Servicio de publicaciones de la Universidad de Murcia, 360 pp.
[10] In this text, the word "etnovariety" is used as equivalent to a "local variety" or "traditional variety".
[11] Benozzo, F. (2007). *La flora, la fauna, il paesaggio: l'importanza dei nomi dialettali per la conoscenza del passato preistorico.* F. Benozzo-C. Cevolani, Dizionario del dialetto di San Cesario sul Panaro, 3, 2006-2008.
[12] Prescott-Allen, R., % Prescott-Allen, C. (1990). *How many plants feed the world?* ConservationBiology 4(4): 365–374.
[13]Barbera G., Sottile F., 2006, *Conservare e valorizzare la biodiversità. Il Museo Vivente del Mandorlo "Francesco Monastra" nella Valle dei Templi (AG).*ItalusHortus 13(2): 95-100.
[14] Schicchi, R., Marino, P., & Raimondo, F. M. (2008). *Individuazione, valutazione e raccolta del germoplasma delle specie arboree da frutto di prevalente interesse negli agrosistemi tradizionali della Sicilia*. Dipartimento Azienda Regionale Foreste Demaniali.

Fruit plants, being perennial, are significant markers in landscape characterization. Ancient varieties persist within the landscape, even after abandonment, as traces of the past and of historical land uses, together with material elements such as terraces and irrigation systems. Thus, in some areas of the Mediterranean old tree of rare pear, sorb or azarole still persist within abandoned areas.

Traditional variety fruit trees are often associated with low impact productive systems and farming practices. Terraces and irrigation systems have an important role in maintaining this varietal heritage.
Traditional agricultural landscapes16 and ethno-varieties therein present are inseparable elements of a single system. Landscapes are polycentric systems in which different factors (natural and anthropic) have complex interactions (Fig. 5). Within these landscapes, old fruit orchards are key elements of traditional agricultural systems that encase biocultural diversity (including genetic and species richness, ecosystem and biotope variety, etc.) and cultural diversity, both material and intangible (architectural heritage, local knowledge, traditional farming practices, dialectal culture, etc.) (Fig. 6)17.

The rediscovery and proper exploitation of local fruit tree varieties is an opportunity to safeguard agrobiodiversity from the risk of genetic erosion and to keep all those activities and practises that determine traditional agricultural landscape structure and dynamics.

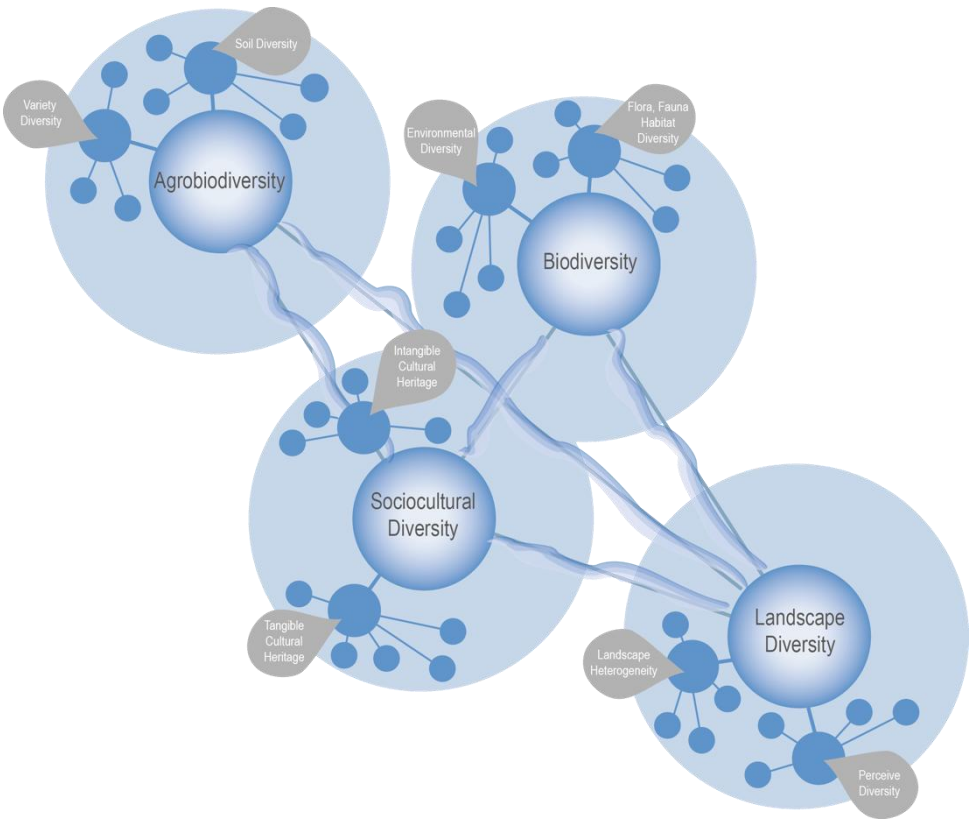

Fig. 5 - Interaction among factor defining diversities of biocultural systems (drawn by A. Cancellieri).

[15]Schicchi, R., Marino, P., & Raimondo, F. M. (2008). *Individuazione, valutazione e raccolta del germoplasma delle specie arboree da frutto di prevalente interesse negli agrosistemi tradizionali della Sicilia*. DipartamentoAziendaRegionaleForesteDemaniali.
[16] In this text, the terms "Traditional agricultural landscapes " is used as equivalent to a “Traditional agrosystems”.
[17]Bazan, G., Baiamonte, G., Cancellieri, A., & Schicchi, R. (2017). *BioCulturalLandscapes per la rigenerazione innovativa dei territori di montagna.* In Atti della XIX Conferenza Nazionale SIU - Società Italiana degli Urbanisti. - Cambiamenti responsabilità e strumenti per l’urbanistica al servizio del paese. (pp. 189-195). Roma-Milano :Planum Publisher Books.

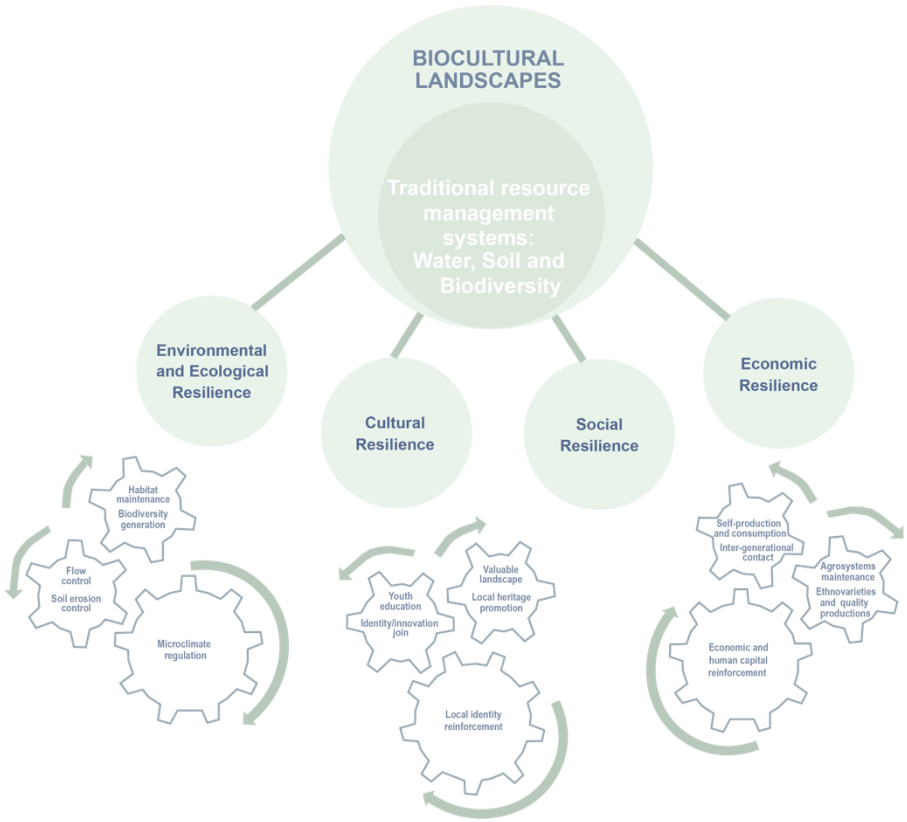

Fig. 6 – The role of Biocultural Landscapes in sustaining resilience and ecosystem services for human well-being[18].

RISKS OF AGROBIODIVERSITY AND CULTURAL HERITAGE LOSS

During the last fifty years, in Europe, farming systems have changed to compete within global markets, making more use of industrial productive systems that have significantly altered landscape. Economic drivers have facilitated the transition towards intensive farming models based on mechanization, simplification of productive systems and energy apportion. These systems, although efficient from an economic point of view, have proven fragile when the environmental component is taken into account. The effects on both cultivated and spontaneous plants are dramatic.

The choice of varieties best suited for commerce and intensive production by the market has flattened consumers' tastes, posing a great risk for autochthonous germplasm. Varieties considered inadequate for consumers' needs have been abandoned, eroding the genetic heritage built up through millennia of selection.

Agriculture modernization has damaged spontaneous plants and wild animals as well. Field rearrangement aimed at easing mechanization, has led to the removal of hedgerows, tree lines and small patches of spontaneous vegetation, compromising ecological connectivity within traditional agricultural systems.

Since 1960s, marginal land, where environmental restrictions have held back agriculture modernization, have suffered a significant crisis that has determined a substantial rural population exodus and a slow but irreversible decline of traditional fruit farming.

Abandonment has triggered a rewilding process of extensive areas, not necessarily associated with a biodiversity increase. Abandonment, in fact, leads to an alteration of traditional agricultural landscapes

[18]Cancellieri A., Bazan G. (2017) *I paesaggi bioculturali come elementi della resilienza socio-ecologica dei territori*. In Atti della XX Conferenza Nazionale SIU - Società Italiana degli Urbanisti. In press

(often cultural landscapes) due to ecological succession. Land use change and the disappearance of traditional farming practices may have positive effects in strict ecological terms, but damage the biocultural heritage of these territories.
Landscapes that have been shaped for centuries by local economic needs become fragile with abandonment. In fact, biomass increase, eutrophication, intensive recreational use and urbanization make them vulnerable to violent fires. In Sicily, for example, hundreds of old olive trees and varieties have been destroyed by fires because of land abandonment (Fig.7).Therefore, land use change in both opposite directions, modernization and abandonment, can be considered the main cause of biological and cultural heritage loss, with a much greater impact than climatic change[19].

Fig. 7 – ancient olive trees destroyed by fire in Sicily (Photo by: G. Di Noto).

POLICY FRAMEWORK

The Convention on Biological Diversity (CBD, Rio de Janeiro, 1992), introduces a global and ecosystem approach to biodiversity conservation at all levels. The CBD fostered the diffusion of numerous legislative, planning and management initiatives aimed at preserving biodiversity at national and international level.
A milestone in agrobiodiversity protection is FAO's "Global Plan of Action for the Conservation and Sustainable Utilisation of Plant Genetic Resources for Food and Agriculture" adopted by the International Technical Conference on Plant Genetic Resources, held in Leipzig (Germany) on June 1996. The primary objective was to enhance world food security through conserving and sustainably using plant genetic resources for food and agriculture (PGRFA).

[19] Rotherham, I.D. (2015). *Bio-cultural heritage and biodiversity: emerging paradigms in conservation and planning.* Biodiversity and conservation, 24(13), 3405-3429.

FAO Conference, after years of negotiation, adopted the plan in 2001 in Rome with the "International Treaty on Plant Genetic Resources for Food and Agriculture". The objectives of this Treaty was the conservation and sustainable use of plant genetic resources for food and agriculture and the fair and equitable sharing of the benefits arising out of their use, in harmony with the Convention on Biological Diversity, for sustainable agriculture and food security.This document is legally binding and institutes a multilateral system of facilitated access to a specific list of Plant Genetic Resources and benefit sharing of their use.

The Sixth Meeting of the Conference of the Parties to the Convention on Biological Diversity (CBD), held in the Netherlands in 2002, adopted with Decision VI/6 "The International Treaty on Plant Genetic Resources for Food and Agriculture", acknowledging "the important role that the International Treaty on Plant Genetic Resources for Food and Agriculture will have, in harmony with the Convention on Biological Diversity, for the conservation and sustainable utilization of this important component of agricultural biological diversity, for facilitated access to plant genetic resources for food and agriculture, and for the fair and equitable sharing of the benefits arising out of their utilization".

European policies address natural biodiversity conservation and agrobiodiversity both throughEnvironmental policies and Agricultural Policy.In EU Environmental policies agrobiodiversity is addressed in the European Parliament resolution of 22 May 2007 on halting the loss of biodiversity by 2010.

The resolution:

- Points out that maintaining the diversity of European rural landscapes is essential not just to enable the services provided by sustainable farming to keep going, but also to maintain the gene flow between wild fauna and flora populations;
- Is concerned at the diminishing diversity in farmed animals and plant varieties; calls therefore for immediate transposition of Council Directive 98/95/EC(9) , which provides a legal basis to permit, within the framework of legislation on the seed trade, the conservation, by use in situ and on farms, of varieties threatened by genetic erosion;
- Points out that the CAP and the associated developmental dynamic leading, on the one hand, to specialisation and intensification and, on the other, to marginalisation and under-utilisation of land, have contributed to a significant biodiversity loss in recent decades;
- Points to the wide richness of species and genetic diversity of agricultural crops and animals, and argues in favour of preserving and strengthening that diversity;
- Proposes that biodiversity should be one of the main principles of the 'health check' on the CAP due to be carried out in 2008, and considers it necessary to use the 2008 'health check' to assess the effectiveness of the various measures on biodiversity, especially measures in the forestry sector, and to deal appropriately with shortcomings in this area;
- Draws attention to the new rural development regulation (programming period 2007-2013), which provides inter alia for financing Natura 2000, contains agri-environmental measures and measures to preserve genetic resources in agriculture and support sustainable forest management, and maintains payments for areas with natural handicaps.

In 2011, the European Commission adopted the "Biodiversity Strategy to 2020" setting out 6 targets and 20 actions to halt the loss of biodiversity and ecosystem services in the EU by 2020. In the Action 10 (of Target 3) - Conserve Europe's agricultural genetic diversity "The Commission and Member States will encourage the uptake of agri- environmental measures to support genetic diversity in agriculture and explore the scope for developing a strategy for the conservation of genetic diversity".

It is noted that both the Biodiversity Strategy to 2020 and EU Parliament resolution of 22 May 2007 suggest the important role of Common Agricultural Policy (CAP) in biodiversity conservation: "As a user of biodiversity, agriculture has a key role to play in managing and maintaining that biodiversity; and whereas the common agricultural policy (CAP) must henceforth promote sustainable production models which, while being economically viable, enable action to be taken on the environment and on regenerating and rehabilitating the biodiversity of as many animal, plant and microbial species as possible".

In addition to the EU Biodiversity Strategy, other sectoral Biodiversity Action Plans are central elements for the preservation of biodiversity. The Biodiversity Action Plan for Agriculture was adopted in 2001 within the Agricultural Policy. It is based on the use of a number of CAP instruments benefiting biodiversity. In

2004, as proposed in the Action Plans the Commission launched the "Community programme on the conservation, characterization, collection and utilization of genetic resources in agriculture", established by Council Regulation (EC) No 870/2004. The programme promotes genetic diversity and the exchange of information including close co-ordination between Member States and between the Member States and the European Commission for the conservation and sustainable use of genetic resources in agriculture. It also facilitates co-ordination in the field of international undertakings on genetic resources, in particular within the Convention on Biological Diversity, the International Treaty on Plant Genetic Resources for Food and Agriculture and the FAO's Global Plan of Action for the Conservation and Sustainable Utilisation of Plant Genetic Resources for Food and Agriculture.

At national and regional levels, specific laws precisely define protected genetic resources, local varieties and breeds, intended as species, breeds, varieties, populations, ecotypes and clones originating in the regional territory, or originating outside of it but introduced by a minimum of fifty years and traditionally incorporated in local agriculture or farming; local varieties and breeds no more present in the regional territory but preserved in botanical gardens, farming facilities or research structures are protected as well.
In the 2010 The Joint Programme between UNESCO and the CBD Secretariat (SCBD) was developed at the International Conference on Biological and Cultural Diversity, held in Canada. The programme responds to the necessity of integrating international legal instruments that deal with biodiversity and cultural diversity separately and remarks "a holistic approach consistent with cultural and spiritual values, worldviews and knowledge systems and livelihoods that contribute to conservation and sustainable and equitable use of biodiversity".

As can be seen from the above, the European Community address agrobiodiversity both through environmental policies, as biodiversity sensulato, and agriculture policies, as resource.An acknowledgement of agrobiodiversity as Cultural Heritage is still missing in European policies.

POLICY IMPLICATIONS AND RECOMMENDATIONS

Even though European legislation addresses agrobiodiversity and actions have been taken in rural development plans at regional level, varietal heritage loss is still an ongoing process.
MEMOLA research objectives and findings suggest that existing policies are not sufficient to limit biodiversity loss and maintain agrosystems' functionality.
On this basis, the following recommendations should be taken into account under MEMOLA criteria:

- Start long term conservation projects, beyond horizon of European Community Policy, aimed at concrete results and a more efficient use of financial resources. Traditional varieties are biological entities depending on human care and post-project abandonment would undermine the conservation effort.
- Ecoregional coordination of sampling, collection, characterization and propagation activities, aimed at obtaining a full picture of the varietal heritage and at preventing knowledge duplication. Migrations and commercial fluxes characterizing European history have moved fruit varieties, therefore the same genotypes may be present in different administrative areas and have different dialectal names.
- Promote on-farm germplasm conservation, which is the most appropriate conservation strategy for this type of biodiversity that is strictly linked to the environmental and cultural contexts of origin.
- Recover and enhance polyculture, which underpins traditional agricultural systems. This approach preserves both agrodiversity and landscape, enhancing rural contexts' tourism attractiveness.
- Reactivate commercial interest towards traditional varieties, increasing consumer awareness regarding nutrition choices and encouraging farmers to cultivate traditional varieties.
- Recover Traditional Ecological Knowledge (TEK), traditional varieties' uses, so preserving the associated biocultural heritage.
- Acknowledge ancient fruit varieties as European heritage under UNESCO's normative framework.

PROJECT IDENTITY

PROJECT NAME

MEditerranean MOntainous LAndscapes: an historical approach to cultural heritage based on traditional agrosystems (MEMOLA)

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