The International Treaty
ON PLANT GENETIC RESOURCES FOR FOOD AND AGRICULTURE

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SUBMISSIONS SENT BY CONTRACTING PARTIES, OTHER GOVERNMENTS, AND RELEVANT INSTITUTIONS AND ORGANIZATIONS ON THE IMPLEMENTATION OF ARTICLE 6

Note by the Secretary

This document presents the submission on how to improve sustainable use of plant genetic resources for food and agriculture, including on sectoral policies and best practices for sustainable agriculture, submitted by Italy on 15 March 2013.

The submission is presented in the form and language in which it was received. Minor editorial changes include the full rendering of acronyms and the correction of spelling.

CONTRACTING PARTIES

Italy

Chapter 1

Summary of the Guidelines for Conservation of Plant Genetic Resources for Food and Agriculture

1.1 Outline of the guidelines for conservation of plant genetic resources of agricultural interest

This manual contains the guidelines for the conservation of **Plant Genetic Resources for Food and Agriculture (PGRFA)**. As for the ones on livestock and microbial genetic resources, this manual is scientifically sound and provides a streamlined and schematic structure for the easy consultation of useful operational tools by all involved at various levels in PGRFA management.

In order to respond to the requests of the Standing Committee on Genetic Resources, the Working Group on Agricultural Biodiveristy (WGAB) has produced a volume in two parts divided into six chapters, and a series of appendixes designed to provide an in depth analysis on the various topics.

The first part provides general information ranging from the definition of biodiversity and PGRFA (Chapter 1) to the assessment of the risks of extinction and genetic erosion (Chapter 2), and concludes with the regulatory and operational framework for the conservation and valorisation of PGRFA in Italy (Chapter 3). The second part offers detailed operational procedures, which provide standard guidelines for the protection of PGRFA. Practical case studies on conservation are included, which have been adopted by some regions (Chapter 4 and related *Appendix*). Thereafter, the methods characterising both morpho-physiological and molecular resources are discussed (Chapter 5). In conclusion, a series of case studies covering the widest possible contexts are outlined (Chapter 6).

Despite the multitude of situations relating to biodiversity of agricultural interest in Italy and the difficulties relating to schematization, the WGAB has attempted to "typify" the various possible contexts as well as to describe the implementation of the various interventions adopted. This is achieved by referring to issues that were previously addressed and were positively concluded. Various "typologies" have been proposed, each highlighting the respective strengths and opportunities, as well as their weaknesses and potential threats. Some of the known actions for each "typology" are reported and specific case studies are then explained in detail and outlined as examples.

The Appendixes have the dual purpose of streamlining the various chapters, thereby allowing easy reading even by non-specialist users and providing a more in depth analysis of certain topics, in particular with regard to methods, laws and other specific competences of experts in the field. The following Appendixes are integrated: a detailed glossary of the many technical terms in the manual, which are widely debated and shared (*Appendix 1*); the translation of the Standard Material Transfer Agreement for plant

genetic resources for food and agriculture (*Appendix 2*); the proposal of a simplified agreement for the transfer of vegetal material of plant species not belonging to the list of crops under the Treaty, and their direct use in the field (*Appendix 3*); a series of methodological details of techniques to be applied (*Appendix 4*); a framework of EU and Italian legislation for the marketing of seed material (*Appendix 5*); different guiding principles used for the description of material (*Appendix 6*); a plan for the reproduction and multiplication of seeds (*Appendix 7*) and finally, a case study for the genetic characterization of specific resources in the Region of Lazio (*Appendix 8*).

All topics discussed are supported by an extensive bibliography (both cited and referenced), which includes the most recent publications from links to network connections and numerous references relating to case studies and initiatives present throughout Italy.

1.2 Agricultural biodiversity: from past to present

The PGRFA or phytogenetic resources are defined as "any genetic material of plant origin that has a present or potential value for food and agriculture". This definition has also been adopted by the International Treaty on Plant Genetic Resources for Food and Agriculture. This includes all material under cultivation, the wild progenitors of cultivated material, the progenitors of those species not cultivated, and wild species not cultivated but used by mankind for specific purposes (medicinal plants, plants for dyes, etc.).

Over the last fifty years, several international agreements have been negotiated to ensure the conservation and sustainable use of PGRFA. This was a necessary response to reports received from different continents, documenting a rapid loss of genetic diversity in crops. In 1967, during the Technical Conference on Analysis, Use and Conservation of Plant Genetic Resources, organized by FAO and the International Biological Programme (IBP), the term "genetic erosion" was used for the first time. This term then became synonym with loss of variability within crops.

It was necessary to wait until 2002 to have a more precise definition of genetic erosion, which was formulated during the Ninth meeting of the FAO Commission on Genetic Resources for Food and Agriculture (CGRFA). This definition referred to genetic erosion as "the loss of genetic diversity, in a particular area over a given period of time, including the loss of single genes or combinations of genes that can be found in either landraces or varieties ".

The causes of genetic erosion throughout the period of agricultural modernization are ecological, socio-cultural, agricultural, commercial. In general, such erosion goes through a phase of under-utilization of a given species or variety, which in turn is accompanied by the loss of knowledge regarding the traditional use of these crops. In other words, the under-utilization of a crop plant leads to a cultural impoverishment, since the elderly, guardians of our local agro-food culture, are increasingly incapable of passing this information on to subsequent generations.

Besides the loss of species, the growing awareness of the loss of cultural heritage in the agricultural world revealed the need for appropriate international policies. There is also a requirement for research programs on the evaluation, use, development and

conservation of plant genetic resources that are at risk of extinction and that in turn would tend to preserve local knowledge on crops.

At international level, the focus on agricultural biodiversity has resulted in two crucial negotiating processes. These are the Convention on Biological Diversity (CBD), which entered into force in 1994, and the International Treaty on Plant Genetic Resources for Food and Agriculture (ITPGRFA, International Treaty, or simply referred to as the Treaty), which has been in operation since 2004.

Landrace (local variety)

Of all the definitions included in this document certainly that of "landrace" is the most important (and most controversial) because it allows to determine exactly the areas of intervention of the National Plan for Agricultural Biodiversity (NPAB), i.e. to establish "what" and "how" must be identified and, therefore, "what" must be safeguarded and how.

Among all the numerous definitions of "landrace" available in literature, the one proposed at the second meeting of "On-Farm Conservation and Management Taskforce of the European Cooperative Programme on Plant Genetic Resources (ECPGR)", held in Stegelitz in 2006 can be considered quite complete and appropriate: "A landrace of a seed-propagated crop is a variable population, which is identifiable and usually has a local name. It lacks 'formal' crop improvement, is characterized by a specific adaptation to the environmental conditions of the area of cultivation (tolerant to the biotic and abiotic stresses of that area) and is closely associated with the traditional uses, knowledge, habits, dialects, and celebrations of the people who developed and continue to grow it."

This definition highlights that one of the distinguishing features is the strong bond of the landrace with a specific socio-economic context. However, among the many Italian case studies there are many examples of varieties historically present in a given area and subsequently introduced into another. If a resource is no longer present in the area of origin, but it's present in the introduction area, it is obvious that in this new environment the historical connection with the local socio-economic element is less strong than the one existing in the area of origin. Nevertheless, the resource may have found there important elements of context and therefore, in this case, it is defined as a landrace.

The CBD establishes three fundamental points:

1. The ending of open access to genetic resources as Common Heritage of Humanity, since these resources become the "goods" on which governments apply sovereignty of the respective States in which these resources originate and are located.
2. Conservation is closely related to the sustainable use of resources.
3. Access to resources (not only those material, but also intangible resources such as traditional knowledge) must be established by the Prior Informed Consent (PIC) of the community holders and by an agreement for the equal sharing of any benefits arising from the use of these resources (benefit-sharing).

The Treaty, adopted in 2001 by the FAO Conference and subsequently adopted by Italy in 2004, has the following objectives: the conservation, the sustainable use of plant genetic resources, the fair and equitable sharing of benefits arising from their use in

harmony with the provisions of the CBD and the creation of a multilateral mechanism of facilitated access to PGRFA. To reach this objective, member States decided to create an *ad hoc* space, managed on a multilateral level (the Multilateral System of Access and Benefit-sharing, MLS), which favours the exchange and sharing of PGRFA through a Standard Material Transfer Agreement (SMTA) (*Appendix 2*). However, at present, this Multilateral System only applies to the 64 crops listed in *Annex I* of the Treaty.

The above-mentioned international agreements reflect the ongoing scientific debate about the most suitable conservation conditions. This debate is still very much alive, as the choice of the optimum conservation techniques is not only based on purely scientific examinations, but also on social, and especially economic considerations. It is useful to outline the process starting in the early 60's to understand the reason for the choices made today.

Generally, in order to identify germplasm conservation techniques, reference is made to two classes of genetic resources: namely wild and domesticated species. The former are best preserved in their natural habitats and plant communities where they belong. In cases where these are in danger, it is necessary to resort to specific forms of protection. This may occur in forest reserves, protected areas, in special genetic reserves or *ex situ*, for example in gene banks. On the contrary, all cultivated species, require active measures for their conservation. The *ex situ* conservation is distinguished from the *in situ* because the plant material is stored in areas other than those of origin. The *ex situ* may be a dynamic system if the populations of domesticated or wild species are kept in habitats where they are still exposed to selective pressure. However, the *ex situ* is considered a static system when recombination with external material is prevented and the erosion of each genetic accession is minimized, as well as selective pressure.

For many years *ex situ* conservation was adopted as main strategy. PGRFA were maintained in controlled environment far from their area of origin, and hence they were removed from a logical evolutionary process over time, as well as from the selective pressure of environmental and anthropogenic factors. In so doing, the role farmers might have played in performing this important function of conserving diversity of agricultural interest in their fields was neglected. In the rapid process of modernization, to keep the cultivation of old, often unproductive traditional varieties was seen by younger farmers as a sort of link to a rural community belonging to a past from which they wanted to break free. Due to this, Frankel was prompted to comment that "*in situ* conservation of local varieties is socially and economically impossible."

As it turned out, much diversity has been lost, but much has also been preserved *in situ* thanks to local families continuing to cultivate old varieties to sustain their own food needs. Cultivation of old varieties also occurs in rural communities often located in marginal areas, where tradition is important. As for rural communities accepting the cultivation of modern varieties it is important to reflect on the studies carried out during the 80s in some countries of the Southern hemisphere. Anthropologists and sociologists showed that in certain rural areas in marginal social, cultural and economic contexts, modern varieties were not used by farmers because the performance of these varieties did not guarantee consistency in yield and production, which was the primary objective of those farmers. Following these studies, possible *in situ* conservation linked to agricultural systems and their development was initiated. It was only in the 90s, when the discussion

turned to industrialized countries, that the central role biodiversity can play in sustainable agricultural systems was highlighted, even in the context of modern agriculture.

Tracing the historical path up until present, the question of which conservation model is to be adopted evolves over time, showing greater linkages to the more general question of which agricultural model is to be sustained.

Pistorius and van Wijk wrote in 2000: "The debate on the strategies of farm conservation must be extended to include the antagonism between, on the one hand, globally organized industrialized agriculture and on the other hand, locally organised, traditional, non-industrialized productive strategies". It is thus obvious that for the non-industrialized agricultural systems the use of different crops (on an inter- and intra-specific level) is not aimed at conservation, but is an essential element of the system to cope with a variable production environment to reach a secure and stable production.

In 2001, M.S. Swaminathan began to speak about the integrated approach to conservation, which includes mutual supportive strategies of *ex situ*, *in situ* and on farm. In agriculture, the *in situ* concept became wider over time, delineating a specific dynamic storage system, which is presently applied by farmers in their agricultural systems, namely the so-called on farm conservation. This strategy guarantees greater biodiversity and the safeguard of crops adaptability to the environment in a complementary manner to *ex situ* conservation, which has the advantage of keeping the resources in protected areas and making them easily accessible for wider use, but has the limit to conserve these resources in a static manner. Over the past ten years a lot of scientific literature has been published on the subject. Among various approaches, the one proposed by Maxted *et al*. in 2002 attempted to establish a common methodology for on farm conservation. The authors outlined two possible strategies to be pursued:

1. Actual on farm conservation, based on the conservation of genetic diversity of a particular resource within a well-defined farming system;
2. On farm management, where the focus is on the safeguard of the agricultural system as a whole, and not just the genetic diversity per se.

An example of the difference between the two approaches is given by different opinions that arise regarding the introduction of modern varieties into a given agricultural system. These varieties can be integrated by farmers in their fields and also crossed with local varieties. This ensures the continuity of the agricultural system, but produces a certain degree of genetic erosion of traditional varieties initially present. This process, if analysed from the point of view of conservation is negative because genes and varieties are lost. However, if analysed from the point of view of on farm management, the process is valuable because it helps to maintain a high level of diversity within the system. The rationale is that something will be lost, but at the same time new diversity is created. In this context, it is certainly very useful to preserve the evolutionary processes that normally occur in agro-ecosystems, making sure to either facilitate or support agricultural practices where diversity plays a central role.

In Europe, farmers who proved to be more interested in on farm conservation / management were those involved in organic farming. Organic cultivation differs substantially from conventional cultivation with regard to the heterogeneity of culture conditions and technical itineraries, as well as the different requirements of farmers for

crop varieties, the lack of varieties on the market bred specifically for organic farming, and specific demand by consumers. These characteristics generally favour the use of traditional, local varieties and their conservation.

1.3 The Italian framework

To understand both the role and the importance of biodiversity in Italian agricultural systems, it is interesting to read the statistics that describe this role. Italy appears to be a country caught in between tradition and modernity, where agricultural activities – an insignificant percentage of GDP - still retain great value for a large part of the population. In fact, despite the decline in recent years, Italy is the third largest agricultural country in Europe after Poland and Romania, with more than one million people involved in agricultural activities. After Romania and Poland, Italy also holds the third place for number of farms.

In this framework, agro-biodiversity plays a dual role: on the one hand, it is still strongly linked to farmers who manage farms defined as "enterprises" and on the other hand quality production and labels attesting products' geographical origin (PDO, PGI and TSG) represent excellence worldwide. Regarding the latter, Italy is the queen of Europe with more than 200 certified products, which represent more than 20% of the European range. Geographic indication products are a demonstration of the link between territory, culture and agriculture. Their strong presence in Italy testifies to the importance that this trio still has in shaping the economic development of agriculture. It should be noted, however, that most of the cultivated biodiversity and associated traditional knowledge is maintained in a class of farms generally managed by people over 65 year-old.

It is therefore necessary to adopt policies coping with this situation, in order to avoid the loss of knowledge and the loss of local varieties due to the change in generation, and to create economic, social and cultural rights to ensure that these farms continue producing agricultural products. In fact, the global market and international competition are targets that are unattainable for those farmers who, without adequate forms of protection or development, would disappear taking with them the specific varieties and traditional knowledge passed on through generations.

In this context agricultural policies, in particular those for rural development, play a pivotal role. If correctly set up, these policies would narrow the gap between tradition and modernity, avoiding interruptions and using agricultural diversity as an incremental factor for local development. In this regard, the objective is not simply to deal with implementing conservation policies for PGRFA, but changing the perspective by moving to a system of safeguarding which would guarantee interaction and complementarities between *ex situ* and *in situ*/on farm conservation strategies.

The Regions and the Autonomous Provinces (AAPP) are public bodies, which, by their knowledge of the territory and their legislative autonomy in the field of agriculture, are in a privileged position to synthesize and coordinate the principle actions for the conservation and valorisation of biodiversity. In fact, there are many regions that fund and promote similar actions in their territories. In some cases, these activities have resulted in the implementation of specific regional legislation with the aim of protecting local breeds and varieties. Tuscany was the first region to enact a law in 1997 on the protection of agricultural biodiversity and was followed in subsequent years by Lazio,

Umbria, Friuli Venezia-Giulia, Marche, Emilia-Romagna and Basilicata. At present, similar laws are being discussed in other regions.

Regional Italian legislation can be considered one of the few operating examples for the protection and exploitation of PGRFA in Europe. These bodies have advanced laws at both national and European level, while keeping in line with the objectives of the Treaty.

In addition to the regions, in Italy there are several bodies that interact at various levels, depending on territorial dynamics, towards the creation of a virtuous circle for plant genetic resources for food and agriculture (from conservation to valorisation). There are three categories of stakeholders: scientific institutions, local authorities and people or institutions that are not included in the former categories, defined as the "non-governmental sector". The three categories ought to work in complete synergy. In general, it can be stated that:

- Scientific institutions deal with the collection, inventory, material characterization, eventual rehabilitation and *ex situ* conservation, as well as the dissemination of information collected;
- Regions, AAPP and other local institutions (Provinces, Municipalities, Mountain Communities, GAL, etc.) coordinate and promote such actions, often supporting them with dedicated lines of credit (e.g. regional laws for the protection of cultivated biodiversity) or through funds for agricultural research and regional Rural Development Plans or others;
- The non-governmental sector (all subjects not included in the previous two categories, such as farmers as individuals and groups, associations, foundations, various organizations, etc.) stimulate and/or plan, based on the needs of local communities and farmers and their history, processes for safeguard and valorization of specific local varieties or particular territories.

In this setting the role of farmers is crucial. Farmers have always been involved in the safeguard of genetic resources and this central role is also reflected in all activities outlined in these guidelines. Farmers are involved both in their capacity as cultivators (using local varieties within the management of their farm) and that of " custodians of biodiversity", either as individual producers or as participants in organized programs enhancing and promoting specific PGRFA.

Consumers appear to be particularly attentive and interested in local varieties, to such extent that a vibrant market of typical and/or local products has developed. A typical local product is categorised as such on the basis that a local variety, its product and any process of transformation are closely linked to the territory in which the genetic resource evolved over time. It is hardly necessary to point out that the term "territory" is construed in the broadest sense, indicating both the physical space (geographical demarcation, orographic, geo-soil type, and climate) and anthropogenic attributes (typical elements relating to the mode of human settlement), as well as the set of values, history and culture that characterize the area. This term also encompasses the dynamics and stratification over time of the presence of man, including the concept of "technological-productive culture", bearing in mind that the recovery and development of "local values" or "territory" is only achievable through a comprehensive evaluation of all aspects that contribute to its definition.

In recent years there have been many experiences, either completed or still in progress, on conservation and valorisation of old varieties by individuals, both farmers and non-farmers, that have provided funding for projects on a voluntary basis. Such practices have often been linked to the promotion of a particular territory and products connected to it. These initiatives are dispersed throughout the country (fairs, markets, awareness raising events, promotion and valorisation, consortia of producers, development of product specifications, small projects for local products) and it has become evident over time that they are highly fragmented, poorly coordinated and frequently overlapping. Above all, most initiatives failed to adequately convey the appropriate "know-how". However, it must be said that dissemination activities, including publications produced in recent years, have contributed substantially to the current available knowledge relating to the heritage of local Italian varieties, which often were not adequately described in the official manuals. In addition, the collection of information derived from cookbooks and traditional knowledge (which allows for the adequate cultivation and use of old local varieties) should not be underestimated. The material heritage and traditional knowledge developed through the ages and the objective experience of farmers of the past are a precious heritage that must be preserved for the benefit of humankind.

1.4 Guidelines for the Protection of Plant Genetic Resources

In the preparation of these Guidelines, the recommendations made by international treaties and guidelines of the National Plan for Agricultural Biodiversity (NPAB) have been taken into account.

In summary, it is important to recall the characteristics of the conservation systems *ex situ* and *in situ*/on farm. The first is conservation of PGRFA in specific structures and by different means depending on the species. With the exception of collection fields, it is a virtually static system, at least during the storage phase. The onset of changes or loss of genetic diversity in the regeneration phase of field material becomes possible, when standards are not respected. The *in situ* conservation is conservation of PGRFA in their ecosystems and natural habitat, as well as the maintenance of populations and species, both wild and domesticated, within environments where, in accordance with the definitions given by the CBD, these have developed specific characteristics. This is a dynamic system of safeguard. Different populations are adapted continuously to both biotic (including human pressure) and abiotic pressures. The *in situ* conservation of cultivated species is generally defined as on farm.

The two systems - *ex situ* and *in situ*/on farm - should not be seen as alternatives, but as possible complementary actions to safeguard diversity. In fact, when it is not possible to implement the *in situ*/on farm of a particular genetic resource, at least the *ex situ* may guarantee its survival. In particular, the *in situ*/on farm conservation practices are considered the better options for local varieties, which have been selected and preserved for hundreds of years by farmers and represent a biological, cultural and territorial "system" and not only a biological entity. Given that the farmer is the central figure of this particular system, s/he can be identified as the main player in this conservation activity. The central role of farmers must, therefore, be properly taken into account in all on farm conservation projects. In certain contexts, it is appropriate to emphasize their contribution to conservation. Thus it is important to support initiatives

present in all regions, also in order to develop responsibility and awareness in local resources holders.

Ex situ conservation. The WGAB refers to Article 9 of the CBD, which emphasizes the importance of integrating *in situ* conservation with *ex situ* actions and calls on States that are Contracting Parties to take measures for *ex situ* safeguard, while trying to give preference to *ex situ* collections located in the country of origin of genetic resources. Ultimately, *ex situ* conservation programs are not only complementary to those *in situ*, but sometimes, as we shall see later, the only viable option in some instances.

As already mentioned, from a genetic point of view the *ex situ* maintains a static genetic situation, whilst the *in situ* conservation allows for evolution. Evolution can be described as change in the wealth of genetic variants. However, it is not possible to understand in advance in what direction (either increasing or decreasing) the change will occur. For small populations, the trend is generally towards a reduction of genetic diversity, which could culminate in the final extinction of the population. In this case, the *ex situ* conservation practice is able to ensure a higher level of diversity compared to the *in situ*. In addition, for species of interest to the agricultural and food industry, where the intensity of erosion / extinction can dramatically change even within a very short period of time, the *ex situ* conservation ensures the maintenance of specific genotypes, populations, varieties, breeds, strains, etc. It can also ensure their reintroduction into cultivation if they are lost.

In summary, the *ex situ* conservation becomes a compulsory tool of conservation when:

- The *sensu lato* populations are subject to heavy impact due to human activities, such as the replacement of local breeds and varieties with other alien species in the territory (for instance the introduction of modern varieties);
- Changes in either environmental or socio-economic conditions radically alter the structure and the vocation of a territory, causing the abandonment of agriculture activities;
- The area of cultivation of a given population decreases steadily for various reasons, thus exposing it to high risk of extinction.

To identify the most appropriate and effective conservation techniques, it is important to be familiar with the biology of the species (in particular, reproductive biology) as well as the genetic structure of their populations. This can be obtained in different ways, which can be grouped as follows:

- ✓ Collection of plants in the field, in pots, and in a greenhouse;
- ✓ Seed collections maintained in either seed banks or germplasm banks (a widespread practice);
- ✓ Collections of propagation material, seedlings, and other tissues, maintained in vitro or in cryopreservation.

All material preserved *ex situ* should be managed so as to minimize risks in the event of natural disasters, technical problems, biological damage, socio-economic problems, etc. The procedures for protection, then, must provide for a continuous monitoring of the material. In particular, germplasm should be conserved in duplicates

held in different locations. Moreover, the management of *ex situ* populations must carefully avoid any actions that may undermine the genetic integrity and viability of the material (reduction in genetic diversity, artificial selection, transmission of pathogens, uncontrolled hybridization, etc.). Additionally, particular attention must be paid to the collection of the minimum number of genotypes necessary to guarantee the maximum diversity of the population, within the scope of logistical and financial limits.

The *in situ*/on farm conservation. This mode of safeguard is certainly one that should be given widespread recognition. For this reason, the WGAB has focused its attention on this mode of safeguard. The *in situ*/on farm is a dynamic form of conservation, where populations are constantly changing in response to both the selective pressures to which they are exposed and to the soil-climatic environment in which they are located. In so doing, this process allows for possible adaptation of species or populations, as well as the co-evolution between different life forms. Therefore, it is more appropriate to speak of "safeguard" instead than "conservation", as the latter has a more static connotation.

From this viewpoint, the *in situ*/on farm appears to have a holistic approach to agro-ecosystem biodiversity conservation, which is intended to safeguard all life forms, whether cultivated or wild. Great importance is given to the maintenance of the complex relationship among them, which is not neglected but rather strengthened. Local varieties then integrate this framework. These have existed for a long period of time and have been cultivated by specific communities in specific locations. As such, these varieties can be defined as “native” in the sense that they have “always existed”.

The terminology “always existed” should be further clarified. For annual species propagated by seed, the continued maintenance of a given population in a defined area over fifty reproductive cycles (50 years) can be considered a sufficient period of time for a variety to develop both the characteristics of adaptation and the appropriate relationship with the environment (including the anthropogenic environment) for it to be defined as "local". As it is not easy to define the precise framework of time required in order to consider a variety “adapted”, a time frame of 50 years has been set. However, for most trees and shrub species (perennial), 50 years (which cover just one or few generations) are considered insufficient for a species to be considered adapted to a certain area, and therefore “local”.

As far as time is concerned, it follows that both the actions of reintroduction of local varieties in an area and the development / selection of new populations from local varieties (actions that also help maintain diversity that is useful to man) should not be covered by the term "on farm conservation". When referring to *ex situ* populations preserved for decades, “reintroduction" (a particularly topical subject), can lead to the cultivation of plant forms that are not adapted to the physical, biological and cultural conditions of the area of re-introduction, which characterizes the local varieties. In other words, from the time of re-entry a new process of adaptation starts, which will result over time in these populations becoming real local varieties, while being different from the original populations.

It is true that the margin between the reintroduction and exchange of material propagated in an area (especially in large areas with variable climatic conditions) is often quite thin. It is equally true that inducing the evolution of genetic material not perfectly

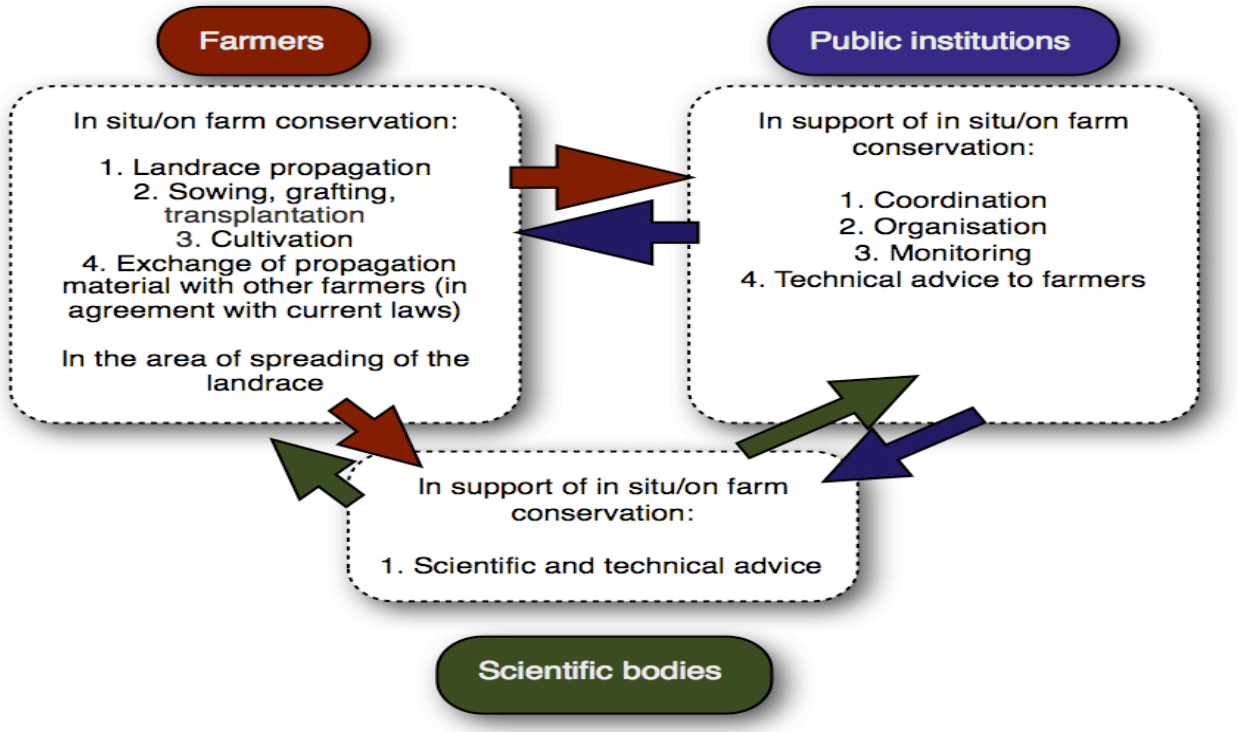
adapted to a specific environment is still useful to conservation (e.g. resulting in the movement in the frequencies of rare or under-represented alleles in the original environment, etc.). In addition, reintroduction (including into similar areas) is sometimes necessary when the variety has completely disappeared from cultivation and it is not possible to reintroduce it into the same area because of changes either to the environment or the social context.

The *in situ*/on farm conservation must be carried out in such a manner as to permit the population/local variety to maintain the variability that distinguishes it. Moreover, it is important that this process is in balance with the environment in which the population/local variety evolved distinctive characteristics, to ensure that the latter are not lost. For this purpose, it is particularly important to plan the production activity for the propagation of material, which must take place in the area of origin and under conditions that avoid both mechanical (pollution during the sowing, harvesting, storage) and genetic pollution. The former is easier to control. In contrast, the latter can be more problematic and depends on the following: the species (if autogamous or allogamous, and in the latter case if pollination is anemophilous or performed by insects), the orographic conditions within the area of multiplication, the surface area, the weather conditions, etc.

Regarding measures to develop new populations/varieties either by crossing with other varieties or by selection activities aimed at identifying, maintaining and propagating only certain genotypes, it is evident that these actions can distort the genetic constitution and therefore, the characteristics of local varieties. Genetic variation is the basis of any genetic improvement program. In the past, local varieties represented the raw material from which scientific research, starting from the beginning of the twentieth century, produced improved or "modern" varieties. Even at present, many vegetable and fodder crop (grasses and legumes) varieties are obtained by selection using local varieties. Every selection process leads to a reduction in diversity (when compared with the original material) because the specific choices dictated by the objectives of the improvement program are implemented. Recently, an interesting approach to the use of such variability in genetic improvement is offered by participatory breeding (Participatory Plant Breeding). The purpose, similar to that of classical breeding, is to obtain improved varieties, but with the participation of farmers in the selection process. The objective is the attainment of a variety with a large genetic basis.

At this point, at least two fundamental considerations must be highlighted, on which the guidelines for the *in situ*/on farm conservation are based. The first consideration is that the objective of *in situ*/on farm conservation, apart from protecting farmers' rights, is similar to that of any other conservation action, which is to maintain the current and potential utility to meet the PGRFA needs of both current and future generations. Since it is not possible to predict future needs, in other words to know which genes and gene structures in populations will be needed, it is necessary to adopt conservation strategies that maintain the highest diversity. Contrary to the general practise for the conservation of wild species and populations in protected areas where conservation is generally implemented directly by public bodies, the implementation of on farm conservation of crop plants is the responsibility of farmers. It is them who, year after year, continue to cultivate and maintain local varieties. The public sector can (and always should) promote, organize, coordinate and monitor activities on conservation, by providing financial and technical support to farmers and promoting their activities through appropriate public policies. The role of scientific institutions in conservation is

also important. They serve as junction between farmers and public institutions, as schematically shown in the following image.



From this, it follows that if circumstances don't make it possible to guarantee conservations activities by farmers over time (for various reasons), it is important to formulate *ex situ* conservation alternatives in order to at least ensure the survival of populations. With regard to the role of the public sector, support activities provided can be managed in different ways. These include promoting increased awareness on: the importance of PGRFA Food Safety; the well-being of present and future generations; the financial support to create the knowledge needed to exploit in the market a product obtained from a local variety. In any case, these activities must always be oriented towards ensuring that cultivation of local varieties is maintained, or even increased, over time.

The second consideration is that local varieties (both autogamous and allogamous species propagated by seed, as well as some vegetatively propagated species) are different populations, therefore distinguishable from each other. Moreover, these local varieties must be populations with a certain level of internal diversity, being composed of different genotypes. These varieties are subject to evolutionary change over time in response to changes in the physical/agronomic environment and changes within the biotic community, both in terms of genotypes present and the numerical relationships amongst them. This evolution is obviously much faster for the annual species. The genotypes that better adapt to a different environment perform better at the expense of others, while new genotypes, due to mutational change, may also appear. It is this inherent characteristic in local varieties that renders the populations adaptable to the physical, biological and

cultural diversity, thereby making them useful to agriculture. Therefore, in the preparation of these Guidelines, the inherent variability of local populations and their ability to change over time were taken into consideration as positive features. These same positive features must be safeguarded. In other words, given that local varieties retain their usefulness in the various stages of the on farm conservation activity, they should be given the freedom to mutate or change over time.

Finally, a reference describing the complexity of the situations is required. This complexity includes the conditions under which local varieties are maintained and the lack of scientific data on the subject. Therefore, it is difficult to propose guidelines based on solid practices that can comfortably be applied everywhere. The current situation, in which local varieties are maintained on farm both in Italy and Europe, has never been so complex (especially for annual plants). This complexity is due to the multiplicity of variables involved which include the species, the number of local varieties, as well as the physical, climatic, ethno-anthropological, social and economic situation. There is very little scientific evidence (based on distinct analysis of the results obtained by applying a particular strategy) to provide precise directions on how to implement on farm conservation. There are also limited data relating to the conservation of *in situ* wild populations, even if some progress has already been made. This is particularly true with regard to the potential of maintaining an adequate level of genetic diversity over time, whilst avoiding the phenomena of genetic erosion due to mixing with similar commercial varieties.

Fortunately, sound practical experiences are there, particularly those that have been developed in different regions in Italy. These regions are either already equipped with a law for the protection of PGRFA or have already provided funding for those activities. These may serve as reference in providing operational guidance. In the Manual, case studies in the regions of Tuscany and Lazio are reported (*Appendix* to Chapter 4). These regions were the first to adopt a law on this issue. In the first case study the valuable role of the "farmers-custodians" is shown, as well as the operational validity of the storage and security network, in particular with regard to supporting the exchange of resources between farmers. The second case study shows the importance of conducting a detailed investigation in the territory reaching every single "holder", in order to collect as much information as possible. This is a prerequisite in understanding the various issues and dynamics within each farming community.

The organizational and monitoring activity of *in situ*/on farm conservation is accomplished according to the following phases:

1. Collection of information on existing local varieties (inventory) and collection of propagation material for *ex situ* conservation and for characterization;
2. Identification of the priority areas to be allocated for *in situ*/on farm conservation (choice of areas to implement this activity, with priority on the promotion, organization and monitoring of activities);
3. Characterization and assessment of the distinctiveness of local varieties;
4. Assessment of population size and genetic structure of local varieties maintained *in situ*/on farm;
5. Monitoring the effectiveness of *in situ*/on farm conservation (periodic assessment of the maintenance of an adequate level of genetic diversity and absence of genetic erosion);

6. Set up and operation of an information system for work related to *in situ*/on farm conservation.

The proposed steps must not necessarily be in sequence, since certain interventions may proceed in parallel, whilst others transverse all stages, such as the setting up and management of the information system.

The outline of the proposed activities is calibrated primarily on herbaceous species, but provides a useful model for the *in situ* conservation of tree species. It is to be noted that the steps listed above are also important in the planning of actions for *ex situ* conservation. Coordinated activity among the various stakeholders involved (government agencies, research organizations, farmers, technicians) is obviously necessary to achieve the best results.

Step 1. Gathering information about existing local varieties (inventory). This phase is supported by a series of instruction sheets developed by the WGAB, based on the analysis of existing experiences. The process is initiated with the indication factsheet, followed by the morpho-physiological characterization factsheet, and by the synthetic varietal factsheet. To support this activity, a historical investigation based on both written documents and oral testimony is a key factor in the genetic resource inventory process. The historical investigation makes it possible to verify the strong connection of genetic resources with the territory.

Unfortunately, much of the farmers' traditional knowledge has been passed down orally and a lot of information about use, production techniques and utilization of local agro-food products has been lost. Recently, we have become aware that this oral culture may be very important to drive protection policies and strategies for the enhancement of biodiversity. Therefore, at this stage an anthropological approach is of great help since some of these practices have already been implemented in some Italian regions. This method developed in Italy represents a novelty in the conservation of PGRFA and has recently been taken into consideration by other European and international standards.

This initial phase must be accompanied by the cultivation of propagation material for *ex situ* conservation and characterization.

Step 2. Identification of areas to be devoted primarily to *in situ*/on farm conservation. The conservation of PGRFA in the greatest possible number of environments and involving the greatest number of farmers is certainly the most effective. However, given the limited resources, it is often necessary to select and give priority to specific areas in order to promote, organize and monitor the conservation activities.

To this end, guidelines based on scientific theories have not been fully developed and standardized yet. Nevertheless, it is possible to refer to some research studies funded by the European Commission, which suggest that priority be given to those areas (defined as "appropriate areas") with greater wealth in terms of agro-biodiversity. These are areas that are rich in local varieties, diversity and agro-ecosystems, and that have already been targeted for measures to protect nature (e.g. in parks and protected areas). On the other hand, a completely different approach may be taken, based on alternative

objectives, by giving priority to areas less rich in biodiversity in order to safeguard existing genetic material and to increase the existing level of biodiversity.

The area designated for conservation would be the same as the one where seeds multiplication of conserved varieties occur.

Step 3. Characterization and assessment of the distinctiveness of local varieties. These actions are of considerable importance because they allow for:

- ✓ The identification of those populations that are really representative of local varieties and that must be protected for their unique characteristics and genetic diversity, for their link with the customs and traditions of the people who developed them, and for the possible risk of their erosion/extinction;
- ✓ The promotion of the product to be obtained from local varieties based on their uniqueness, authenticity, characteristic features and link with the territory;
- ✓ The listing of varieties, which forms the basis for planning conservation actions on both farm and territory level, the implementation of potential marketing initiatives for seeds, and the assessment of the risk of extinction.

At this stage, it is necessary to distinguish between local and commercial varieties. Morpho-physiological characterization is essential. Alternative forms of characterization (including genetic) can certainly be implemented to resolve specific problems (e.g. the genetic identity of a particular variety or the study of genetic relationships between populations). The type of characterization chosen is inherently related to the availability of financial resources.

Step 4. Assessment of population size and the genetic structure of local varieties maintained *in situ*/on farm. This aspect, together with the correct identification of a PGRFA, is of major importance for the appropriate planning of conservation actions. In the case of small sized populations, these are at risk of losing (in a random and unpredictable manner) the genetic variability that characterizes and determines their adaptation. If in a given area a local variety exists in genetically distinct populations, it is necessary to conserve diversity in order to maintain all the different populations. On the contrary, if the different populations are essentially similar, conservation may be limited to only one population within a given farm. Although intra-variety variability is more limited in species propagated by vegetative means than for crops that reproduce by seed, this variability still exists and should be preserved as much as possible. In fact, this forms the basis for either mass or clone selection. From a safety perspective, this makes it possible to recover individuals that are exempt from diseases transmitted by grafting. In essence, the more accessions of a single PGRFA are conserved (in larger and more varied populations) thus involving in the process more areas and more farmers, the greater the guarantee in achieving an effective and efficient system of conservation. This understandably depends on the availability of resources (both human, structural and financial) within the cultivation areas.

Step 5. Monitoring the effectiveness of on farm conservation. This is the cornerstone of all actions put in place for conservation because the aim is to assess whether the objectives are delivered on time and in the appropriate manner using both the human and financial resources provided. The monitoring also assess whether over time there is any erosion of the diversity that ought to be preserved.

In other words, this step allows for the evaluation of the effectiveness and efficiency of the conservation actions implemented. To achieve this goal, the monitoring activity should be initiated from the start of the *in situ*/on farm conservation process. This is because often, when dealing with fragile and complex situations, it is necessary to have full information on the "*status ante*" (farm information and genetic features of both populations and subpopulations). Thereafter, it is necessary to repeat the collecting of information at regular time intervals and to compare the initial data with the data gathered after the start of activities involved in the promotion, organization and management of *in situ*/on farm conservation.

Step 6. Establishment and management of an information system for *in situ*/on farm conservation. *In situ*/on farm conservation provides in each phase for a series of activities that either gather information or generate information, which is necessary for the understanding and better management of the local variety conserved. Therefore, it is important that all data is maintained and organized in a rational and functional manner, possibly in a computerized system. The objective of this phase is to collect full information on the activities carried out on *in situ* conservation for easy control and management. Moreover, the use of a database featuring both rapid access and rapid data processing makes it possible to compare many factors. These include different case study experiences, the development of improved conservation practices, the compilation of inventories on a larger scale (e.g. national register) and, in general, the promotion of an ever more extensive conservation activity.

1.5 Commercial aspects of the multiplication and dissemination of propagation material of local varieties.

This is a topical aspect in the management of PGRFA conservation, both for the large and complex regulatory framework that characterizes it and for the growing number of requests by farmers for multiplication material.

Here attention is focused on two specific elements. The first is the introduction of the concept of “conservation variety” in European seed legislation. The second involves implementation of provisions for plant nurseries and pest control for fruit trees and grapevine.

Seed propagated species. A recent and interesting new element was the introduction of the concept of varieties for conservation (forged at first at EU level and then at national level). This was followed by the subsequent establishment of a specific section for agricultural species in the National Register of Varieties, with specific access rules. Only in this area is it possible to establish appropriate methods of marketing and distribution of local varieties (landraces), while highlighting the fact that the varieties for conservation are a subset of those local varieties. In fact, only a fraction of these can be included in the Register. For others, it is possible to envisage a limited circulation at the local level, defined by regional law as " Conservation and Security Networks”.

A variety for conservation to be entered in the Register must meet the following requirements: be of interest to a conservation program; be accompanied by information derived from an official examination or by inscriptions, characterizations, knowledge and other details obtained from competent authorities or organizations; not be entered in

the Community Catalogue for at least two years; not be protected by either community or national property rights; be identified by the area of origin, and meet the limited DUS requirements (DUS stands for Distinctness, Uniformity and Stability) for those characteristics determined by technical questionnaires (Community Plant Variety Office - CPVO or International Union for the Protection of New Plant Varieties - UPOV). Precise requirements must also be met for the production of seeds. These include the seed reproduction area, the phyto-sanitary quality and the marketable quantities. On the regional level, the registration dossier is "filtered" and then the request for inclusion of the variety for conservation is sent to the MiPAAF (Ministry of Policies for Agriculture, Food and Forestry Resources) where the dossier is verified for its compliance with the requirements. Entry is free, unless it is necessary to perform supplementary investigations in order to establish variety distinctness.

Fruit trees. Among the large number of current regulations governing the production and marketing of plants and plant products, the Legislative Decree n. 124-25/06/2010 can be recalled. According to this decree, in order to produce and market local fruit / olive variety, the variety needs to be registered in the variety Register (maintained by the MiPAAF) and the producer must have obtained the required phyto-sanitary certification. These certificates can be provided by an appropriately authorized nursery. In specific cases, as defined by law, Plant Protection Services can award certificates to small producers.

Vine. As in the case of fruit trees, the law has not taken into account grape varieties for conservation. This means that conservation and valorisation of local germplasm are operations that are neither immediate nor simple. Given the current legislation, it is clear that old grape varieties not registered in the national Register can only be cultivated for family use and only by a farmer who does not possess another vineyard. A further obstacle to the cultivation of grape varieties unlisted in the Register is nursery legislation. In fact, vine propagation material can only be marketed if subject to certification control. However, only material from the varieties registered in the National Register are admitted to official controls and certification. On the other hand, the law's definition of "marketing" opens the possibility of propagating unregistered grape varieties that are destined for experimentation and for internal farm use. In other words, it is possible to transfer propagating material to a nursery for the production of grafted rootling for farm use, but not for selling purpose.

All of the above shows that there are limitations not only for the *in situ* conservation of vines, but also for the rapid reintroduction of an old grape variety into cultivation, a prerequisite for the valorisation of any wine produced. For the purpose of conserving and exploiting old grape varieties, it is appropriate to proceed very rapidly towards their propagation (better if controlled and on a small-scale). This should be undertaken without waiting to register the variety in the National Register and without considering any possible sanitation (to prevent virus transmission), since during the long period required the material could risk extinction. Obviously, virus and other pathogens control is important in preventing the spread of diseases transferable by grafting. Up to present some grape germplasm has been preserved, thanks only to the care of old farmers. This dedication is something that has been handed down in families through generations, including the art of grafting and the ability to propagate material for personal use. It can be concluded, therefore, that at present the safeguard of an old grape variety may be entrusted only to *ex situ* collections linked to research institutions

(therefore exempt from the regulations for reasons relating to research or trial purposes). Safeguard can also be entrusted to farmers owing the varieties in danger of extinction, providing these varieties are intended for the exclusive family use. In any other case, the process leading to the registration of the variety in the National Register must be undertaken.

Most of the above mentioned information for vines also applies to fruit and olive trees.

1.6 The characterization of Plant Genetic Resources

As mentioned above, characterization is finalised to a precise identification of PGRFA. In this Manual the WGAB presents the most effective markers divided into categories and illustrating the guidelines for their utilization.

The proposed work starts from the analysis of individual accessions to the establishment (if possible) of a varietal factsheet summarizing the morpho-physiological profile of the variety, starting from the observation of individual accessions. It is important to reiterate that sometimes local varieties (especially herbaceous varieties) are characterized by a degree of internal diversity. During their evolution in time and space (under both environmental and anthropogenic pressure) this diversity renders the varieties unstable.

When these characteristics are particularly accentuated, it is not possible to fully utilize the characterization guideline tools (descriptors) developed for identifying improved varieties (typically uniform and stable). In these cases, an evaluation of single plants must be performed so as to identify sub-populations or varietal typologies through the attribution of frequency classes. The data collected is then statistically analyzed. In contrast, when the level of internal variability shown by a local variety is low, it is possible to apply the characterization systems developed for DUS evaluation. These criteria, although more flexible, are indispensable for the eventual registration in the National Register of varieties for conservation.

Collection of information on existing local varieties. An initial description of PGRFA collected in the territory represents the first step on the path towards conservation. A more precise *in situ*/on farm or *ex situ* characterization according to the conservation model is then carried out. After the elaboration of existing models, the WGAB produced a group of crop descriptors for the collection of information and PGRFA characterization (available in the appendixes to this Manual). The series starts with an indication factsheet, followed by a factsheet to describe the single accession, and then another containing the passport or identification descriptors. This is then followed by a factsheet for markers, allowing a detailed description of the morpho-physiological characteristics of accessions, which vary from species to species (species-specific descriptors). In conclusion, the varietal factsheet summarizes the characteristics of the different potential accessions in a variety.

Taken as a whole, the proposed methodology for the collection of information through the use of factsheets permits the characterization, organization, coordination and monitoring of the previously described conservation activities. However, it must be noted that based on different necessities as well as on financial and human resources,

single parts of the general scheme may also be carried out, for instance by using specific conservation methods but not others, or collecting information using just some of the factsheets (the most important in the specific context) and not others.

Some important aspects for the proper use of these tools are provided herewith, while for details on the factsheets reference should be made to the Manual.

Passport descriptors (or those identifying PGRFA in relation to precise collecting conditions) are fundamental in exactly identifying and distinguishing each accession, including those propagated or transferred. These passport descriptors are also currently in use by international data banks (MCPD and EURISCO), which have a common coding system allowing the comparison with materials kept in other countries. Besides the passport descriptors shared at international level, the WGAB (following advice provided by regional delegates) is proposing four additional and complementary identifying descriptors, that may be useful in providing interesting information on both local and national level for more detailed accession identification. Finally, two more specific descriptors have been identified for accessions of crops contained in *Annex I* of the International Treaty and/or as components of European collections, as defined by the European Integrated Genebank System.

Morpho-physiological markers. The description of the plant phenotype represents one of the most important instruments to investigate biodiversity. This description, based on the measuring of morpho-physiological parameters, allows for characterization and identification of varieties by specific comparative methodologies. In general, the descriptors refer to highly inheritable and stable characters, which often represent the basic elements for plant classification. Characterization must be carried out following shared and objective criteria within a scientific framework and where possible according to common procedures in harmony with relevant national and international procedures.

On this basis, the WGAB proposed a descriptive factsheet (defined as species-specific) to describe a local variety or accessions of a local variety within the framework of the species considered in the present Manual. If the characterization is finalized towards variety identification, then generally all the characters described by the factsheet must be used and systematically collected according to the recommended procedures. However, to provide users with easy-to-understand factsheets that can be rapidly compiled, some descriptors (marked with the acronym WGAB) were highlighted. These descriptors are considered indispensable and therefore highly "recommended" for the characterization / identification of PGRFA in accordance with the objectives of the present Guidelines.

Different systems focussing on variety characterization were developed at international level. These are specifically designed for description, documentation, exchange and management of genetic resources (Bioversity International, USDA-GRIN) or to evaluate the distinctness, homogeneity, stability and uniqueness of those resources, a requirement in order to obtain certification for varietal protection (by the CPVO). In line with the objectives of the present guidelines, for most of the species the UPOV international system was found appropriate. Therefore, this system is generally quoted in the varietal characterization methodologies listed in the Manual. The basic criteria of the UPOV international system are coherent with both national and European systems

for the official registration of varieties. These are well known and already in use in different regions for many species and they correspond almost completely to the IPGRI/Bioversity International system descriptors for characterization. For some species, including vines, other organisations such as l'Organisation Nationale de la Vigne e du Vin (OIV) worked together with UPOV and Bioversity to create a system of common descriptors for the genus Vitis. Given that it represents the most utilized system for vines at regional, national and international level, the morfo-physiological characterization factsheet for Vitis vinifera refers to these descriptors.

In some factsheets describing fruit species, the WGAB used other descriptors, such as those published by the Tuscany Region. In the case of emmer (Triticum dicoccum and Triticum monococcum) due to lack of UPOV/CPVO descriptors, national descriptors were employed and a completely original factsheet was prepared. Finally, based on the experiences of the WGAB components, other descriptors were elaborated and introduced in the factsheets.

In species propagated by seed, it is important to recall that local varieties do not possess the same characteristics of the improved varieties, on which both UPOV and CPVO criteria were set. In fact, these often show high internal variability and therefore some of the procedures foreseen and proposed by these Organisations may not apply (for example those relative to the evaluation of "homogeneity"). To evaluate the level of homogeneity in a local variety, it is frequently necessary to evaluate the characteristics on single individuals and then apply the appropriate statistical analyses.

Molecular markers. From the time of their first application in the field of plant science approximately twenty years ago, molecular markers have proved to be useful investigation tools for the study of genetic diversity. These are proving to be ever more promising, owing to the increasing knowledge on the genomes of organisms and to the subsequent development of more efficient and less expensive analytical techniques.

Each individual contains small differences in the DNA that render that specific individual different from the other individuals belonging to the same species or population. These polymorphisms can be identified if homologous DNA traits among individuals are compared. Therein "lies" the analysis of so-called molecular markers, that is of DNA fragments positioned at various points of the chromosome (thus inheritable). Their presence distinguishes ("marks") the portion of DNA in which they are located in a univocal manner.

If compared with the phenotypic type of morphological description, genotype characterization using molecular markers is definitely more advantageous. These advantages include a greater reliability, as there is no environmental interference on the expression of the characteristics. Moreover, there is no subjective bias, which may occur when conducting a morphological analysis. Genotype analysis is also the most reliable from a legal aspect.

Furthermore, DNA analysis may also be used to detect differences among individuals that are genetically very similar (often indistinguishable phenotypically). Because of marker inheritance, it is possible to obtain objective information on the genetic proximity among individuals or populations and on parental identification (pedigree) to establish / validate the genetic origin of a variety. Further advantages of the

method are that DNA can be extracted from many parts of the plant (stem, leaves, fruits, seeds, roots), during the vegetative cycle or during winter dormancy. Moreover extracted DNA is fairly stable and can, therefore, be stored.

The aforementioned positive aspects, combined with the development of analytical techniques and more sustainable instrumentation costs, have resulted in the increasingly popular use of molecular markers. In so doing, these do not replace but complement the morpho-physiological characterization of PGRFA. Knowledge relating to the phenotypic variability within a species is always necessary, both during the sampling of material and in the interpretation of the results obtained by genetic analysis. For certain species, molecular markers have proved highly effective in distinguishing differences between individuals, in the identification of varieties and in the study of genetic relationships among individuals and varieties (databanks containing reference genetic profiles have become available to operators). However, for other species that have not received the same research attention by the scientific community, the available methods are either poor or not particularly informative, or simply nonexistent. Among the crops of the first type, the vine can undoubtedly be recalled. Some of the most widely used microsatellite markers have been adopted as genetic descriptors. After the development of a system for encoding results in order to standardize data from different laboratories, these have been added to the official list of morpho-physiological markers for international use in the characterization of *Vitis* species and varieties. Databases of the genetic profiles of grape varieties are now available online, and are regularly updated.

In summary, both practical and field skills relating to the study of the morphology and physiology of the species under characterization are irreplaceable, whilst genetic methods are useful for the objective confirmation of varietal identity on the basis of a specific genetic reference profile. This has been demonstrated for example in the case of errors made when rendering the denomination of a particular variety, or in synonyms between cultivars in distant places. Molecular markers may ultimately provide scientific information of great importance for the management and study of PGRFA, such as in the establishment of core collections (collections which contain in an individual limited number the widest genetic diversity) and in defining genetic variability of a population and its structure This information is also important in assessing the risk of genetic erosion and in monitoring the effectiveness of conservation activities.

1.7 Concluding remarks

The present Guidelines aim to make operating tools available to all stakeholders in order to provide effective and coordinated actions in the territory, with emphasis on a systematic approach. Various reasons reflected the need of standardised operating tools. In Italy there is no centralized coordination entity acting as a reference point for PGRFA. Moreover, there are numerous public and private initiatives, all dedicated to safeguarding PGRFA.

So the first step is to circulate this instrument over the entire national territory. The Manual wishes to provide all operators with the basic regulations relating to PGRFA, as well as common methodologies for PGRFA description and management. Additionally it provides, through case studies, experiences that can serve as examples towards either investigation or towards ascertaining the value of PGRFA.

The next immediate step will involve the activation of a National Register for local varieties and breeds, among other things, provided for by phase C of the National Plan for Agricultural Biodiversity. This represents an effective action to improve knowledge of biodiversity heritage of interest to Italian agriculture, in order to fully protect and enhance it. This Register may provide various levels of detail, necessary in defining the specific morpho-physiological and genetic profile of each local variety under conservation. This will facilitate the comparison among material originating from different areas or regions (identifying synonyms, distinguishing homonyms). Hence, the Register will serve as a precision tool for the identification, the correct denomination and knowledge of PGRFA. In addition, the Register would serve to improve relations with other European and non-European countries for the exchange and development of materials, as well as to provide the tools to create *ex situ* core collections with less financial resources.

Strengthening national coordination that can play as reference is important. This would permit a more widespread circulation of knowledge, experiences and resources. It would also facilitate relations at international level through cooperation within the wealth of our scientific and administrative bodies, in particular with the view to full implementation of the International Treaty on Plant Genetic Resources for Food and Agriculture.