On-farm conservation of forage landraces in Central Italy

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Introduction

Conservation has been defined as a system of resource management which yields the greatest benefit to present generations without impairing benefits for future generations (IUCN/UNEP/WWF 1980).

It is proposed that landraces should be preserved for future generations because they harbour a diversity of interesting traits for future breeding work and for developing new farming systems and moreover, reflect the cultural identity of certain groups of people (Altieri and Merrick 1987; Brush 2000). Since many landraces have already completely disappeared, in recent years some initiatives have been undertaken to preserve these genetic resources at the regional and inter-regional level.

Until recently, germplasm conservation of crop landraces, as well as of their wild relatives, relied on *ex situ* methods (i.e. the conservation of biological material outside its natural habitat, UNCED 1992), mostly in germplasm banks. More recently *in situ* (on-farm) conservation (i.e. the conservation of biological diversity in its natural habitat) has been proposed as a conservation strategy which allows evolutionary processes to continue rather than being halted as occurs to a large extent in *ex situ* conservation (Frankel *et al.* 1995; Maxted *et al.* 1997). The need to conserve and sustainably use biodiversity with special reference to *in situ* conservation of crop plants has also been emphasized by the Convention on Biological Diversity (CBD) Agenda 21, the Global Plan of Action (GPA) and other influential international documents. In on-farm conservation, the farmer or farmers' communities, who are considered to be the stewards and managers of the agroecosystem, are the actors (i.e. they are the subjects actually carrying out conservation). They should be the ones to maintain landraces in the field, under the conditions found in the area of cultivation. This means that not only are natural selection pressures at work, but the selective pressures (deliberate or not) applied by farmers also come into play. For example, a farmer uses the agronomic techniques he/she considers the most appropriate in that year, or he/she may select a different colour of seed. On-farm conservation is not an open-air museum of conservation. Policy makers and local institutions should facilitate farmers' activity by implementing measures to support on-farm conservation.

Before implementing on-farm conservation activities, knowledge of the situations which lead individuals to agree to take part in on-farm conservation is required. Few data are available about human motvation behind on-farm conservation in Europe (Negri *et al.* 2000; Nowosielka and Podyma 2001; Negri 2003).

This paper reports data relative to on-farm conservation of forage landraces in central Italy.

Materials and methods

- **Exploration and collection missions. Collection of information**

Forage species were collected by DBVBA (Dipartimento di Biologia Vegetale e Biotecnologie Agroambientali) during several collecting missions undertaken since 1981.

In some cases collection was made possible through the help of local extension services, while most visits were randomly organized. Farmers were approached in a friendly manner, the reason for the visit was explained and an interview followed during which information

on the presence of materials which had been reproduced on-farm over at least one farming generation was gathered. This study is solely based on this material. Information about the farm (name and age of farmers, farm extension, crops grown), farm management and on adaptative and agronomic traits of landraces found, as well as information relating to crop use and social context were collected. A key question during the interviews carried out in the last decade was: "Why do you keep growing landraces?"

Passport data relative to altitude, longitude, latitude and habitat were also recorded. Data were collected using purposely developed forms. The farmers were also requested to fill in a form when donating germplasm to the bank. Once collected, the landraces entered the conservation procedure of the DBVBA.

- ***Ex situ* germplasm preservation, exchange and characterization**

Seed were first cleaned, dehydrated to an average moisture content of 7-8%, vacuum-sealed in aluminium packets and stored at -18°C in a freezer, with an accession number. Some seeds were used in programmes of characterization, evaluation and breeding: molecular markers showed the existence of genetic differences among and within landraces of a given species in the collection (Russi *et al.* 1997; Veronesi *et al.* 1997).

Passport data relative to the collected materials are stored in a relational database according to IPGRI and FAO recommendations (Lipman *et al.* 1997; Maggioni *et al.* 1998). Since we do not have any institutional duty to distribute germplasm, it is freely donated to all *bona fide* users as small samples, provided that enough seed remains for long-term storage.

Results

- **Landraces found**

One hundred and fifteen landraces belonging to different species (*Medicago sativa* 67, *Onobrychis viciifolia* 35, *Hedysarum coronarium* 5, *Trifolium incarnatum* 5, *Trifolium squarrosum* 3) were found on-farm in central Italy, an area characterized by quite diverse pedoclimatic conditions (Fig. 1).

No grass forage landraces were found in the area. Detailed information on collecting sites and on farmers maintaining landraces on farm can be found in Negri (2003); the following results are drawn from those data.

Average annual rainfall (mm)	Average temperatures (°C)			soil pH
	Maxima of the coldest month	Annual	Maxima of the hottest month	
550 - 1500	-4 - +8	9.5 - 15.7	24.5 - 31.9	5.5 - 8.0

Fig. 1. Range of climatic constraints and soil pH in the collection area (sea level - 1000 m asl).

- **Where landraces are preserved on farm**

M. sativa landraces can be found almost everywhere, from sea level to 1000 m asl., on average farm elevation was 451.5 m; *O. viciifolia* is generally found in inland mountainous areas from 190 to 1300 m asl: on average farm elevation was 749.1 m. The other species are sporadically found at low elevation. My next comments only refer to the most frequently found species.

- **Who preserves landraces**

Forage landraces are generally grown under modern agricultural techniques by farmers of average age equal to 60.9 and 56.8 years old for *Medicago sativa* and *O. viciifolia* growing farmers, respectively. Farm dimensions are quite large by Italian standards: 72.2 and 65.8 ha for farms where *M. sativa* and *O. viciifolia* can be found, respectively.

- **Main destinations of the landraces found**

The forage is mainly used on the farm (98.6%) for both species. A different situation exists for the seed. *M. sativa* seed is mostly used on the farm (83% of recorded cases) while in 17% of recorded cases it is sold on the local market. A significantly lower percentage (56%) of *O. viciifolia* seed is used on the farm, while 42 and 2% of it is sold on the local and larger markets, respectively (Fig. 2).

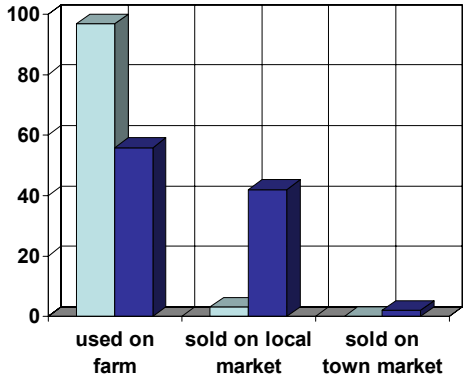

Fig. 2. Main destinations of the seed of *M. sativa* and *O. viciifolia* landraces in central Italy.

- **Why landraces are conserved on farm**

Better persistence and productivity than modern varieties and adaptability and good productivity under difficult or harsh condition are the reasons given by the farmers for continuing to grow landraces.

Discussion and conclusions

Despite the agronomic value of landraces as declared by the farmers, problems for continued on-farm conservation exist.

Social problems seem to be leading to progressive genetic erosion. Rather few people, many of them old, remain in the countryside. They often declared that they felt unable to carry on their farm activities any longer.

The younger people who live in the country are often employed part-time in agriculture and often find it more convenient to buy the seeds from the market rather than to reproduce them. Seed harvesting, cleaning and conditioning require time and sometimes the appropriate equipment, which is not always present on the farm. Lack of skill is another constraint in reproducing seed, since younger farmers often lack the practical know-how that

was generally available and used in the past. This makes it difficult to increase landrace cultivation or, even more troubling for plant genetic resource conservation, to continue cultivation.

In addition, the seed legislation is a major constraint to on-farm conservation of *M. sativa* landraces in the future. Commercialization of *M. sativa* seed of landraces has been allowed up to now, but only varieties will be commercialized from this year. At present, farmers can only reproduce landraces for their own use on the farm.

A different situation exists for the other legume forage crops since they can be commercialized without the status of variety.

If Directive 98/95 allows forage landrace conservation on-farm, how to implement it is still matter of discussion. A fierce opposition by the local seed industry exists toward the implementation of this Directive. As a consequence of all these problems, most landraces appear to be condemned to extinction if concrete actions for their safeguard are not rapidly taken.

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