MOLECULAR ANALYSIS FOR EX SITU AND ON-FARM CONSERVATION OF COMMON BEAN (PHASEOLUS VULGARIS L.) ITALIAN GERMPLASM

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Summary
A wide morphological and genetic variation was detected in a large landrace collection from Italy. This germplasm appear to be useful for breeding purposes. Possible on-farm conservation strategies should rely on widening local markets of typical products and on a reinforced social and cultural context. One example landrace appeared to be structured as a metapopulation so that to maintain the entire genetic diversity several farm should be involved in a conservation program.

Key words
Common bean, landraces, genetic diversity, *ex situ* and on-farm conservation

Contribution
Landraces reflecting the cultural identity of the people and harbouring a diversity that is of interest for future breeding work, as well as for developing new farming systems and new products, deserve to be preserved for future generations. Little is known about the current levels of crop diversity in Europe while the need for scientific work to catalogue and characterise landraces for prospective use in breeding work and in developing economies based on typical and high quality products is widely acknowledged. Knowledge of the existing level of diversity is also fundamental in planning conservation activities because, without monitoring, it is not possible to verify the effectiveness of conservation.
Phaseolus landraces are still maintained on-farm in central Italy because of a local market request of high quality products or because of sticking to family traditional use in cooking. Non the less most of them appear severely endangered with the risk of extinction due to the old age of the farmers and the socio-cultural context where they are maintained [4].
The first objective of this study was to investigate the genetic variation in an Italian germplasm collection of *P. vulgaris* landraces. A second objective was to determine the level of diversity within a landrace in order to define the most appropriate strategy of on-farm conservation.
One hundred and seventy three *P. vulgaris* Italian landraces were collected and stored in the gene bank of the Department. Accessions were characterized for several morphological traits and ten SSR primer combinations [6; 1] were used to assess genetic variation among collected materials. A wide variation was observed overall for seed shape, seed colour pattern, seed weight (100 seed weight ranging from 16 to 86 g, Fig. 1), growth habit (from bushy to aggressively climbing ability) and alleles detected at each locus. Total number of alleles ranged from 1 to 24 depending on the locus examined (Table 1). Italian germplasm appear to be an useful source of variation for breeding purposes. However, it should be noted that the particular morphological characteristics and their strong link of examined material with local cultural heritage, strongly recommend their continued on-farm (*in situ*) conservation and management. Only on-farm conservation can safeguard genetic resources by maintaining their ability to evolve in the face of biotic and abiotic pressures, social and cultural changes and to meet the

needs of unpredictable future demands [2;3]. Possible on-farm conservation strategies of landraces should rely on widening local markets of typical products and on a reinforced social and cultural context.

The possibility of defining an on-farm conservation strategy was studied in the landrace 'a pisello'. This landrace is cultivated in an restricted area nearby Rieti on the Appennine Mountains. One hundred individuals from five farmer seed lots and 32 SSR markers were used to assess genetic variation and structure. Figure 2 shows example patterns detected in four of examined seed lots. The total number of alleles detected ranged from 31 to 63 overall loci in different seed lots and Fst estimate was 0.38. Different farmers maintain distinct gene pools and the landrace is structured as a metapopulation. The same situation was detected in a cowpea population from a restricted area of Umbria [5]. Since no, or limited, migration occurs among subpopulations grown by single farmers, any mutation arising in a subpopulation may become fixed in that deme, but cannot spread to other subpopulations. When each subpopulation is maintained, no allele can ever fix in the metapopulation, drift to fixation takes an indefinitely long time and the effective size of the metapopulation becomes infinite [7]. This increases its chances of survival. On the other hand, local extinction of a single subpopulation would reduce the overall amount of variation and should therefore be prevented. Consequently, this study suggests that the best strategy for preserving the diversity of a selfer, like common bean, even in a restricted area, would be to maintain the entire metapopulation on-farm. This means that each farmer should receive appropriate advice and support to maintain his own population (i.e. each subpopulation should be maintained on the farm from which it came). Besides, the dimension of each population should be kept as large as possible.

Primer	n° of alleles
AZ044945	9
AZ301561	11
AZ301513	5
AZ301573	3
X74919	10
X80051	24
M75856	11
X79722	7
X04660	10
J01263	1

Table 1
Number of alleles observed for each locus in the Italian *P. vulgaris* collection.

Figure 1
Example of the variation detected for seed shape, seed colour and seed weight in the examined collection.

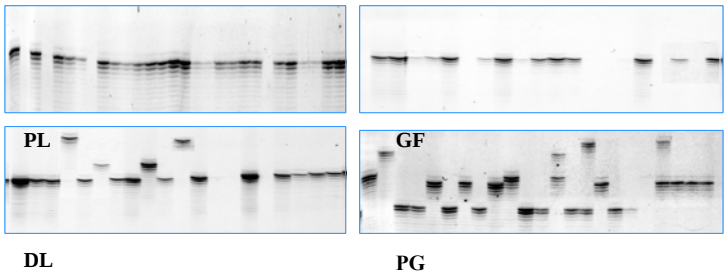

Figure 2
Amplification products of locus X80051 detected on polyacrilamide gel in four different farmer seed lots of "A pisello" landrace (initials refer to farmer names).

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