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Activities and perspectives of plant diversity conservation in rice paddies (and surrounding) of Po River Plain, N-Italy

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ABSTRACT - Plant biodiversity is often threatened by agricultural activities, through direct impacts related to the change of land use and habitat destruction and use of chemicals (fertilizers and pesticides). The latter negatively affect many wetland-dependent plants, which are particularly sensitive to eutrophication and herbicides. Current agronomic practices have led to the extinction or decline of many important plant species, but many conservation projects are in place to recover such important species and their natural habitat. In this context, low input and organic farming are good practices to sustain the biodiversity in an agricultural landscape.

KEY WORDS - biodiversity, plant conservation, in situ, ex situ, wild flora.

Current levels of plant biodiversity in the rice fields of the Po River Plain are generally very low, although in these anthropogenic wet habitats crops and wild plants of great conservation value have lived together until recent times. Among them, we can mention species growing in wetlands in the surrounding of rice fields in Lombardy, Piedmont, Veneto and Emilia-Romagna; in particular some species of great conservation value listed in the Habitat Dir 92/43 EEC and the Bern Convention, like the two famous idro-pteridophytes *Isoetes malinverniana* Ces. & De Not. and *Marsilea quadrifolia* L. Other species related to rice fields, to be mentioned for their remarkable conservation importance, are: *Lindernia palustris* Hartmann, *Sagittaria sagittifolia* L. and *Salvinia natans* (L.) All. (all included in the Italian National Red List [1]).

The changes of biodiversity in paddy fields are witnessed also by the evolution of the weedy alien flora: in the last three decades, along with new introductions, such as *Cardamine hirsuta* G. Don [2], some species have become rare and some have become extinct, e.g. *Ammannia verticillata* (Ard.) Lam. and *Eleocharis atropurpurea* (Retz.) J. Presl. & C. Presl. [3], [4].

Is this heritage lost forever? Maybe not, thanks to various protection and conservation projects started in recent years. These are often pilot actions aimed to make possible the coexistence between agriculture and biodiversity conservation, often considered antithetical, but for which it is necessary to find a way of cohabitation.

This is of particular importance when agricultural areas host important zones of high conservation interest, such as sites of the European Network "Natura 2000".

Nowadays, the main threats to plant biodiversity in an agricultural landscape, and specifically in rice fields and surroundings, are represented by the impacts produced by some practices on plant species, more than the habitat destruction.

The use of fertilizers with the consequent water eutrophication and the high use of herbicides are likely to be the most important threats for *I. malinverniana* [5] and *M. quadrifolia* [6], respectively.

Conservation actions are both in situ (reintroduction) and ex situ (seed banking), both at the species level and at the habitat level and provide an added value to the modern agriculture where farmers become the main actors and managers of the "shared natural resource"; these actions also facilitate the persistence of the ecosystems services that wild vegetation and single plant species provide to the society [7].

From the conservation point of view important results are already available as the outputs of interesting projects carried out in Lombardy like CORINAT and SOSTARE, while other conservation projects are currently in place or under development and directed to the conservation of species with high conservation value, but highly affected by the rice cultivation. In particular, the reintroduction, hence the establishment of new populations of these species, are foreseen to increase their local populations. Different methods have been defined and experimented in order to identify suitable sites for reintroductions [8].

In this context, a low impact rice cultivation (e.g. low input and organic farming) and the introduction of new practices aimed at improving the habitat quality and biodiversity would make the cultivation of rice more eco-friendly and sustainable [9].

For instance, the presence of small channels along the edges of the rice paddies where the water can be available during the dry period (for "upland" rice farming) and during winter would greatly improve the chance for many species of wild flora and fauna (e.g. amphibians) to survive.

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