Towards a Weed Risk Assessment for the Italian peninsula: preliminary validation of a scheme for the Central Mediterranean region in Italy.

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Aim/s and Introduction
In agro-ecosystems, where anthropogenic manipulation of the territory for agricultural production has changed the original natural ecosystem (Caporali 2000, Gliessman 2000), habitat degradation, fragmentation, abandonment of arable lands and altered nutrient cycle are all factors contributing to the creation of new temporary free niches with the subsequent increase of invasive alien plant species. The Department of Environment Protection of the Italian Environment Agency – APAT - is at present investigating the role that alien plant species may have in the loss of biodiversity in vegetation remnants in agro-ecosystems, while at the same time, is also considering the future use of agricultural land for widespread and intensive cultivation of crops for bioenergy production. However, a recent paper (Ragu et al. 2006) highlighted the potential harm, to the environment, of biofuel crops given that their ecological traits are commonly found among invasive plant species.

While the biology and ecology of weed species are important aspects that aid recognition of the potential for invasion, an elaborate Weed Risk Assessment (WRA) can help to understand which new cultivation ought to be considered as a potential pest. An attempt of this study was to investigate the possibility of developing a pre-entry screening method for vascular plants, such as a WRA, for the Italian Peninsula. The main aim was to provide decision makers a screening tool to prevent the mass propagation of new plant cultivations that could be potentially invasive.

Methods
A specific WRA was adapted for the Italian geographic, climatic and weed management context from Pheloung et al. (1999), which was originally developed for the Mediterranean-type region of Western Australia. The geographical area tested in this study was the Mediterranean climate area of Central Italy. Subsequently, “climate and distribution” features were set for this region. Climate parameters and values were the same as that used in Blasi 1994: total precipitations, summer precipitations, summer mean maximum temperature, winter mean minimum temperature, number of months with mean temperature below 10^0C and number of months with aridity. Climatic suitability was compared with the parameters of the native distribution of the investigated species and the reliability was calculated on the numbers of parameters available. The adaptation considered Weber and Gut (2004) and the FAO (2005) procedures for assessing weed risk, setting as required, many of the questions used in these two studies. A set of both well-known invasive alien plant species and aliens with an occasional or naturalized distribution were tested to validate the WRA.

Results
The accuracy of correctly predicting invasiveness was over 80% and consequently, the WRA was used also for the risk analysis of new biofuel crops. The WRA seems to have a good accuracy of predicting across different life forms; for example, invasive plant species such as the tree *Robinia pseudo-acacia,* the shrub *Acacia saligna* and the herb *Sorghum halepense* had a high score while the non-invasive tree *Aesculus hippocastanum* and the non-invasive herb *Cicer arietinum* had a low score. Outcomes of the WRA showed the potential invasiveness of some biofuel crops such as: *Helianthus tuberosus* and *Melia azedarach* (Table 1). For some species however, it was difficult to obtain all the needed information and consequently the final score could be overestimated.

Discussion
Within the European Union, the spread of invasive alien species is becoming of great concern and many directives (CE 2003, EC 2006, FP7 2006) highlight the necessity for each country to develop a national strategy and to determine management priorities of alien species. Indeed, in the Common Agriculture Policy, importance has been given to process weed control and eradication, especially in farmland areas of high nature value (HNV).

Some biofuel crops have the potential to escape the enclosure of cultivated areas given that they are “selected” as being efficient in phythomass production and their cropping system may include planting in abundance, repeated introduction, and large-scale plantation widespread in different climate regions. All of these factors can contribute, together with the invasibility of the habitat, to an increase in the potential for invasiveness of the planted species. On this specific issue, the Agriculture sector of APAT has already published a first report (Crosti and Forconi 2006) and the development of a WRA will provide additional useful information.

Other countries have already adopted a WRA with the purpose of identifying high-risk species, thereby allowing decision-making on prevention and eradication in order to avoid ecological and economic harm. In some of these countries that have isolated ecosystems, the primary concern of the WRA is to prevent the entry of new weed species. For Italy, the WRA process could both prevent the entry and spread of new bioenergy crops in cultivation and could be used as a management tool to eradicate and prevent the proliferation of weed species that are already present in farmland and that can harm vegetation remnants in agro-ecosystems. This WRA could be one of the first stages of a procedure known as "post-border weed risk management-WRM" (HB 2006, FAO 2006) for Italy. Furthermore, the degree of disturbance/invasibility of a habitat could be evaluated, through presence, frequency and WRA score of weed species.

This new WRA is at the early stage of its experimentation and needs further practice and modification to increase its accuracy. Its use, however, is recommended for those regions in Italy that intend to introduce new cultivation crops for energy production. In fact, just changing climate parameters should be sufficient to evaluate the potential for invasiveness of alien species for a specific region.

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Table 1. Preliminary results of the WRA for the Central Mediterranean region in Italy

Species	WRA score	Invasiveness	biofuel species
Acacia saligna	10	high	yes
Aesculus hippocastanum	-3	low	no
Ailanthus altissima	16	high	yes
Carpobrotus edulis	11	high in specific habitat	no
Cicer arietinum	-3	low	no
Crambe abyssinica	0	unknown	yes
Datura stramonium	14	high	no
Helianthus tuberosus	12	high	yes
Melia azedarach	12	low	yes
Panicum virgatum	4	low	yes
Paulownia tomentosa	4	low	yes
Robinia pseudoacacia	15	high	yes
Sorghum halepense	19	high	no
Yucca gloriosa	-1	low	no
Zea mais	-1	low	yes
Kochia scoparia	11	unknown	yes

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