



“Gheorghe Asachi” Technical University of Iasi, Romania



IRRIGATED PERMANENT GRASSLANDS IN NORTHERN ITALIAN FARMLAND – OPTIMISING MULTIPLE ECOSYSTEM SERVICES

Ciro Gardi^{1*}, Alwyn Williams², Martha B. Dunbar³,
Alessandro Petraglia¹, Marcello Tomaselli¹, Katarina Hedlund⁴

¹University of Parma, Department of Life Sciences, Italy

²University of Lund, Centre for Environmental and Climate Research, Sweden

³European Commission, Joint Research Centre, Land Resource Management Unit, Italy

⁴University of Lund, Department of Biology, Sweden

Abstract

Permanent grasslands represented a common type of land use in traditional northern Italian agriculture, but their total area has been consistently declining over the last 50 years, gradually being replaced by alfalfa meadows. The aim of this work was to obtain a comprehensive understanding of the ecological functions of permanent grasslands within the intensive agroecosystems of the Po valley. In particular we focused on the evaluation of the effects of permanent grasslands as producers of ecosystem services in terms of plant biodiversity and soil carbon in comparison with an alternative forage crop. The research was carried out in the Po valley (northern Italy), in two different locations: 1) northwest of Parma, in the heart of the Parmesan cheese district; 2) northeast of Modena. Six permanent grasslands and four arable fields in the Modena and Parma provinces (northern Italy) were characterized in terms of soil carbon stock and plant biodiversity. A total of 118 vascular plant species were recorded (86 in the Modena sites and 87 in the Parma sites). The organic carbon stored in the upper 50 cm of permanent grasslands soil was, as average of the two areas, 178 t ha, which was significantly larger than the 101 t ha obtained for arable lands. Most floristic biodiversity was concentrated in the permanent grasslands (59.2 species per field) while the cultivated sites showed a drastic reduction of species number (11.5 species per field). The results demonstrated the importance of permanent grasslands as a potential carbon sink of atmospheric CO₂, and as biodiversity ‘hot spots’ within a floristically impoverished intensive agroecosystem. These ecosystems are able to successfully combine agricultural production, carbon storage and biodiversity conservation, supporting distinct ecological features within a uniform agricultural ecosystem.

Key words: agroecosystems, biodiversity, carbon storage, ecosystem services, grasslands

Received: April, 2014; *Revised final:* May, 2015; *Accepted:* May, 2015

* Author to whom all correspondence should be addressed: e-mail: ciro.gardi@unipr.it; Phone: +39 0521 905692