



Environmental and economic advantages of Giant Reed harvesting in semi-arid climate conditions

L. Sciuto^{a*}, F. Licciardello^b, S. Barbagallo^b, G. Cirelli^b

^a International Doctorate in Agricultural, Food and Environmental Science – Di3A – University of Catania, Via S. Sofia 100, 95123, Catania Italy

^b Department of Agriculture, Food and Environment (Di3A) – University of Catania, Via S. Sofia 100, 95123, Catania Italy

*L. Sciuto. E-mail address: liviana.sciuto@phd.unict.it. Phone number: 347-2434256

E-mail address: flicciar@unict.it (F. Licciardello), salvo.barbagallo@unict.it (S. Barbagallo), giuseppe.cirelli@unict.it (G. Cirelli).

Keywords. riparian vegetation management, hydraulic risk, invasive species, remote sensing, energy crop.

Abstract. The vegetation development in riverbeds creates obstructions to the regular water flow with the consequent flooding hydraulic risk increase. *Arundo donax* L. or giant reed (GR) is one of the most successful invasive species of riparian ecosystem in Mediterranean areas, causing a strong economic impact for its removal and disposal. Meanwhile, due to its high biomass yield and adaption capacity to several conditions, GR is a very promising no-food crop to produce biogas by anaerobic digestion.

The research activity provides for the involvement of territories belonging to the inner areas of Sicily, especially the Calatino area, characterized by heightened phenomena of climate change with water scarcity and drought and flooding risk increase, typical of the Mediterranean environment mostly in the last decades. The aim of the study was to map and quantify the actual spatial distribution of GR in watercourses embankments in Geographic Information System (GIS) environment using Remote Sensing (RS)-based classification algorithm. In this regard, a method based on the automatic supervised classification, was applied on three different combinations of spectral bands (True Color Image – TCI; Near-Infrared, Green and Blue – NGB; Vegetation Red Edge – VRE) of Sentinel-2 satellite related to summer season (11th August 2019), with the aim of identifying the most suitable classification to map the GR. The results showed that the VRE composition is the most accurate for the determination of GR, followed by the NGB image. The worst performance was obtained by using the TCI combinations. A further elaboration was carried out combining the three classified image, in order to obtain a more accurate localization and quantification of GR. The final thematic map allowed to correctly classify GR for the 46% of the cases, with an overall accuracy of 85.02% and a high Kappa Coefficient of Agreement value equal to 0.81. Finally, the surface covered by GR in the study area (computed in GIS environment) was about 2 km².

The study could contribute to the development of a maintenance plan with the aim to reduce the risk of streams flooding in valley areas and at intersections with infrastructure works. The plan could be used by stakeholders to manage watercourses and get economic benefits in inner areas.

*Corresponding author.