



Land use planning for utilizing biomass residues in Tuscia Romana (central Italy): Preliminary results of a multi criteria analysis to create an agro-energy district



Andrea Colantoni^{a,*}, Lavinia Delfanti^a, Fabio Recanatesi^a, Michela Tolli^b, Richard Lord^c

^a Department of Agriculture, Forests, Nature and Energy, Via S. Camillo De Lellis s. n. c., Viterbo 01100, Italy

^b Department of architecture and design, Via A. Gramsci 53, Roma 00100, Italy

^c Department of Civil & Environmental Engineering, University of Strathclyde, Room 5.05g, Level 5 James Weir Building 75, Montrose Street, Glasgow G1 1XJ, UK

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ABSTRACT

This study provides a preliminary agro-environmental, economic and energetic analysis to critically evaluate the biomass potential of an area of central Italy (Tuscia Romana). This area is selected as representative for agro-forestry from its orographic characteristics, climatic conditions, land use and potential energy sources. Accordingly, the model we have obtained could be used for other similar areas of central Italy. We have assessed the potential agro-forestry biomass availability, energy potential and transport infrastructure using multi criteria analysis and geographic information system approaches. Finally, optimum locations to develop an energy plant were identified. This model could be applied at a local level to help deliver environmental policy.

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1. Introduction

1.1. International and National policy

Currently, biomass for energy use contributes 10–12% of the world energy balance, but the amount consumed is about 40% of the usable potential. On a global scale, this potential is approximately 1/3 of today's consumption of conventional energy sources (Hall and House, 1995; EC, 2012; Pignatelli et al., 2014; Salvati et al., 2015).

In a territorial system, two main sources of biomass origin are identifiable:

- Forests
- Agricultural territories.

Energy exploitation of these sources is possible so long as the actions are sustainable. In particular the critical factors related to the interaction between exploitation and land conservation should

be considered. In both productive systems, industrial plants may produce large quantities of waste (wood processing, food processing, etc.). The reuse of these residues may be an optimal solution for the environment and for the benefit of various production chains. Bioenergy in general, and agro-energy in particular, as with other renewable energy sources, is not necessarily “positive” in environmental terms. A bad system of production and use of renewable sources can be just harmful to the environment as a fossil fuel.

Biomass penetration of energy markets depends not only on suitable exploitation of the energy component, but also on detailed planning that takes into account factors such as: geological and climatic characteristics of the considered area, the potential sources, crop economics, alternative fuels markets, the local energy needs, environmental degradation in the area, etc. Then potential problems with the adopted technology are to be examined by checking macroeconomic and “macro-ecological” aspects (Hummel, 1988; Ministerial Degree n. 9800/2012; Recanatesi et al., 2014; Bensten et al., 2015).

Assessment of the national biomass availability is made difficult not only by the current lack of reliable official data (and this difficulty is also found in the evaluation of its use), but also by a conceptual point: whether “available” is the total availability of biomass in the territory (potential availability), or whether it is the availability which is technically and economically viable. With a gradual transition of responsibilities in renewable energy sources

* Corresponding author.

E-mail addresses: colantoni@unitus.it (A. Colantoni), laviniaadelfanti@unitus.it (L. Delfanti), fabio.rec@unitus.it (F. Recanatesi), michela.tolli@uniroma1.it (M. Tolli), richard.lord@strath.ac.uk (R. Lord).

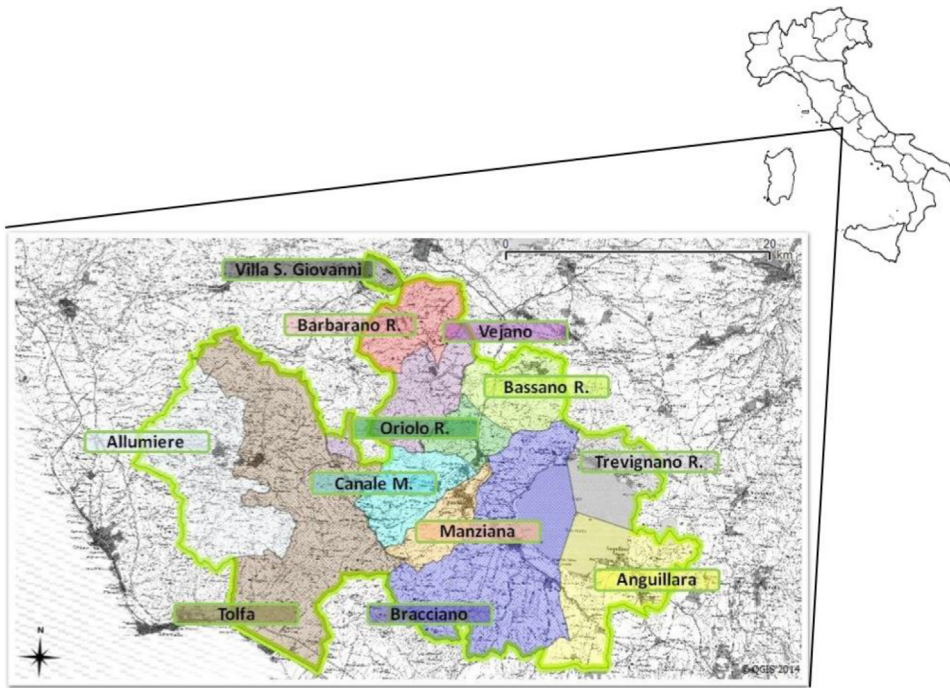


Fig. 1. Location of the studied area. Tusciana Romana (central Italy).

(and therefore also of biomass) from the State to the Regions, a stronger commitment from the government in initiating studies and accurate research, to evaluate the territorial assessment and planning might have been expected. Instead Energy Plans of Regions (or similar planning documents) are, in most cases, extremely superficial in this kind of analysis and, in many cases, the data are actually unusable (Pignatelli et al., 2014; Bilgili and Ozturk, 2015).

There is not yet a complete and comprehensive set of technical standards for bioenergy, despite the efforts in recent years, both at National and European level, from the various institutions responsible for technical standards such as:

- ISO (International Organization for Normalization), which operates worldwide;
- CEN (Comité Européen de Normalisation), for European regulation;
- UNI (National Unification), in Italy, which includes the CTI (Italian Heat Technology Committee Energy and Environment) and, with specific reference to biofuels, the CUNA (Technical Commission Unification Motorcar).

The reasons for this incomplete and not always satisfactory technical standards production are manifold; the most significant are:

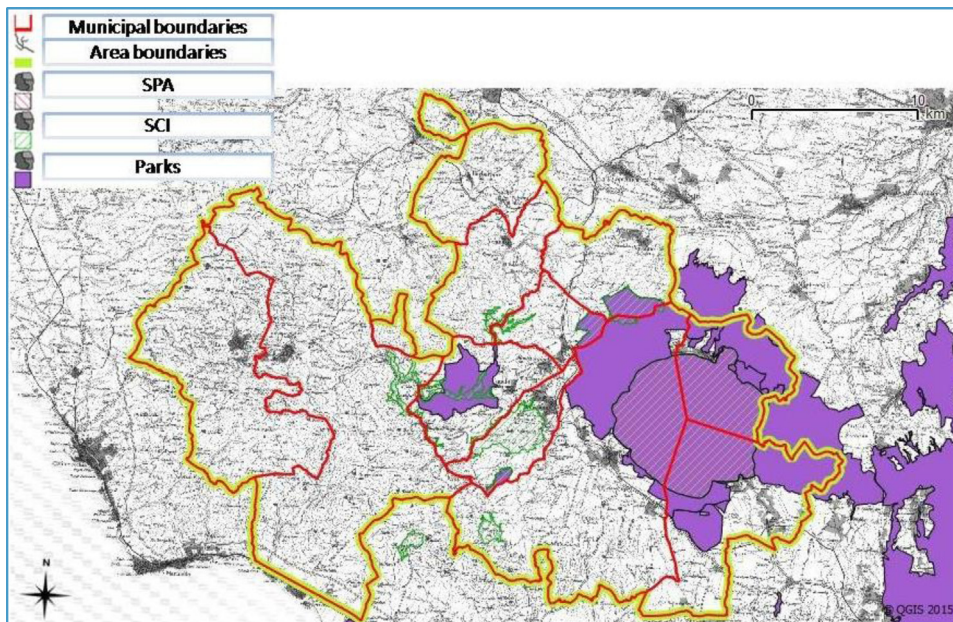


Fig. 2. Location of protected areas (SPA, SCI, Parks).

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