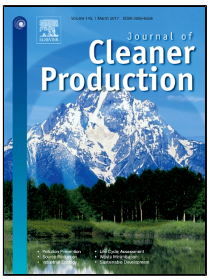
Accepted Manuscript



Evaluation of The Energy And Greenhouse Gases Impacts of Grass Harvested on Riverbanks for Feeding Anaerobic Digestion Plants

Davide Boscaro, Andrea Pezzuolo, Luigi Sartori, Francesco Marinello, Andrea Mattioli, David Bolzonella, Stefano Grigolato

PII:	S0959-6526(17)30272-X
DOI:	10.1016/j.jclepro.2017.02.060
Reference:	JCLP 8986
To appear in:	*Journal of Cleaner Production*
Received Date:	08 July 2016
Revised Date:	06 February 2017
Accepted Date:	08 February 2017

Please cite this article as: Davide Boscaro, Andrea Pezzuolo, Luigi Sartori, Francesco Marinello, Andrea Mattioli, David Bolzonella, Stefano Grigolato, Evaluation of The Energy And Greenhouse Gases Impacts of Grass Harvested on Riverbanks for Feeding Anaerobic Digestion Plants, *Journal of Cleaner Production* (2017), doi: 10.1016/j.jclepro.2017.02.060

This is a PDF file of an unedited manuscript that has been accepted for publication. As a service to our customers we are providing this early version of the manuscript. The manuscript will undergo copyediting, typesetting, and review of the resulting proof before it is published in its final form. Please note that during the production process errors may be discovered which could affect the content, and all legal disclaimers that apply to the journal pertain.

ACCEPTED MANUSCRIPT

EVALUATION OF THE ENERGY AND GREENHOUSE GASES IMPACTS OF GRASS HARVESTED ON RIVERBANKS FOR FEEDING ANAEROBIC DIGESTION PLANTS

Davide Boscaro[1], Andrea Pezzuolo[1*], Luigi Sartori[1], Francesco Marinello[1], Andrea Mattioli[2], David Bolzonella[2], Stefano Grigolato[1]

[1] Department of Land, Environment, Agriculture and Forestry, University of Padua, Legnaro, PD, Italy
[2] Department of Biotechnology, University of Verona, Strada Le Grazie 15, Verona, Italy

***** Corresponding author: Andrea Pezzuolo (andrea.pezzuolo@unipd.it); +39 049 8272763

Abstract

More sustainable scenarios in the bioenergy sector can be achieved when biomass exploitation is based on eco-efficient supply chains. Regarding this, grass as a by-product obtained from landscape management could provide a large quantity of biomass potentially utilizable in the Anaerobic Digestion (AD) supply chain.
This study assessed the energy and greenhouse gases (GHG) impacts of grass obtained from the landscape management of riverbanks.
A study area of a land reclamation authority was investigated by interpreting high resolution spatial data and determination of the biomass yield. In addition, an inventory was made of the grass production chain. An energy analysis was performed using the Cumulative Energy Demand method (CED), while the GHG balance of grass AD was calculated based on CO2 equivalents. Special attention was also given to the logistic approaches: two different supply systems were evaluated in order to determine the best supply chain for this feedstock.
The results show that the biomass yield of riverbank grass amounts to 13 $t_{f.m}$ /ha (4.8 $t_{d.m}$ /ha) while the energy utilization of grass determines a saving on fossil energy of about 2.6 – 2.4 GJ/$t_{f.m.}$ (7.0 – 6.4 GJ/$t_{d.m.}$) and on GHG equivalent emissions of about 86 – 67 $kg_{CO2eq}/t_{f.m.}$ (233 – 181 $kg_{CO2eq}/t_{d.m.}$) depending on supply distance and logistic approach. In this regard, the Indirect Logistic Approach (ILA) achieves the best performance in terms of the reduction of fossil energy and GHG emissions.
The results suggest positive prospects for the integration of grass from non-cultivated areas into the AD supply chain in order to mitigate the requirement for agricultural feedstock and obtain a positive return, in terms of energy and emissions saved, from landscape management operations.

Keywords: Riverbank grass; Energy balance; Greenhouse gases balance; Anaerobic digestion.

1. Introduction

The exploitation of biomasses from non-food agricultural annual crops in the Anaerobic Digestion (AD) supply chain implies a strong pressure on the environment as well as competition in terms of land use (Pick et al., 2012; Timilsina et al., 2011). This problem, especially in Europe, has become more accentuated in the last years due to a rapid development of AD that mainly exploits agricultural biomasses (European Biogas Association, 2015). As a consequence, the agricultural framework is changing rapidly with negative impacts on the local economies (Ingrao et al., 2016).

By-products from agricultural processes or biomasses derived from still not exploited resources, could represent an important sustainable source able to satisfy the environmental needs and reduce the dependence on fossil fuels of society and the requirement for agricultural biomasses (Martínez-Blanco et al., 2010; Menardo et al., 2015; Triolo et al., 2012). Regarding this, landscape management could provide a large quantity of biomasses potentially utilizable in an AD supply chain, like grass cuttings (Piepenschneider et al., 2016).

The potential contribution that landscape management could make to the AD supply chain could be interesting, especially in a region with an extensive system of non-cultivated green areas composed of linear elements such as riverbanks or roadsides, and wide open areas of grasslands or marginal lands (Colantoni et al., 2016; Dandikas et al., 2015; Herrmann et al., 2014; Meyer et al., 2014; Voinov et al., 2015). In fact, all these elements produce a relevant quantity of biomass, generally not exploited today, that could potentially reduce the requirement for energy crops for the AD sector and exert a positive impact on the environment and society

دریافت فوری ← متن کامل مقاله

ISIArticles
مرجع مقالات تخصصی ایران

✓ امکان دانلود نسخه تمام متن مقالات انگلیسی
✓ امکان دانلود نسخه ترجمه شده مقالات
✓ پذیرش سفارش ترجمه تخصصی
✓ امکان جستجو در آرشیو جامعی از صدها موضوع و هزاران مقاله
✓ امکان دانلود رایگان ۲ صفحه اول هر مقاله
✓ امکان پرداخت اینترنتی با کلیه کارت های عضو شتاب
✓ دانلود فوری مقاله پس از پرداخت آنلاین
✓ پشتیبانی کامل خرید با بهره مندی از سیستم هوشمند رهگیری سفارشات