



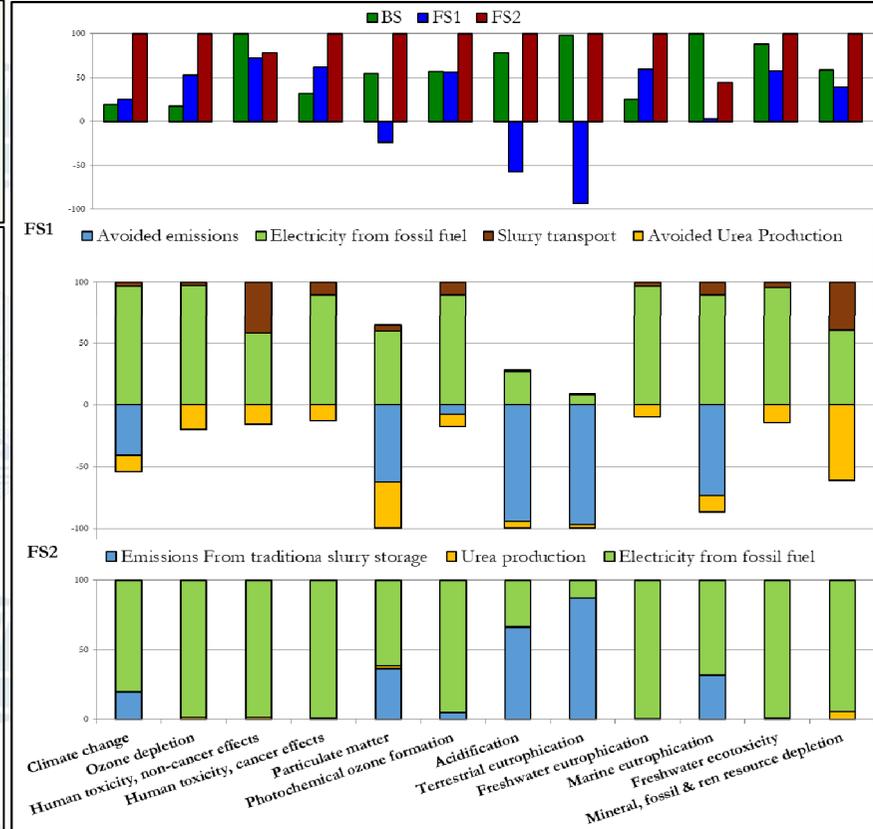
Electricity from biogas in Italy: Environmental consequences related to the elimination of economic subsidies

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INTRODUCTION: Anaerobic Digestion (AD) is recognized as one of most viable way to produce renewable electricity (EE). In Italy, in the last 20 years, thanks to a favourable subsidy framework, around 1800 AD plants fed with agricultural feedstock were built. Despite the higher supply cost, due to the level of subsidy (280 €/MWh of EE for plants built before the 2013), several plants are fed mainly with cereal silage. The future scenarios of bioenergy production could change considerably when the incentives will cease.

AIM OF THE STUDY: To analyse the consequences related to a change in the actual subsidy framework and, in particular, the elimination of the grants for biogas production from cereal crops. A consequential life cycle assessment (cLCA) was performed.

MATERIALS AND METHODS: ILCD method were used. LUC modelling was performed through a “backwards looking” approach, by assessing the historical trend of cereal silage area, focusing on “statu quo ante” the AD plants building. Analysis of trends from 1961 to 2013 showed that the use of cereal silage for AD did not cause relevant LUC thanks to productions intensification. Respect to the **Baseline scenario** (BS, actual public subsidies) two different future scenarios were evaluated keeping constant the Italian electricity demand: - **FS1**, to the grant elimination correspond a reduction of EE produced from agricultural AD plants because cereal silages are substituted with animal slurries that show a considerably lower biogas potential. Consequently, the reduced production is balanced out by an increase of EE production from non-renewable energy sources; - **FS2**, the grant elimination is supposed to involve the stop of the different AD plants. The EE produced by biogas in BS is completely substituted by EE from non renewable energy sources.

RESULTS AND DISCUSSION - Respect to **BS** (current Italian production of EE from agricultural AD plants thanks to the actual public subsidies):

- **FS1** involves an impact reduction for all the impact categories affected by cereal cultivation and, in particular, for particulate matter (-77%) acidification (-134%) and eutrophication (-191% terrestrial and -97% marine). Moreover, the higher content of NH₃ in the digestate reduce the use of mineral N fertilisers. Finally, the offsetting of the reduced of EE production through non-renewable fossil sources does not affect considerably the performances of FS1.

- **FS2**, due to the total substitution of EE from biogas with non renewable energy sources, shows worst environmental performances in all impact categories (10/12) except human toxicity (non-cancer effects) and marine eutrophication. For climate change, the worsening of the impact is related to the slurry storage in open tanks that takes place instead of the AD. In fact, the traditional storage involves higher emission of CH₄, N₂O and NH₃. Furthermore, the smaller availability of nitrogen (in the animal slurry respect to digestate) requires a supplemental consumption of N fertilisers (Urea) respect FS1 and BS.

CONCLUSIONS - The achieved results can support the decision of policy makers in order to drive the future towards more sustainable direction. Future activities will involve further future scenarios evaluated using a partial equilibrium model.

