

2<sup>nd</sup> World Congress and Expo on

# Recycling

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## Recalcitrant agriculture waste to produce biogas and amendments

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Biomass represents a useful resource, whose value is related to the chemical and physical properties of its molecules. Agriculture wastes and livestock manures are highly polluting and difficult to dispose of, with a high cost for farmers. Thus, their anaerobic digestion could be a reliable way to use refuse as resource producing economic benefit. Biogas technology, also known as anaerobic digestion (AD) technology, can be considered a competitive process for reducing the rate of climate change and global warming managing biodegradable waste streams to produce renewable energy and nearly stable residue (digestate), in a sustainable way. While biogas represents an ascertained useful source of renewable energy, the digestate ever-increasing production induces problems related to its sustainable discharge. Consequently, use of waste to produce biogas has to be associated to a sustainable disposal of digestate for being economically and environmentally competitive with the fossil fuels. To achieve these aims, the following objectives were designed: 1) to evaluate if recalcitrant agriculture wastes (olive wastes and citrus pulps), mixed in different proportions with livestock manures, milk serum and maize silage produce biogas different in composition; 2) to characterize the obtained digestates, each separated in liquid and solid fractions; (3) amending fields with the liquid (L) and solid fractions (S) of the two digestates to evaluate growth and productivity of cucumis sativus. The biogas produced from both plants contained 55% of methane, but the digestates coming from both plants were chemically and qualitatively different. In particular, the digestate from plants fed with animal manure (Fattoria, F) as principal waste had less total phenols and fatty acids minor COD and BOD, but a greater amount of nutrients than that coming from the digester filled mainly with agricultural wastes (ULIVA, U). In addition, chemical and biological differences between solid and liquid fractions were also found. The solid fraction (SF) of Fattoria had less total phenols, fatty acid, but major amounts of nutrients and organic matter respect to LF and SU. Conversely, SU had less fatty acids and total phenols than LU, but higher than SF. Additionally, SU contained less K, Mg and NH<sub>4</sub> than LF and LU. The data related to the growth and quality of cucumber evidenced that the digestates increased the growth in terms of weight, length and diameter of cucumber. As not expected, cucumber amended with digestates particularly with liquid fractions, produced fruits with a higher percentage of dry matter and greater antioxidant properties, in particular with higher free radical inhibition capacity, total polyphenol, ascorbic and citric acid contents in respect to plants not amended. In contrast, the parameters linked to the perception quality like peel color, lightness and brightness were lower than in not amended plants. In short, integrated waste recycling practices can drive profit and reduce cost: animal and recalcitrant agricultural wastes, may represent a great resource in the production of biogas with high methane percentage, and of organic fertilizer. The smart utilization of agricultural wastes has the potential to provide new revenue streams, to crop producers and food processors, while creating new sources of clean renewable energy and chemicals that do not compete with food production. If fully developed, these mechanisms can not only decrease waste and environmental degradation, but provide cost-savings and increased profits.

### Biography

Muscolo A graduated in Biological Sciences (MSc) and has completed her PhD in Food Science at the Policlinic Federico II University of Naples, Italy. In 1988, she started her professional career as Researcher at Mediterranean University of Reggio Calabria where she is still working as Professor. Since 1990, she is reviewer for scientific international journals and since 2008 she is evaluator of national and international projects for European Community and Funding Research Agencies. She is examiner of international PhD dissertation. She published more than 180 papers in international journals with IF and has been serving as an Editorial Board Member of many international journals.

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