

Climate Change and Environment in the Arab World

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Recycling Farm Biomass for Biogas Production: A Feasibility Study in Rural Lebanon

Biogas technology can reduce the effects of global warming

Biomass is the third largest primary energy resource in the world, after coal and oil, and has the potential to be a partial substitute for fossil fuels, stated a feasibility study conducted by the Issam Fares Institute and the Faculty of Agriculture and Food Sciences (FAFS) at the American University of Beirut (AUB).

The current levels of methane (CH₄), one of the naturally occurring greenhouse gases (GHG), is increasing significantly as a result of human activities including agricultural and farming, especially animal production. With the growing global concern over climate change and greenhouse effects, many scientists are investigating the use of alternative energy sources such as recycling agricultural wastes and dairy farm manure for biogas production in an effort to control the methane gas emissions and their attendant effects.

Control and recovery of energy-rich GHG (biogas) produced by anaerobic digestion of agricultural waste can be a new source of renewable energy with less harm to the environment.

The controlled use of such gases will reduce the dependence on fossil fuels, reduce GHG emission and enable rural farmers to produce crops off-season by using inexpensive and non-polluting energy to warm agriculture greenhouses. Such investments have potential impacts on land and water resources, food security, health, biodiversity and climate change.

In addition, the nutrient-rich digestate and effluent from the biodigesters used in the production of the biogas can be used as organic fertilizers.

Investigating 30 small farms in the Beqaa region, Dr. Mohamad Abiad, Department of Nutrition and Food Sciences, AUB, Dr. Isam Bashour, Dr. Ali Chalak and Ms. Rosine Habchy, Department of Agricultural Sciences, AUB, in conjunction with the Issam Fares Institute, put together a study to explore the viability of recycling farm wastes for biogas production.

The potential for recycling biomass for the production of energy in rural households has been studied in detail in many developing countries. Yet to the best of knowledge, a study conducted with the same depth has not been carried out in the Middle East, especially as regards exploring new ways to help farmers reduce their energy expenses.

Biogas technology suitable for maximizing scarce resources

Waste-to-bioenergy technologies to convert livestock and agricultural wastes-to-energy are mainly dominated by the use of anaerobic digesters. The anaerobic digestion converts the complex organic wastes to produce a gaseous mixture predominated by methane (CH₄) and carbon dioxide (CO₂) with methane percentages varying between 40% and 70%.

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“ With the continuous increase of fossil fuel prices, the introduction of on-farm bio-digesters in rural areas will help farmers save on energy costs. ”

The Issam Fares Institute for Public Policy and International Affairs (IFI) at the American University of Beirut (AUB) was inaugurated in 2006 to harness the policy-related research of AUB's internationally respected faculty and other scholars, in order to contribute positively to Arab policy-making and international relations. IFI is a neutral, dynamic, civil, and open space that brings together people representing all viewpoints in society. It aims to: raise the quality of public policy-related debate and decision-making in the Arab World and abroad; enhance the Arab World's input into international affairs; and, enrich the quality of interaction among scholars, officials and civil society actors in the Middle East and abroad.

The Research and Policy Forum on Climate Change and Environment in the Arab World provides a mechanism that brings together AUB professors, other academics and researchers, civil society, the private sector and policymakers. By promoting close interaction between researchers and policymakers, it aims to help formulate more effective environmental policies in the Arab World, and to mitigate the impact of expected climate change scenarios and other environmental challenges. The AUB-IFI Climate Change Forum comprises lectures, research, publications, comprehensive regional databases of scholars and research, and regular workshops, seminars and conferences.

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in rural areas will help farmers save on energy costs, not to mention the decrease in GHG emissions and savings on the cost of fertilizers along with other positive environmental impacts. Under such conditions, the study argues that dairy farm manure, agricultural wastes and organic household refuse represent a viable alternative source for energy.

Methane gas from the anaerobic digestion of biomass has a decent energy value. It is utilized to generate electric, thermal or mechanical energy to be used on farms, in addition to the effluent and digested sludge that can be used as organic fertilizer. Furthermore, the results show that biogas production in the surveyed farms in the Beqaa Valley could meet approximately 45% of their energy demands.

However, the surveyed farms are small in size and the agricultural waste produced on each does not provide enough biomass for a continuously operating system. The findings show that it is more feasible to install centralized biogas plants rather than having individual reactors on each farm. The study also demonstrates tangible gains in social welfare through the implementation of such initiatives.

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Conclusion and Recommendations:

- Based on the findings of this pilot study, further research must be conducted to investigate the available farm waste volumes that can be potential source for energy.
- In addition, the study recommends allocating sites across rural Lebanon, where energy is scarce, to install biodigestion systems.
- Further recommendations suggest the involvement of the government in encouraging the implementation of biogas digesters through introducing low interest loans and credits for alternative energy systems. The government is also encouraged to build and operate biogas plants which can be managed by local municipalities.
- Moreover, the study recommends that public funds be assigned for further research and development in this particular area. ■



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Further Reading:

Abiad, M.et.al. *Recycling Farm Biomass for Biogas Production: A Feasibility Study in Rural Lebanon (2010)*

IFI Commissioned Papers:

Country-specific Studies on Climate Change and the Policy-making Process in the Levant

http://www.aub.edu.lb/ifi/public_policy/climate_change/ifi_cc_texts/Pages/cc_policy_levant_workshop.aspx

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