Net jobs generation and net GHG emissions reduction from biogas partially replacing fossil fuels in Southern Brazil

Topic: Energy Policies
Author: Maria Priscila Ramos
Co-Authors: Gustavo Adolfo Ferro, carlos adrian romero

The move towards renewable energy sources can imply complementarity or substitution of conventional sources. If the links between both sources were strictly complementary, and the renewables started from scratch, jobs created in this new sector would be additional to existing jobs in the conventional energy industry. However, if renewable energy is going to substitute partially conventional energy, jobs in the renewable energy sector would replace part of the jobs in the conventional energy sector. Same, if conventional energy sectors yield certain levels of GHG emissions and it is replaced partly by a cleaner energy, the net GHG emissions would decrease at the whole economy level.
We explore the reach of net job creation and net GHG emissions reduction from the partial substitution of conventional energy sources by biogas in Southern Brazil. Biogas is generated from substrates derived from agriculture and cattle, agroindustry, urban solid waste, and sewerage treatment. The Southern Region of Brazil is made up of the states ParanÃ¡, Santa Catarina, and Rio Grande do Sul. Fossil fuels are globally responsible for more than 70 percent of GHG emissions and part of the solution of the global warming is their replacement with renewable energies.
Brazil is a middle-class country, with an industrial base, the tenth GDP by size in the world. Brazil has an energy matrix relatively clean, with an important share of hydroelectricity, and a great potential for biogas production (the current production is around 3.4% of the estimated potential). According to the targets in the Brazilian National Determined Contribution to Paris Agreement, the country aims to reach a 45 percent share of renewable energies in its energy matrix by 2030.
The measurement of socioeconomic impacts in each economy helps assess clearly and in detail all the social costs and benefits of a certain sectorâ€™s expansion or reduction. To account for production and industrial chain relationships, Input-Output analysis offers good clues to measure a sectorâ€™s expansion impact. Nevertheless, two problems arise: first, newly developed sectors could be not present in statistics, normally devised with a limited degree of disaggregation; and second, regional statistics in developing countries can be inexistent, incomplete, obsolete, or incoherent with national statistics. Part of the task to achieve the goals of determining net job creation and net emission reduction consists of providing disaggregated, consistent, coherent, and updated regional Input-Output tables and models.
Concerning jobs and GHG emissions, Input-Output tables and models are expressed in monetary units, while employment is measured by jobs and GHG emissions are in tCO2eq. Our contribution uses hybrid approaches for regionalizing matrices, opening inexistent entries in the Input-Output tables, and adding satellite accounts to compute net jobs and GHG emissions.
Once the baseline has been established, we consider different scenarios of fossil fuel substitution by biogas. We hypothesize that net job creation will be positive because biogas industries are more labor intensive than fossil fuel energy generation and that net GHG emissions will be negative since biogas industries generate lower emission levels than conventional energy sources. Scenarios were devised on moderate assumptions concerning the demand and supply of biogas, the potential supply of substrates, and degrees of substitution achieved between fossil and biogas energy sources.
However, caution is needed in advancing conclusions. The (partial) substitution of fossil fuels, demands several adjustments in the infrastructure of electricity generation, and public policies to help the market develop.
Results are useful to develop public policies (command and control -regulation- as well as incentive ones -taxes and subsidies-) to encourage changes in the energy matrix aimed at increasing net

employment and decreasing net GHG emissions, based on evidence, and avoiding partial (sectoral) arguments which can be distributive.

Jobs in biogas industries are sparse in the territory because of the nature of some biogas industries. Part of the production could be centralized in big cities, such as the one coming from solid waste processing, or from industries with great scale economies, such as beer, while several small or medium-sized industries and agricultural enterprises can also produce biogas from their substrates. Thus, jobs will be generated in the whole territory of the states involved. GHG emission reduction, in turn, will help achieving international commitments to control global warming.

Our analysis is based on sound methods, and updated and homogeneous statistics, and tries to address all relationships of complementary and substitution among sectors to avoid partial reasoning in favor or against certain sectors. We rest on empirical evidence and moderate assumptions on technical conversion factors.