Geophysical Research Abstracts
Vol. 17, EGU2015-8087, 2015
EGU General Assembly 2015

Co-location opportunities for renewable energy and agriculture

Sujith Ravi (1), Jordan Macknick (2), David Lobell (3), Christopher Field (4), Michael Elchinger (2), and Blaise Stoltenberg (2)

(1) Temple University, Earth & Environmental Sciences, United States (sujithravi@gmail.com), (2) National Renewable Energy Laboratory, United States (Jordan.Macknick@nrel.gov), (3) Stanford University, Environmental Earth System Science, United States (dlobell@stanford.edu), (4) Carnegie Institution for Science, Global Ecology, United States (cfield@ciw.edu)

Solar energy installations in arid and semi-arid regions are rapidly increasing, due to technological advances and policy changes. Large-scale expansion of solar infrastructure can adversely impact land and water resources. A major challenge is how to meet the ever-expanding energy demand with limited land and water resources, in the context of increasing competition from agricultural and domestic consumption. We explored opportunities to co-locate solar infrastructures and agricultural crops or biofuel feedstocks to maximize the efficiency of land and water use. We considered energy inputs/outputs, water use, greenhouse gas emissions and economics of solar installations in comparison to location-specific agricultural /biofuel crops in different arid regions of the world. The life cycle analyses show that co-located systems are economically viable in some areas and may provide opportunities for electrification and stimulate economic growth in rural areas. The water inputs for cleaning solar panels (photo voltaic) or mirrors (concentrated solar) and dust suppression are similar to amounts required for the desert-adapted crops (e.g. agave, aloe) considered in the study, suggesting the possibility of integrating the two systems to maximize water and land use efficiency. A life-cycle analysis of a hypothetical co-location indicated higher returns per m3 of water used than either system alone. Arid and semi arid regions of the world are experiencing high population growth, creating additional demand for land and water resources. In these water limited areas, coupled solar infrastructure and agriculture could be established on marginal lands, thus minimizing the socioeconomic and environmental issues resulting from cultivation of high value non-food crops in prime agricultural lands.