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Bioenergy & Sustainability: bridging the gaps

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Contents

List of Figures, Tables and Boxes

Figures

right, commercial production of oxygenated liquid fuels, ethanol, and biodiesel, and the more recent hydrocarbon fuels from hydrotreated vegetable oils (HVO)

12.2. Net efficiency range of biomass-to-energy pathways on a life cycle basis from harvested crop to power, heat, and biofuels considered by the (EEA 2013) for current applications and developing lignocellulosic biofuels

12.3. Current bioenergy in GJ compared to a 2020 projection emphasizing resource efficiency for all biomass applications including climate change mitigation using EU-produced and imported biomass. Also shown are the average GHG emissions for current commercial technologies for heat, electricity, and biofuels and a 2020 projection with advanced biofuels from lignocellulosic energy crops

12.4. Mix of energy crops used in Europe from 2006–2008 (left) and the 2020 EEAmodeled crops for high yield of products per unit area used, low waste and pollution, including low ecosystems impacts and high GHG emissions reductions in 2020 (right)

12.5. The current allocation of 114 million hectares in the U.S. is shown on the left. Modeled annual mass flows from a land efficient allocation (right) showing major crops and outputs for a scenario of maximum ethanol production

12.6. Hypothetical s-shaped curve for technology development of biofuels to commercialization and maturation, and advanced technologies that could surpass theperformance of incumbent technologies

12.7. Average producer prices from 2002 to 2012 for commercial ethanol are expressed in liters of gasoline equivalent energy from commodity crops and 2012 estimated production cost ranges (IRENA 2013) in major producing areas

12.8. Trend in human carcinogenic toxicity of E85 (85% ethanol/15% gasoline blend) from corn ethanol in the U.S. from 2001 to 2010 (left) and freshwater exotoxicity impacts (right)

12.9. Comparison of parameters for sustainability assessment of liquid fuels routes from existing oil refinery process with developing alternatives based on gasification of coal, biomass, and coal/biomass to liquids using the commercial Fischer-Tropsch catalytic processes

12.10. Life cycle improvements, using time-specific technologies for conversion and feedstock production for corn ethanol production in the U.S.

12.11. Brazil's sugarcane industry-wide electricity generation nearly doubled since 2006-2009

12.12. Biomass pretreatments alone or in combination with hydrolysis lead to sugars that can be fermented to ethanol and other products as indicated. The most common application for the lignin is process heat and electricity although many others are being developed. Examples of other biofuels discussed in the next section include: other alcohols, microbial products using tools of synthetic biology (Alonso et al. 2013; Peralta-Yahya et al. 2012; Yoon et al. 2013), or fatty alcohols via heterotrophic algae in dark fermentation (Perez-Garcia et al. 2011) that are also undergoing parallel technology development

12.13. Examples of metabolic pathways leading to microbial fuels from Rude and Schirmer (2009) and examples of bacteria and yeasts

12.14.1. Biomass gasification steps to fuel synthesis using FT catalysts for integrated fuels, heat, and power production

12.14.2. shows the general composition of catalysts for various conversion pathways from syngas to many fuels and chemicals

12.15. Illustration of the sum of CO_2-equivalent (GWP100: Global Warming Potential over 100 years) emissions from the process chain of alternative transport and power generation technologies both with and without CCS

12.16. Schematic of biomass-derived syngas fermentation to ethanol and a variety of oxygenated products from Liew et al. (2013) reproduced with permission from Intechopen. Also converted are industrial off-gases containing CO and CO_2

12.17.1. Fast pyrolysis of biomass process steps to liquid, solid char, and gaseous fractions, followed by upgrading of the bio-oils to liquid hydrocarbon fuels and chemicals

12.17.2. Multiple pyrolysis biorefineries under development with parts already commercialized

12.18. An integrated biorefinery emerged from a paper mill in Norway with basic products and their applications (Rødsrud et al. 2012) with improved environmental impacts

12.19. Examples of pilot, demonstration, first-of-a-kind industrial projects from IEA Bioenergy Agreement including only member and associated countries as of 2013

12.20. At the top, the 57 connected advanced (also called second-generation) biofuels websites show the links from government programs (yellow) elements, red indicates the nonprofit technology platforms of research funded by European government programs, green are the various industries operating in one or more countries, and the blue circles indicate the public science as performers of RD&D or conferences or associations. At the bottom left, are the linkages between the major types of organizations and the links between countries are displayed on the right

12.21. Summary of current estimated production costs of biofuels and projected estimates by 2020

12.22. Transport fuel applications are shown on the left, showing the ease of introducing electric or hybrid concepts, higher for light duty road vehicles and urban road services. Liquid fuels are needed in the aviation and marine sectors due to the high energy intensity of hydrocarbon fuels. The right figure illustrates the various types of integration of the fuels needed with engines, after treatments to comply with emissions regulations, refueling, and customer acceptance

12.23. Properties of liquid fuels for common types of engines: Left—compression ignition with the corresponding petroleum fuels, diesel and heavy fuel oil (HFO) or oxygenated blends or substitutes from biomass, HVO (hydrotreated vegetable oils), SVO (straight vegetable oils), FAME (fatty acid methyl ester - biodiesel), and DME (dimethyl ether) with SVO causing the most problems in use. Right: Gasoline and blends or alternative fuels such as MeOH (methanol), EtOH (ethanol), Hydrogen, LPG (Liquefied Petroleum Gas), and CNG (Compressed Natural Gas) and LNG (Liquefied Natural Gas)

12.24. Examples of identified pathways for producing biojet fuels and status of ASTM certification (red developing and green approved)

13.1. Integration of food and energy crops can be spatial (left) or temporal (right), in either case increasing ecosystem services and biodiversity relative to annual monocultures (center)

Tables

Boxes

section

Foreword

The development of modern high efficiency bioenergy technologies has the potential to improve energy security and access while reducing environmental impacts and stimulating low-carbon development. While modern bioenergy production is increasing in the world, it still makes a small contribution to our energy matrix.

At present, approximately 87% of energy demand is satisfied by energy produced through consumption of fossil fuels. Although the International Energy Agency (IEA) predicts that this share will fall to 75%, the total consumption of fossil fuels will continue to rise, adding another 6 Gt of carbon to the atmosphere by 2035. The consequences of this increase are worrisome.

Our oceans are being critically affected. Oceans are an important CO_2 sink and absorb 26% of the CO_2 emissions but due to accelerated acidification and rising sea surface temperatures, this capacity may be reduced. Never in the last 300 million years has the rate of ocean acidification been so high. In the last 150 years, acidity in oceans increased by 30%. The main cause are the emissions from fossil fuel burning, especially the release of CO_2.

Deforestation and land degradation also contribute to increased greenhouse gas emissions. The world's total forest area in 2010 was just over 4 billion hectares, which corresponds to an average of 0.6 ha per capita. Each year, between 2000 and 2010, around 13 million hectares of forestland were converted to other uses or lost through natural causes. The production of timber for housing or the need to make land available for urbanization, large-scale cash crops such as soy and oil palm, subsistence agriculture and cattle ranching induce deforestation. Forests are also degraded or damaged due to the soaring demand for fuelwood and charcoal for cooking and heating in developing countries that suffer from low levels of access to modern energy services. Most of the world's bioenergy is presently derived from wood burning for cooking and heating in developing countries. Such traditional uses of biomass are low in cost to the users, but their technical inefficiency results in considerable health and environmental costs while providing only low quality energy services. Many countries demonstrate that a much higher efficiency can be obtained in traditional uses commercially with sustainably managed feedstock supplies. Since bioenergy systems often operate at the interface between agriculture and forestry, they are also closely connected to the planning and governance of these sectors and of policy to conserve and manage

forests. Consequently, interdisciplinary and cross-level or horizontal studies are needed in order to define the best routes through which achieve a sustainable energy matrix.

Can modern bioenergy make a significant contribution to our energy matrix with positive contributions to the environment? What are the social, environmental and economic implications of the expansion of bioenergy in the world? How does expansion of bioenergy perform in the context of the food, energy, climate, development and environment nexus? Which are the most significant potential benefits of bioenergy production and use and how can we design implementation platforms and policy frameworks to ensure that such benefits are realized and widely replicated? What are the scientific research needs and technological development requirements needed to fill in the gaps?

To answer some of these questions, FAPESP BIOEN, Climate Change and BIOTA Research Programs led, in December 2013, a group of 50 experts from 13 countries convened at UNESCO in Paris, France, for a rapid assessment process on "Bioenergy and Sustainability" under the aegis of SCOPE. Background chapters commissioned before the workshop provided the basis for this international consultation during which crosscutting discussions focused on four themes: Energy Security, Food Security, Environmental and Climate Security, Sustainable Development and Innovation.

The resulting synthesis volume has the contribution of 137 researchers from 82 institutions in 24 countries.

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BIOEN

BIOEN, the FAPESP Bioenergy Research Program, aims at articulating public and private R&D, using academic and industrial laboratories to advance and apply knowledge in fields related to bioenergy in Brazil. Research ranges from biomass production and processing to biofuel technologies, biorefineries, sustainability and impacts.

RPGCC

The FAPESP Research Program on Global Climate Change (RPGCC) aims at advancing knowledge on Global Climate Change and guide decisions and policy in the field.

BIOTA

The BIOTA-FAPESP Program (FAPESP Research Program on Biodiversity Characterization, Conservation, Restoration and Sustainable Use), aims not only at discovering, mapping and analyzing the origins, diversity and distribution of the flora and fauna of the biomes of the state of São Paulo, but also at evaluating the possibilities of sustainable exploitation of plants or animals with economic potential and assisting in the formulation of conservation policies on remnants of native vegetation.

SCOPE

The Scientific Committee on Problems of the Environment is an international nongovernmental organization founded in 1969. SCOPE is a cross-sectoral and trans-disciplinary network, connecting experts and institutions around the world. It is recognized for its authoritative, independent and influential scientific analyses and assessments of emerging environmental issues that are caused by or impact humans and the environment. It collaborates with inter-governmental agencies such as UNESCO and UNEP and with other partners in the development of its scientific program and outreach activities.

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