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Bioenergy and Food Security: development of renewable fuels can help feed the world while achieving other goals

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Bioenergy's role to achieve Sustainable Development

Multiple goals, including food and energy security, can be achieved with proper bioenergy project design and implementation. "Reconciling Food Security and Bioenergy: Priorities for Action" reviews the food security impacts of biofuels. An interdisciplinary describes steps to address climate challenges via the development of a bioeconomy linked with better management of land, forests, and water. When implemented, these steps contribute to hunger and poverty reduction, provision of affordable clean energy, and achievement of other United Nations Sustainable Development Goals (Figure) and Paris Agreement targets for climate action to reduce reliance on fossil fuels.

With bioenergy projected by the International Energy Agency to be required for up to one-third of primary energy by the middle of this century, it is important to accelerate efforts to have the global bioeconomy develop in ways that support social, economic and environmental goals.

Ask the right questions

Who is hungry or malnourished? Why? Effectively addressing food security and bioenergy sustainability requires focus on the people at highest risk. Understanding the local causes of food-insecurity is a prerequisite step for designing projects that improve food security in a specific place and time. This approach requires multi-disciplinary analysis and designs to address key constraints and opportunities. Merely increasing global food supply is not the answer in a world where an estimated 40% of the food that is grown each year is wasted and where prices paid to food growers can be so low that crops are left unharvested (Thurow and Kilman, 2009; Vural-Gursel 2021).

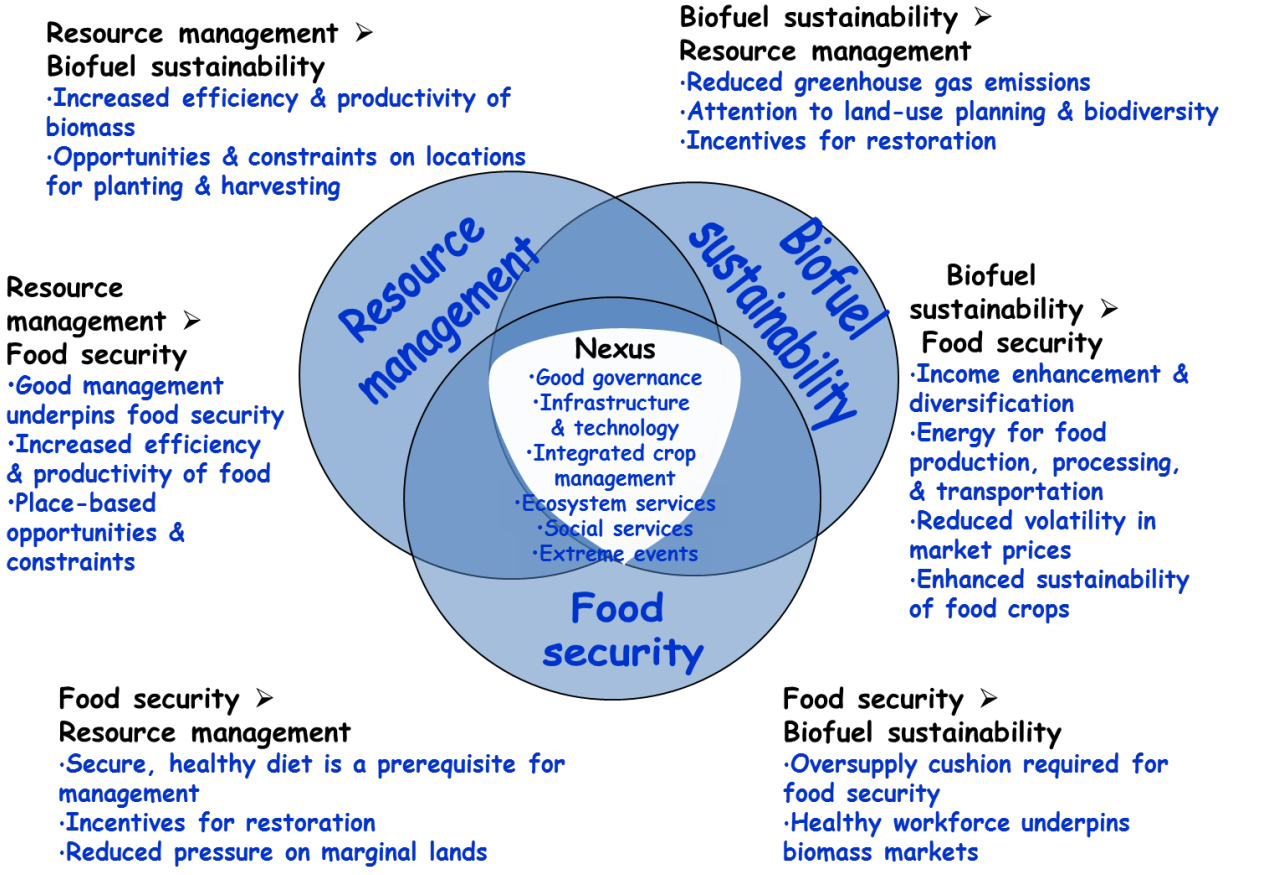
Food security and sustainable biomass production depend on local circumstances. Variables that determine who goes hungry and why are important but often omitted from analyses. The world is making notable progress reducing the number of hungry people, from over one billion in 1990-92 to 690 million in 2014-2015 (FAO 2020a). The larger and growing food-related health problem of malnutrition is caused by eating too much of the wrong foods such as sugar and red meat. Determination of when and how bioenergy interacts with such health challenges requires analysis at local scales based on evidence and focusing on the people at risk.

No simple answers

Bioenergy, like food, can be good or bad, depending on how it is managed. Sustainability requires integrated management to serve multiple needs. When sustainable biomass is given economic value, it can help curb practices that lead to soil erosion, deforestation, extensive fires, and water pollution. Diverse market options boost agricultural production in normal times and provide a larger supply cushion in times of crisis. Bioenergy's role as a complementary market for both the primary and the by-products of agricultural production can increase adaptability and resilience of farming systems, thereby reducing the risk of people going hungry. Investments in bioenergy can also be designed to reduce context-specific vulnerabilities that may limit access to food staples when disasters strike.

The food security – bioenergy – sustainable resource management nexus

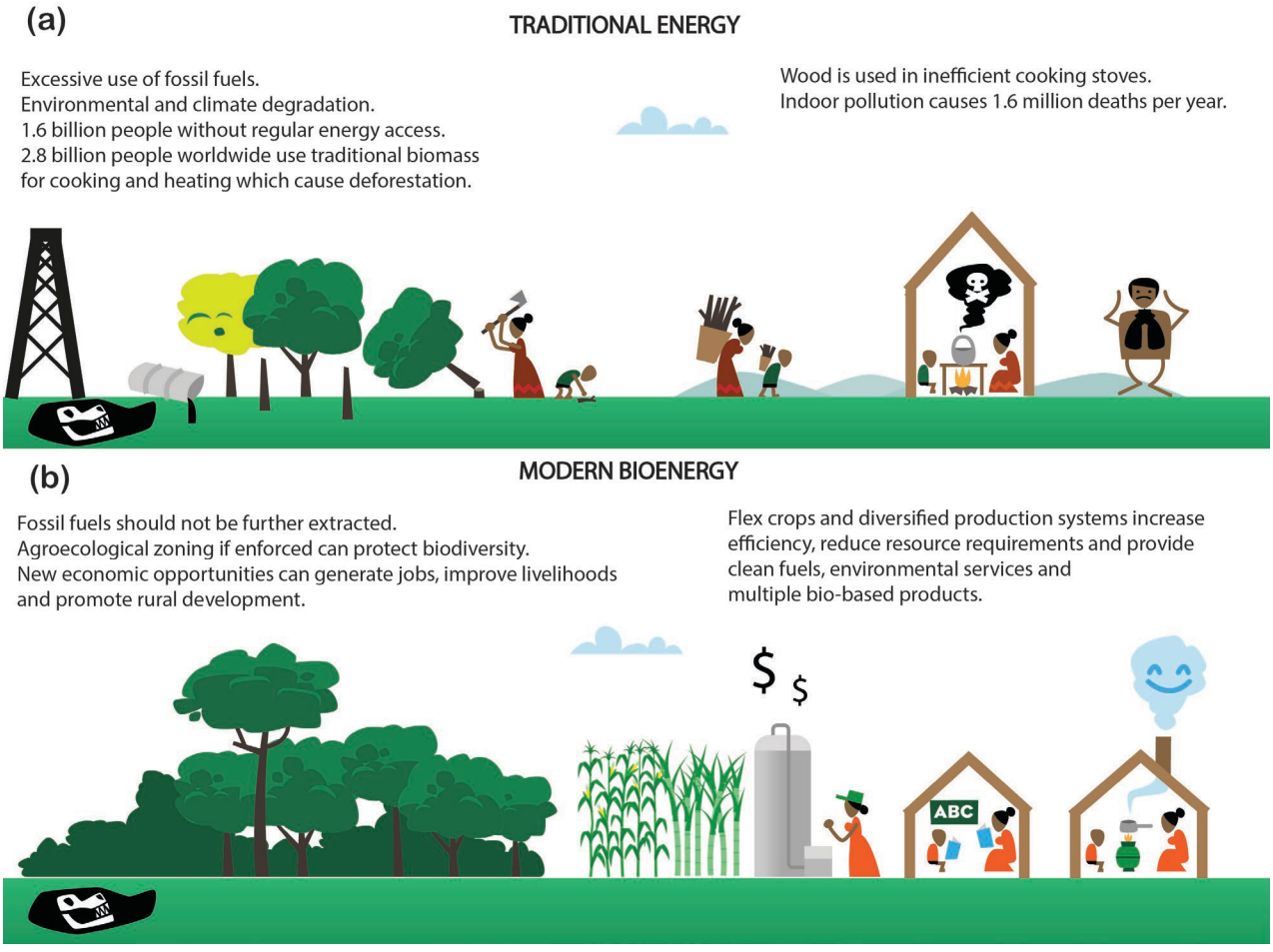
The meaning and interpretation of food security and sustainability are context-specific and change across both temporal and spatial scales in response to changing societal needs, economics, and technology. Many interactions arise among bioenergy, resource management, and food security (Figure). The 3-way nexus in the center of the Venn diagram illustrates the importance of factors such as governance, which includes political commitment and the institutional capacity to provide effective services and security under the rule of law. Government institutions provide "social safety nets" or create conditions that allow non-government organizations to fill this role and thereby help vulnerable populations cope in times of food crisis. These coping mechanisms become unavailable or inoperable when governance fails or is undermined by disaster or corruption.



Respect for peoples' rights to land and resources is interwoven with good governance and is a prerequisite for any project promoting sustainable production. Guidelines exist to take traditional land rights into consideration (e.g., FAO 2011; FAO 2020b) and, if properly applied, avoid problems such as the displacement of smallholder farmers by agro-industrial developments. Inclusive outsourcing can improve incomes and capacities for small landholders. Investments in infrastructure, technology, and diversified production systems also help people adapt to extreme events.

Bioenergy supports a transition from unhealthy traditional fuels to clean energy

Ways in which bioenergy can support food and fuel efficiency are illustrated below. Panel (a) shows how conventional systems rely of fossil fuels for 85% of primary energy, contributing to pollution and greenhouse gases (REN21, 2020). Most bioenergy today is still derived from inefficient traditional cooking systems that undermine health and welfare of 2.8 billion people, which is triple the number suffering from hunger, with negative impacts especially for women and children who collect fuel and are exposed to indoor smoke (WHO, 2015). In contrast, panel (b) shows how modern bioenergy can increase access and efficiency for fuel and food, while reducing rural poverty and food insecurity. Ethanol and biogas offer clean energy alternatives with health benefits for rural and urban populations. Less time collecting fuel and tending fires allows more time for education and other productive activities for women and children. (Figure adapted from Souza et al., 2015 by Kline et al. 2017).



Recommendations

The report's recommendations for ensuring synergies between food security and bioenergy include (1) engaging local stakeholders to design projects that effectively meet their needs, (2) identifying and encouraging flex-crops and other strategies that diversify and stabilize local markets, (3) applying good management practices and tools such as those provided by the Food and Agriculture Organization of the United Nations (FAO 2016, 2020b), (4) planning and implementing multiple-use landscapes that improve efficiency and minimize waste, (5) communicating clearly about specific goals, and (6) strengthening collaborations with existing development programs. For example, bioenergy sustainability initiatives sponsored by the U.S. Department of Energy include collaborations with the U.S. Department of Agriculture and private partners to apply landscape designs that can improve sustainability of using crop residues and energy crops as feedstocks for biofuels. Together these recommendations support progress toward a sustainable bio-based economy that supports enhanced food security.

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