Positive Dynamics

DANIEL DE LA TORRE UGARTE shows how sustainably produced bioenergy can contribute to a new energy paradigm that will alleviate poverty, combat climate change and enhance energy security

Biomass is receiving increased attention as a renewable substitute for fossil fuels. When developed sustainably and used efficiently, it has the potential to generate income, employment, and economic growth in developing countries. It can also help address environmental problems ranging from desertification to climate change and play a major role in economic development strategies.

Modern energy services – heat, electricity and transportation fuel – are essential for economic advancement and for breaking the cycle of poverty. The Kyoto Protocol's Clean Development Mechanism offers an additional economic incentive for developing bioenergy in developing countries. All this points to a new energy paradigm in which combating climate change and poverty alleviation are mutually supportive – and demand international policy coherence.

Greater prosperity

Bioenergy derived from sustainable agricultural practices enables developing countries to use their resources and attract the investment needed to accelerate sustainable development. The potential advantages are both environmental and economic. Environmental benefits include reducing greenhouse gases, improving soil productivity and helping degraded land to recover. The economic benefits will come from increased rural economic activities and greater prosperity resulting from improving access to energy services and enhancing their quality.

Brazilian experience – dating back to the Alcohol Programme of 1980 - shows it is possible to achieve sustainable and economic ethanol production. It is economically viable in Brazil, without any government support, at oil prices above US $35 per barrel. The experience, based on the use of sugarcane, is transferable to other countries.

Efficient distribution

The potential contribution of modern biomass to a new energy paradigm is significant indeed. The world consumes about 400 EJ (exajoules) of energy per year, generates the equivalent of about 100 EJ of largely unused crop residues annually, and could produce another 180 EJ from energy-dedicated grasses and trees. However, the size of bioenergy's ultimate contribution depends on the use of sustainable agricultural practices, land use consistent with the food needs of local and global populations, and technically and economically efficient distribution and conversion of feedstock into energy. Thus bioenergy should be viewed not as the replacement for fossil fuels, but as one element of a portfolio of renewable energy sources.

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Producing energy from biomass involves a range of technologies, including solid combustion, gasification, and fermentation. These produce liquid and gas fuels from a diverse set of biological resources – traditional crops (sugar cane, corn, oilseeds), crop residues and waste (corn stover, wheat straw, rice hulls, cotton waste), energy-dedicated crops ▶

(grasses and trees), dung, and the organic component of urban waste. The resulting bioenergy products provide multiple energy services: cooking fuel, heat, electricity and transportation fuels.

Economic development

This very diversity holds the potential of a win-win-win development path – for the environment, energy security, and social and economic development. Taking the opportunity requires coherent and mutually supportive environmental and economic policies to encourage the emergence of a globally dispersed bioenergy industry pursuing a path of sustainable development.

Bioenergy's potential to reduce global greenhouse gas emissions varies, depending both on the methods used to produce the feedstock and on the technology used to convert it. Ethanol produced in industrialized countries from corn, for example, may reduce life-cycle greenhouse gas emissions only by 10-30 per cent compared to oil, whereas ethanol produced from sugar cane or cellulose may cut them by 90 per cent or more. In both cases, greenhouse gas reductions increase dramatically with agricultural practices that enhance soil carbon sequestration and are less intensive in using petroleum-based fertilizers and fuel. This is especially significant for bioenergy-dedicated grasses and trees, as their production is characterized by a relatively low use of fertilizer and other petroleum-based products.

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Significant gains

Bioenergy brings other environmental benefits when high intensity agricultural techniques shift towards conserving and producing native perennial grasses. There can be significant gains in reducing erosion and the leaching of chemicals, and in improving water quality. Even countries that do not produce biofuels benefit, as improvements in air quality and reduced reliance on fossil fuels help everyone.

Access to energy services is clearly linked to development and to alleviating poverty. They are needed first to satisfy basic human needs – fuel for cooking and heating, energy for pumping water, and electricity for health and education services – and, secondly, to provide energy for income-generating activities that help break the poverty cycle.

Sustainable management

Moving from using traditional biofuels – direct burning of wood for cooking and heat – towards modern ones such as electricity and ethanol, can directly impact the quality of life of two billion people by improving indoor air quality, providing additional energy services for development, and allowing sustainable management of natural resource.

Diversifying energy resource is a key motivation for developing biofuels for many countries – but opportunities for rural development must also be a key priority. The benefits to rural development from a dynamic bioenergy sector begin with feedstock production. Agricultural production in many developing countries is labour-intensive, so more demand for agricultural products will increase employment and wages, while the additional income generated can have significant multiplier impacts when it is spent by the rural population.

Producing bioenergy dedicated crops and using residues from food and feed grains would both provide the foundation of a bioenergy industry and directly support and enhance the production of crops that increase food security. Satisfying needs for both food and energy could lead to more efficient use of land and rural resources when the way they complement each other is recognized.

Positive impacts

Construction and operating bioenergy production facilities – which have to be located in rural areas, close to where the feedstock is grown – will generate additional economic activity there. Transporting the feedstock to the plant and distributing the fuels produced will also benefit rural areas.

These positive impacts in the dynamics of the rural economy could substantially help to reduce the traditional exodus towards urban areas, helping to create the critical mass needed for investment in education, health, and other public infrastructure.

Thus biomass resources offer an opportunity for a win-win-win for energy, climate change, and poverty alleviation, so long as its feedstock is produced and used sustainably ■

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