



## The Need for Research on Modernised Biomass in the Global Energy Economy

by Robert H. Williams, Center for Energy and Environmental Studies, Princeton University, USA

The potential climate change and local air pollution benefits of some modernised bioenergy technologies, the possibilities that some modernised bioenergy technologies can compete with coal, and the potential contributions biomass energy can make in promoting rural development have led various groups to project major potential contributions to world energy from biomass energy in the future (Dessus, 1992; Johansson et al., 1993; Lashof and Tirpak, 1990; Kastler, 1994, WGII, 1996). Despite these prospective benefits, large-scale use of biomass for energy has been challenged on various grounds - especially competition with food production and the setting aside of land areas for natural habitat preservation.

The potential for land-use competition is a reflection of the fact that biomass production is an inefficient way to harness the sun's energy. While some modern biomass energy options have good prospective economics despite this inefficiency, its high land-use intensity implies that for biomass to become a major contributor to a modern energy economy, it will be necessary to overcome potential obstacles associated with competing uses for the land.

While preliminary scoping studies indicate that in many regions potential conflicts with food production could be minimised if agricultural production could be modernised, so doing requires increasing chemical and energy inputs to food production. In principle, low-cost biomass energy made available in rural areas could attract industry to rural areas that could generate the incomes needed to pay for the intensification of agricultural production. But how would this dynamic work in practice? And could agricultural expansion via intensification be made more environmentally desirable than expansion that involves putting more and more marginal lands into food production? The potential for conflict with land set-asides for preserving bio-

logical diversity has received less attention than the potential for conflict with agricultural production.

The potential for land-use competition, especially with food production and the setting aside of land areas for natural habitat for preservation, warrants more careful scrutiny on a region-by-region and country-by-country basis. Assessments are needed of the land use issues associated with biomass energy farms or plantations, giving attention to scale issues (e.g. what is the appropriate mix of large-scale plantations and small-scale farm forestry, given the socioeconomic-cultural context of the region?), and highlighting the key socioeconomic, cultural, and environmental issues that must be addressed to make plantation energy viable where it is feasible.

Deforested and otherwise degraded lands have been identified as promising candidates for establishing biomass plantations (Johansson et al. 1993). Broad-brush assessments indicate that degraded land areas suitable for reforestation in developing regions are large in aggregate.

But the potential for using such lands for energy plantations must be much better understood. Part of what is needed is a region-by-region assessment of degraded lands that might be considered for biomass energy plantations or energy farms - indicating total potential areas, prospective yields, distribution by sub-region and size of typical land plots, socioeconomic-cultural conditions, and key technical challenges that must be addressed. In addition to such assessments, field research is needed on a region-by-region basis to identify and develop technical strategies for restoring these lands to the point where they can be used productively and sustainably for biomass energy purposes.

Considering the large potential benefits relating to rural development, climate change, and local air pollution, together with the concerns that have been raised about large-scale development of modern-

ised energy (especially plantation-based biomass energy), a substantial research effort is called for to address these concerns. If such research activities could be launched in the near term, the issues involved could be much better understood before large-scale commitments to biomass plantation development were made.

There is time to do the needed research because modernised biomass energy industries will be launched largely via the use of residues over the course of the next decade or so, and because where natural gas is readily available, biomass energy will have difficulty competing until natural gas prices are much higher than at present. But this should not be reason to delay undertaking the needed studies. These biomass energy plantation assessments are needed in the near term in order to give prospective industrial developers a sense of the long-term market potential. The extent to which developers will consider the bioenergy option seriously depends sensitively on what they think the long-term markets will be. ■

### References

- B. Dessus, B. Devin, and F. Pharabod, 1992: World potential of renewable energies. La Hoille Blance, 1, 1-50.
- T. B. Johansson, H. Kelly, A. K. N. Reddy, and R. H. Williams, 1993: Renewable fuels and electricity for a growing world economy: defining and achieving the potential. In: *Renewable Energy: Sources for Fuels and Electricity* [T. B. Johansson, H. Kelly, A. K. N. Reddy, and R. H. Williams (eds.)]. Island Press, Washington, DC, pp. 1-71.
- P. Kastler, 1994: Energy for Development. Shell Selected Paper, Shell International Petroleum Company, London, England, November, 11 pp.
- D.A. Lashof, and D.A. Tirpak, 1990: Policy Options for Stabilizing Global Climate, appendices. Report to Congress from the Office of Policy, Planning and Evaluation, U.S. Environmental Protection Agency, Washington, DC.
- WG II (Working Group II: Impacts, Adaptation and Mitigation Options, Intergovernmental Panel on Climate Change), 1996: Chapter 19: Energy supply mitigation options. In: *Second Assessment Report of the Intergovernmental Panel on Climate Change* [Watson, R. T., M. C. Zinyowera, and R. H. Moss (eds.)]. Cambridge University Press, Cambridge, England, and New York, NY.