Extract from notes prepared by Primabio and Forestry Business Services (UK) Ltd for visitors to trial and associated sites in Kent in 2002/3

Biomass for renewable energy

The potential contribution by biomass to national renewable energy targets is widely recognised and is supported through several government schemes. The size of individual opportunities ranges enormously (one thousand-fold) in scale, from domestic and small-scale local heating schemes (typically 100-300 KW), through medium-scale heat/CHP, to large-scale power generation using 100% biomass or by co-firing wood with coal (10-50 MWe). Although each opportunity has its own feedstock quantity and quality profile, they all need to procure their feedstock at the lowest possible cost. For bigger schemes, absolute availability of feedstock and security of supply also become critical factors. A single, large biomass power plant would dominate the local market for biomass fuel.

Woods with low green moisture content and high basic density should be preferred for fuel because these characteristics translate into high calorific value per unit volume. Drying such wood will enhance the calorific value per unit volume still further. Woods with high energy density should also be preferred because of their positive impact on all volume–constrained operations in the fuel supply chain.

Why Hardwoods?

Most hardwoods are significantly better than softwoods in all the above respects, but there is limited recognition of this because attention tends to focus on the large resource of conifers in the UK.

The existing hardwood resource can certainly contribute to energy wood supplies in Britain, but it has not really been recognised that it constitutes a source of well-located, high quality fuel. In practice, more weight tends to be placed on its heterogeneity and the difficulties this presents for cost optimisation consistent with commercial harvesting and transport operations.

We contend that the qualities of hardwoods outweigh the perceived negatives and that much greater emphasis should be placed on exploiting both existing and purpose-grown trees as a fuel resource.

The requirement is for a well-designed examination of candidate hardwoods to measure and quantify those characteristics which contribute to fuelwood quality and cost. With this, project developers would have a source of accurate information which they can use in designing their projects and, in particular, which they can use to establish the relative cost-effectiveness of using hardwood fuel.

Growing Hardwoods Fast

Hardwoods other than poplar and willow (both low energy density species) are still regarded as slow growing in the UK. This means that species that may be very suitable as woodfuel they have not been considered as potential energy crops.

We contend that some hardwood species (both native and exotic) have the potential to grow rapidly in Britain, particularly on lowland farmland.

The international forest industry provides many indications of how correctly applied silviculture of the right type can produce outstanding growth of many hardwood species. It also shows that managing the trees as closely planted coppice is not necessarily the most cost-effective way of producing woodfuel.

However, the yield potential of most hardwood species in UK is unclear because they have never been grown on lowland sites with good quality silviculture. This needs to be examined.

We are proposing to investigate the energy crop potential of hardwoods through a series of trials that will test a range of species with silviculture designed to maximise the energy yield of the trees.

The impact of the Renewables Obligation

The Renewables Obligation came into force on 1st April 2002. Its key aspect is that it obliges generators in England and Wales to deliver a proportion of electricity generated from renewable resources, or pay a penalty. The implications of this are great: the UK currently generates 355 TWh of electricity and achieving the government's target of 10% of electricity from renewable resources by 2010 requires an installed renewables' generation capacity of 5.7 GW. If biomass is to feature as part of the solution to this challenge, a significant number of biomass-fired generating stations will be needed. What are the options for fuelling these?

Biomass fuel options for large-scale electricity generation

The key factors are cost, availability and security of supply, and quality of delivered feedstock. For large-scale users, the interaction of these factors, and their impact on the technologies used at the power stations, is complex and beyond the scope of this note. However, we believe some general statements are possible, and that these indicate some consequences and stimuli for possible change:

- Agricultural and forest residues appear attractive because cost of production is notionally zero. However, they have inherent harvesting, storage and transport costs, which can be significant. Quantities within economic haul distances are finite, and some (e.g., straw) have other, robust markets. Quality is not compatible with some power generation technologies.
- Storage of biomass fuels (consequent on seasonal production) is a cost. Deterioration in storage can also be a cost.
- All handling of biomass fuels incurs costs. Therefore multiple handling is undesirable.
- Road transport of biomass fuels is and will remain a major component of delivered cost. Economic haulage distances are and will remain modest.

There will be public and regulatory resistance to large-scale road haulage of biomass.

- Sea transport of biomass fuels is likely to be an attractive option, at least for power stations with docking facilities. This would expose the UK market to international competition with other European customers for biomass fuel, and UK suppliers to competition from fuel supplies from outside the UK.
- Biomass fuels of low density, including the energy crops currently supported in the UK, will be at a cost disadvantage in all operations that are volume-constrained. This will include all harvesting, handling and transport. Wood of high density (i.e., most hardwoods) has inherent advantages from these standpoints.
- Fuel customers will be interested primarily in delivered cost per oven-dry tonne, assuming other quality attributes are acceptable. Moisture content of delivered biomass should not be a major factor for large users - except insofar as this affects delivered costs/prices - because they will be able to use low-grade heat from power generation operations for drying.

Based on these factors, we suggest that any development of large-scale power generation from biomass will initially be based on wood transported by ship to coastal power stations, supplemented with locally-sourced wood and uncontaminated residues where this is economically competitive. The market preference is likely to be for hardwoods, primarily because of their delivered cost per oven-dry tonne. The international trade in pulpwood provides an analogous model. However, there will inevitably be concerns about longer-term prices and supplies of imported wood, and this will stimulate the development of domestic fuelwood resources within economic haul of wood-burning power plants and suitable ports. The mandated requirement (within the Renewables Obligation) to use a proportion of energy crops in many types of biomass power projects will be another stimulus to the development of domestic fuelwood resources.

The consequent challenge will be to develop suitable economic crop models for such sites, while providing social and environmental benefits and, where possible, other economic benefits for landowners.

We believe that hardwoods grown in UK using quality silviculture have great potential to provide such crop models. Many farmers and other landowners already recognise the opportunities such crops would present. The initial challenge is to gain government support for the technical and economic development of such models.