

ENERGY POLICY

THE LAND CONTRIBUTION TO RENEWABLE ENERGY

World oil prices show no sign of easing and public debate of energy topics intensifies as a major review of national energy policy approaches conclusion. Climate change and economic pressures combine to raise interest in renewable energy supplies. Attention turns increasingly to land-based sources for power, heat, and vehicle fuels.

What can the land deliver ?

Certainly more than it presently does. But what should be the contribution to our energy needs from our land, what are the implications - and how should government policy change?

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Briefings concentrate on the Policy Seminars which are the main business of the Society. The seminars provide opportunity for in depth debate of important issues relating to agriculture and land use, and wider food, farming and countryside policy.

Briefings provide RURAL supporters and others with coverage of the policy issues examined and debated under the Society's arrangements, and which help to inform both the policy development process and those close to and affected by it.

Briefing No 18 reports a debate on an important aspect of energy policy which is yet to receive the necessary public attention - namely what contribution to our energy bill should be made by our land resource. Given the importance of renewable sources and the potential of land, what policy framework is needed?

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ENERGY POLICY - THE LAND CONTRIBUTION TO RENEWABLE ENERGY

Introduction.

For almost a decade RURAL has received regular comment upon the lack of a policy framework that would ensure that land-sourced energy plays its full part in meeting the energy needs of the nation. Concurrently, the total supply of energy has become less certain and more fragmented: North Sea sources are diminishing, imports are rising, and nuclear generation is in decline. The current position is that demand for energy of all forms continues to rise and informed commentators are forecasting a deficiency of power energy supply in the medium term. All energy prices are rising, road transport fuels in particular remain close to peak prices with no realistic prospect of decline, and climate change factors press the case for more energy to be produced from renewable and low carbon sources.

This has been quantified in the Department of Trade and Industry targets requiring that 10% of electricity should come from renewable sources by 2010, with longer term targets of 15% in 2015 and 20% in 2020. These Renewable Obligation (RO) targets have a symmetry that appears to owe more to the political presentation of the need to address CO₂ reduction than to a critical analysis and calculation of the potential of sources for renewable energy production. In their 2004 Report the House of Lords Select Committee on Science and Technology questioned these projections.

As a result of this combination of factors Government has initiated a review of policy, invited public participation in the debate, and is shortly to publish its conclusions. The Prime Minister's pre-publication observation in a speech to the CBI that nuclear, renewables and energy efficiency are now back on the Agenda with a vengeance, drew much shrill comment on the subject of nuclear - but virtually no reporting or debate of renewables.

A variety of initiatives on renewables which relate to the land use community have been made in recent years. These have included the production of bio-fuels for vehicles, bio-mass from forestry and from short-rotation coppice (SRC) for burning in electricity generation plants, and, latterly, in small-scale combined heat and power (CHP) plants. However these initiatives have been spasmodic, fragmentary, very small scale, have sometimes failed, and at no point appeared part of a strategic energy policy.

Much of the initial activity has been entrepreneurial and based on the Non-Fossil Fuels Obligation (NFFO) and the RO. This position has now been modified slightly by the recent adoption of a Road Transport Fuels Obligation (RTFO). However the speed of all of these developments has been slow - whereas the need for solutions is now urgent.

An orthodox strategic approach to energy supply would quantify the need over time; analyse the various sources by costs, benefits, risks and potential; determine the proportions of supply from the sources; and then frame policies to facilitate production. Such an approach is particularly lacking in respect of the contribution to supply that land production could make. Whilst it is the case that the NFFO and the RO seek reduction of carbon dioxide emissions, this has not been matched with production targets for the contribution from land. For example some power companies are actively seeking to substitute coal with SRC or straw and/or miscanthus, but others are not. The recently announced RTFO has not yet translated into production targets or sourcing policy. The potential of land to deliver through a variety of energy crops such as oilseed rape, wheat, beet, SRC, forestry or miscanthus is huge. Uses of land other than for crops are also significant: for example wind energy, which is already proving controversial in some areas, and hydro which remains seriously under-used in the UK. Wind energy, arguably, provides an apt example of how not to proceed. Development is piecemeal, each site is subject to lengthy and often disputatious planning cycles, the process is driven by public subsidy (which is neither widely

understood nor widely publicised), and the product is attended by a wide range of risk and uncertainty of supply.

Cropping, potentially, offers more certainty and could, in an appropriate policy framework, operate more closely to real markets. Composting, which could provide a significant carbon sequestration solution, is also seriously under-exploited. Much material currently regarded as waste may have a market as fuel. However, that use releases carbon to atmosphere, so it may be better to return this material to land as compost and thus lock-in most of the carbon whilst also improving the land energy/fertility balance.

Any of the land based energy sourcing systems will have an environmental impact. This will be of at least two sorts; local and direct - eg mono-cropping, visual or development impact, and indirect - eg a positive contribution to CO₂ reduction. Again analysis is lacking. What are the energy balance equations? What, for example, is the balance from an equation which included the energy costs of production for SRC, wheat, beet, or wind turbines on one side and the energy and CO₂ benefits on the other. Such equations cannot ignore the opportunity costs. Land in SRC for twenty years, or forestry for longer, foregoes other production possibilities, as does land used for oilseed rape for biodiesel, or beet for ethanol. These may be a less good use of resources than simply buying biodiesel or bioethanol from a cheaper market.

These are hugely complex issues, but time is now beginning to press. Some projections suggest future biomass production on hundreds of thousands of hectares of land with considerable long term implications for land use. The issues for farming and the public extend far beyond those of 'alternative' crops. For example, a power station, once dependent upon several thousand hectares of near-locally-grown SRC or miscanthus or even straw, cannot easily or quickly substitute its raw material supply chain. A newly developed network of small-scale forestry-dependent local wood burning stations for power, or CHP, would also create new dependencies. Equally, large scale land use changes and production dependencies imply a potentially profound and inevitable mix of positive and negative wildlife, landscape and habitat effects.

As stated above, analysis is lacking; particularly regarding the use of the land resource. Energy policy is now near the top of the political agenda. An intense public debate is anticipated, and is unlikely to abate when the current Review concludes in mid 2006. Potentially, the implications for many land managers could be huge, as they could also be for the traditional view of large tracts of countryside.

Not to be ignored either are the socio-economic effects in rural areas. RURAL therefore convened this seminar to debate the key issues in this complex mix. What is required now is to raise awareness of the potential of land to contribute to the energy balance and to make proper assessments of the implications of the various land-based production streams that would be needed. Four essential questions arise:

1. What can we expect land to produce to meet our future energy bill?
2. How should sustainable exploitation be achieved?
3. How are the consequences for land and environmental practices to be managed?
4. How should be the role of policy and market activity be balanced?

The core of the policy debate.

This subject is complex, multidimensional and uncertain. It is impossible to encompass all these

uncertainties and their future ramifications at the outset. For example, climate change with its potentially diverse impacts may - or may not - take place at the levels being discussed. Fuel prices may - or may not - follow current trends and forecasts. Governments, however, will react; and policies will have real effects on the pattern of activity and the use of resources. This will happen regardless of the positions adopted by, for example, the pro and antagonists of nuclear and wind solutions.

A first question is what choices should we make about land use. The land cannot itself deliver self-sufficiency in fuel but it can contribute to energy security. The possibility that it can do more raises issues about what land uses are viable in the market, how society should balance energy and food products with non-marketable environmental public goods. Given these preferences what changes in land use should we seek, bearing in mind the raft of CAP and other policies already in effect?

Delivering preferred outcomes depends upon the interaction of markets and policy. A clear understanding of how market pressures are changing is a prerequisite. In the light of that it is important to recognise what policy can and what it cannot deliver. There is a diversity of policy instruments but a need to have some coherent strategy for their use. What seems to be lacking is the integrated overview needed to provide a basis for efficient policy intervention.

A vision outlined at the opening of this debate was for:-

“A consistent, coherent energy policy meeting emissions targets, in which the land is making its contribution through a number of potential sources - cost effectively, competitively, fairly, including delivering public goods, and assuring a satisfactory interface of agricultural, energy and environmental”

This highlights the underlying tension between delivering a coherent energy policy as such and achieving an overall coherence between other policies which emphasise the importance of the environment, of biodiversity, and of greater emphasis upon renewables as well as the other goals of agricultural policy, a vibrant and prosperous farming sector and vigorous rural communities. Governments have to make choices about what priorities they pursue in the light of the probable effectiveness, including the side effects of the policies they may use.

For producers of renewables and environmental guardians alike, the synergies matter. Renewables will have an environmental footprint; they will present new land uses, opportunities, and alternative markets. EU Renewables obligations support this - but they have to be managed with other EU measures such as the Water Framework Directive. Land managers will therefore have to adapt to markets as well as to policies concerning climate change and the use of renewables.

A powerful view expressed at the outset is that the debate is wrong-footed because of the absence of a proper array of carbon emission taxes. An enlightened set of taxes properly related to alternative means of production (eg wind, biogas, biodiesel, biomass, planting grants) would be the closest to an optimal policy route. Since this is not on the political/policy agenda is the choices left are sub-optimal. Already some poor examples and inconsistencies are emerging. For example, licence fees for moving biogas digestate and for biodiesel facilities and lack of consistency of planning decisions across the EU. The UK is already lagging behind other EU states in both technology and political will to move forward with incentives.

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Environmental footprint questions are raised in the mono-crop/biodiversity dilemma. Policy has its role to play but is not equipped with adequate metrics for biodiversity. There are no prices for, say, given bird or invertebrate populations, though they have a 'value'. So price and market 'competition' is not properly represented and decisions have a high emotional content. Similarly, wheat, our most common arable mono crop grown for food, has an emotional impact because of history, culture and perceptions of food security. The same crop grown to be burned in a heating plant or distilled in a bioenergy plant is likely to occupy a different place in the national psyche

Other environmental stresses arise simply from the nature and characteristics of land. Upland or lowland, the dry and sparsely forested East, the wet cool well forested North and West, catchments and basins, watercourses, downland, pasture and the broad arable acres; all present different combinations of opportunities and obstacles when considered as territories to expand the production of renewables. Certain obvious factors emerge. It makes no environmental sense to grow water dependant varieties on land already drought prone or irrigation dependent, or to put richly diverse sites into long term mono-crops. Choices are complex and optimal uses vary across small localities. Only the most general policy guides would be workable if satisfactory results are to be secured across the hugely varied landscapes and farmscapes of the UK.

The necessary expansion of renewables will therefore be dependent upon sensitivity and knowledge if it is to harmonise with other policy objectives; particularly work now going on now to secure much needed environmental enhancements in the farmed landscape. Two features bear most strongly upon this and featured repeatedly in the debate: the scale of operations in any given setting; and the means of "directing, informing, advising, guiding" land managers as they make their production and land use choices.

Concerns were expressed that the policy system does not hold the appropriate data. Much more needs to be done to ensure that scale and distribution of renewable production does not penalise biodiversity. Suggestions such as that 200,000 tons of miscanthus may be needed annually for power co-firing in South Wales, and up to 350,000 hectares for SRC and straw/miscanthus in Oxfordshire and Berkshire, raised fears about the impact on biodiversity. The idea that these goals could be secured by "direction" received a hostile reception - on the grounds of sheer impracticability and ignorance of real markets and business sustainability. However the need for information, and collective or co-operative choice in a given area, e.g. a watercourse, were thought necessary and desirable; and there was keenness to pursue best practice. Participants were insistent that neither national nor regional policy can successfully micro-manage the landscape for the multi-outcomes that are necessary

Doubt was expressed about what government could realistically do. It was argued that because interactions across agriculture, forestry, regional and local government, planning and energy policy are so many and so diffuse, the decision centre needed to be as close to the farm as possible. It was felt that the more localised the decision taking, the better would be the balance between conflicting choices. Indeed it was regarded as essential for reasons of consistency and stability, as well as the means of securing the involvement of all concerned in a landscape. Such decisions are also relevant to creating an economically viable mass for given products, for example biomass

production needed to be close to client heating plants; they are also relevant to the development of local rural or social capital. It was suggested, for example, that Wales would find it difficult to compete in commodity markets - but would be able to do so in smaller scale local added value settings such as small Combined Heat and Power plants (CHPs).

Participants were, with one notable exception, severely critical of the fitness of RDAs to carry out a useful co-ordinating or development function in the drive for greater use of renewables. This requires a marriage of interests of scale, landscape, planning, take-up of local CHP schemes, sustainable agricultural practice and social and rural capital. The experience was that RDAs had utterly failed to become a positive force in the process and they were believed to be ill-equipped to do so in the future. The exception was the North East of England. The RDA in that area had had positive inputs to make as a result of a long experience of the family of kindred petro-chemical industries and its interface with the wider industrial - including agricultural - and social communities

Producers were clear and unanimous in their need to know that policy, including that for biofuels, will remain consistent across Departments and regulatory areas. (An example of inconsistency is that the 5% biofuel inclusion in the Road Transport Fuels Obligation (RTFO) which is fixed in volume terms not of energy value - this adversely affects the incentive.) Equally clearly, participants stressed their wish for long term stability in the policy instruments, and the inconsistencies in present arrangements - for example ROCs having a greater life span than capital grant schemes and the RTFO.

However, it is recognised that markets too do not always deliver consistency, and whilst consistency and stability of policy are always demanded, the position on renewables is that no single option is enough. Any single instrument will be blunt. The RO, having placed most of the incentive in the capital intensive area, is a case in point. Support for renewables is a response to market failure and it is important to encourage a variety of approaches and be sufficiently flexible to find pathways for multiple technologies.

Thus far policy has not looked towards new crops, second generation biofuels, higher cellulose products or improved quality wheats and starches. These crops can *save* energy, and permit major step-changes in energy efficiency. Similarly, it was suggested that there are, hidden in the archives of major industry players, improved engine designs capable of dramatic vehicle fuel consumption improvements. For the companies concerned there is no incentive to bring these to market; indeed the reverse is the case

Most participants in the debate thought the rate of take-up and scale of new production was unlikely to be rapid or large. Although the latest government pronouncement is pro biomass, participants felt that the thrust would be toward small scale operations. The policy driver in the long term may be energy security - which would be tempered by markets - and, in any case, our national "energy obesity" would mean that a large part is yet to be played by energy efficiency measures.

The debate also noted the apparently perverse effects of the RO incentives. Some 80% of current biofuel is currently imported, and we have so far seen little movement in development of locally produced fuels of the future, for example faster growing species such as eucalyptus.

Turning to the wider and international underlying imperatives, participants noted that however much progress the UK made in reduction of Greenhouse Gas (GHG) / carbon emissions, its contribution to the world problem was minute. China, by contrast, is using 30 times the UK's total energy from coal alone, with the massive emissions load that entails.

How then, it was asked, could the UK's renewables policy be regarded as internationally compelling - since the benefits of it are so small. Some of the green pressure group pronouncements on what is achievable from land based renewables were said to be completely

unrealistic. The UK should not set itself up for a fall by believing these ideas. The answer lies in the success with which the UK develops excellent technologies and can demonstrate these credibly to the rest of the world and export this knowhow. Carbon-capture from coal might be the most significant such contribution. The principle of diffusing technology, however, is especially relevant to land-based renewables and crops, where the UK is still regarded as a world leader. Thus public 'good' as well as political clout is achieved on a global scale if excellence is developed, even if the scale is marginal in terms of world volume. UK expertise could be a force multiplier elsewhere in the world.

The debate was reminded repeatedly of the excellence of Scandinavian and Austrian examples in the areas of CHP, district heating and forestry use. These currently leave the UK far behind. It was argued that the UK's policy concentration on electric power generation had generally been a disservice to the development of a biomass industry. The debate catalogued a series of false starts and failures, notably in the SRC area. In contrast, many countries in continental Europe had been forward thinking with community-scale enterprises. However it was felt that widespread new take-up in the UK of renewables-fed local heating systems still faced a formidable hurdle unless incentives were offered in the form of ROCs or similar policies. Since these were at present ruled out it is left to a few local large installations, hospitals, government offices, industrial estates and the like, to lead the way.

Environmental drivers may pave the way in some areas. For example it is possible, in Wales, to envisage that moves to break up the 'green deserts' of 'improved' pasture could create space for renewables crops. The complementarity of these areas with the uplands is a factor. For example, it was claimed that the substitution of renewable crops for current livestock operations on topographically and environmentally suitable marginal improved pasture could, in some areas, result in an advantageous re-population of the hills and improved farming viability as well as an environmental gain to the land and the CO₂ / renewables equation. However the overall environmental picture is potentially very different. Estimates of up to 1 million hectares being required for bio mass have been made. This is the equivalent of 20% of the existing arable lands of the UK. A change of use would have major and potentially unwanted implications for water use and for the landscape.

The inclusion of Biomass in Entry and Higher Level Environmental Schemes was thought not useful. Renewables are not "one thing". Land has an important contribution to make; but this needs to be facilitated by balanced policies that enable an optimum pattern of use to evolve for any given area

The problems of trying to get the land to "do everything" were recognised. For example 'improvement' of land was sometimes needed to enable enterprises to remain viable. This may or may not enhance biodiversity in a particular locale. A shift to renewables production may promote or obstruct some environmental benefits. For example, substituting SRC for ryegrass might, in certain circumstances, be an environmental gain. Land types matter a great deal and underpin any efforts to use land to alter the carbon equation. What emerges as desirable is a mosaic-like picture based on what is possible. This requires enlightened, sensitive local management. For this purpose existing policy tools - countryside character and natural area maps, for example, are not sufficiently sensitive.

From a forestry viewpoint the current policy and strategy leadership from Whitehall is regarded as highly frustrating, and huge opportunities are being foregone. There is no incentive to growers from the RO. This, against a background that forestry could and should be a prime source for heat, as is demonstrated by European and Scandinavian experience. In the UK some 40% of power is needed for heat. The biodiversity argument against wider forestry planting has been greatly overstated; there has been insufficient Life Cycle Analysis of the value of crops and the conversion technologies. No attempt has been made to target incentives (for example some

species should not be grown in SE England because of high water demand). What is required is a “smarter” approach which overlays the planting strategy with other uses so that we achieve strategic placement of forestry crops and products.

This pursuit of efficiency should also apply to the strategy for the energy uses of grain and oilseeds. Grants for crushing plant are thought to be driving the oilseed element of the scene, but, for grain, the need is for large scale operations if we are to produce energy in non-wasteful ways and to see a real economic benefit. Scale is again important, and comparisons with developments in the USA and elsewhere reveal the UK to be falling behind. Other indications of scale are apparent. The grain tonnage to achieve the EU target for renewables is approximately equivalent to the current level of exports. Plans already exist in the UK for a substantial proportion of English grain to be subsumed into wheat/ethanol conversion. The USA is thought to be commissioning one plant each month. In due course this will see 35mt of maize - almost the equivalent of current exports - converted to ethanol. The UK's largest ethanol plant is thought to be the largest in the world but almost all of its feedstock is from imported oils. This highly complex market extends across Europe where plants are being developed in Croatia, Hungary and the Ukraine.

A cautionary note entered the debate at this point. It may not be wise to assume continuation of the current price levels and rates of economic growth. Nevertheless, for energy security and CO₂ reasons the UK's investment in biomass based renewables needs to be long term.

Water as a factor in production featured strongly in this debate - biomass and arable crops being water dependent. Wheat, for example, needs 18tons of water per ton of yield, and trade in these crops and indeed many food crops can be seen as a trade in water. The negative effects on water quality and resource consumption by biomass crops are well documented and understood. However, less well developed are ideas about using biomass in land margins to aid water protection. Even less well developed are opportunities for low-scale hydro schemes. An example quoted is of a successful moorland operation that supplies surplus current to the national grid to the value of £20k per year. Policy seems to have ignored such opportunities. These are surely capable of multiple replication on the many river catchments of the UK.

This is another example of the need for appropriate scale. Getting this right is important in a social and local setting but capable of an effect on a national scale if enabled to flourish. It is also yet another indicator that policy needs linkages to reach down to the producer on the ground in ways that “make a difference”. Perhaps the route for this is through existing schemes like Tir Gofal and networks such as FWAG and LEAF. These considerations raise the direct questions: Who is responsible for promotion - particularly for CHP or heat plants? Who will take the risks of leading expansion and exploitation?

What are we trying to achieve from the land?

From a national viewpoint, but in an international context, the UK has accepted a leadership role in relation to global climate change and the greenhouse gas (GHG) and energy debate. To that end, it has to be seen to be driving down its own greenhouse gas emissions in order to have credibility in the debate. It will exert even greater influence if it is able to offer examples of economically competitive technology and practice that will enable others, particularly rapidly developing countries such as China and India, to shorten their own time-scales in resolving emissions and energy efficiency problems. Land based systems have a significant role to play in this process, perhaps especially in the future in underdeveloped Africa. Innovations in land based energy therefore provide a politically and economically valuable proving ground, as well as a production arena.

GHG is therefore the major driver and within that carbon reduction is the major factor. Renewable energy from agriculture must therefore be about carbon, but at the same time must not

lose sight of methane reduction and other energy objectives. All of this is in the context the Sustainable Strategy for Farming and Food (SSFF). Energy security does not, alone, drive land based renewables policy - and neither does the SSFF.

The potential of land based energy is perceived as a win-win opportunity. Formerly, energy choices have been opportunistic and followed available markets; for example the 'dash for gas'. Renewable energy does not present such an opportunity for agriculture but it does offer new markets. At a time when agricultural businesses are under severe economic pressure, with many in decline, energy presents "an additional string for this already stressed bow." For government, the task is to facilitate the balancing of the public interest and those of the many stakeholders

The RO is perceived as a mechanism almost guaranteed not to secure the best outcome. It is held to have introduced confusion, the wider public is thought to see it, for example in the case of wind-power, as reasonable - a case of the DTI picking winners perhaps. However, although it provides a framework, it has not secured investor confidence. It ought to be possible to obtain a full 1% emissions benefit from agriculture but the prospects for that are not promising at present.

The importance of agriculture's ability to do something positive about carbon should be assessed objectively. In the post WW II world agriculture became totally committed to food production. This was its single minded goal for fifty years. We know the consequences of ignoring other dimensions to have been very negative. It is important to heed that lesson, and for policy and farm businesses not to become wholly locked-in to energy production and carbon management. Lessons from the "garden of a thousand flowers" philosophy and the knowledge that flexibility, local solutions, and the need for plurality of technologies and applications provide guidance for policy makers and promise the best results for the welfare of communities.

There is a need to measure the varied solutions now required of farming and forestry against a diversity of criteria. For example, to measure farming's emissions, its costs and energy inputs - as well as to focus on the desired outputs; space for wind, solar or hydro or ground heat installations, CHP, heat, biofuels, space to fix carbon, small-scale fuel and power operations. For policy the problem is to stimulate appropriate investment. This requires incentives, the availability of comparative advice and the ability to recognise and respond to market signals.

One present feature is lack of consistency leading to perverse incentives. The biofuels tax position is inconsistent within the EU, sewage sludge and biogas digestate has to be handled under licence, current definitions of wastes and fuels are at times an impediment. One area where land can make a huge impact is in the absorption of waste as compost. Much green compostable waste is already treated as such by local authorities, but much more, such as scrap wood and furniture and other carbon-rich or naturally derived material, is presently land filled. There are some half a million tons of wood arising from tree surgery and road and railway margin operations which are estimated to be 'lost' by failure to harvest for use. This material is useable as fuel, but that outlet is often obstructed by opponents of incineration, whether as a disposal route or as fuel for heat and/or power. Use as fuel returns carbon to atmosphere, so there are advantages in composting such material, returning it to land, and locking-in much of the carbon. The cycle is imperfect as the material slowly oxidises over time, but the land quality improvement which is known to result can reduce significantly the nitrogen required for given levels of fertility, and soil structure is improved.

Not enough is known about the extent to which this exploitation could succeed, and there are no incentives to commercialise the concept. The carbon contribution could be highly significant.

This illustrates the ideal policy which is that a coherent policy framework will achieve both savings of energy use and production of relatively more energy from renewable sources at higher levels of efficiency - it fits the vision above.

Biomass technology presents continuous improvement energy efficiency, rather than the once for all benefits of other techniques such as household insulation. Wood pellet-fired systems are now viable for use in small scale installations. Biomass can also displace existing power generation capacity through the use of mobile electricity generators that can be delivered to a site for installation or temporarily to supplement or back-up existing systems. Biofuels lend themselves to electricity generation in such settings. The development of such technologies for wider applications again depends on incentives. One solution might be to Band the RO.

There are huge benefits to be gained from using waste as part of a changing balance of land use and environmental benefit, if only farmers and others connected to the land and the wider population could be enthused. A key issue is convincing land users of the carbon message. To accommodate biomass and biofuels, land use change is implicit. There is much resistance to change but participants in the debate, whilst mindful of biodiversity, landscape, habitat, water quality and wider environmental responsibilities, believed that the arguments against change are “thin” and ignore experience. Land use has changed constantly over recent decades. Oilseed rape, maize, rotational pasture and the recent rapid expansion of farm woodlands to half a million hectares provide apt examples.

However well the carbon message is delivered and received, there is likely to be a problem in finding the estimated 1 m hectares by replacing existing crops. Land use changes could be very noticeable if marginal or near-marginal landscapes are impacted. The limitations are likely to be determined by a combination of economics and topography because of machinery limitations on slopes, rather than in soils and climate. The moist West, ideally suited for biomass production, is often very hilly. Scale once more enters the analysis; small operations might succeed where large ones could not, and might harmonise more easily with existing practices and communities.

It was suggested that biomass production could complement livestock operations by moving animals back into higher landscapes currently being vacated, thus arresting an adverse environmental trend. The application of such ideas is not confined to the high ground of the South West, Wales, Cumbria and Scotland. The seminar heard descriptions of similar dynamics in the Weald downland of Kent and Sussex. However, livestock operations will have to compete in a market that is expected to become increasingly competitive. The debate of these issues pointed again to the need to scrutinise land at the local level to determine what exactly will work where. The general view was that these movements will depend in part on reactions to CAP reform but predominantly on the way real markets behave.

How do we get from where we are to the envisaged position?

Renewable energy needs to be viewed from a land perspective, and embrace some of its characteristics: diversity, economic profitability, exportable products, and sustainable practices. Intervention in the related markets has proved very difficult and the outcomes have been perverse. The RO is not encouraging enough; it is unbanded, and apparently places too much capital risk on the entrepreneur. The RTFO, whilst positive in that it supports bio-diesel fuel, is expensive to administer.

The plea was made for *simple* policies, and for government to resist the temptation for the “laying-on of hands” – that is verbal blessing with no further action. In order to generate competition, the RO needs revision to include targets, say 10% for electricity for example, arbitrary though that may be, and differentials in favour of low carbon, per megawatt of power, security of supply and non-intermittent delivery. There is, too, a need for clarity. Confusion abounds in a framework where benefits are sometimes conflicting with incentives. The single message is that the policy instruments are not working. From a policy standpoint, it is necessary to establish what is new and different - so that the case for banding and differentials can be made more compelling.

This point illustrates the importance of the yield of systems. The UK needs to invest in research to improve technical performance, starting with the crops and their varieties, and in the means to deliver them. Most innovation arises as the result of entrepreneurial energy that is then marketed to users. How can we “do a Henry Ford”? This is not something for government but government needs to create an environment in which businesses are encouraged to invest in innovative systems and use them to adapt and respond to new demands and opportunities.

We are dealing with market failure. What is needed is for mechanisms that make price reflect public as well as private values. If this was the case, it was argued, the cash would flow. The UK has been singularly ineffective compared with many other European countries. Even now we are not making use of tried and tested profitable systems, and there is no imperative for efficiency. Energy price signals have been tied to fossil fuel prices and the RO prevents real price signals getting through. As a result wind turbines have expanded on the back of subsidies that offer prices that do not adequately capture the sum of the public and private costs and benefits.

A problem exists with research, innovation and public investment in near market commercially applied research. Since government withdrew from near market research some years ago, it has consistently been the case that publicly funded research and development in agriculture has not been taken to the point of application. Innovation generally comes into agriculture as ‘packages’ from outside industry - public research is not able to fund the ‘Henry Ford’ biomass boiler. However what is not sufficiently recognised is that the public benefit from research is through its use in technologies that implement it for use within the wider community. It is through this route that the community benefits.

The infancy of the UK land-based energy business scene is analogous to the organic production movement of a decade ago. That was given critical stimulus by the involvement of the large multiple retailers. The parallel for energy would be a step-change in the involvement of the international oil multiples, which could provide a major market impact. There is uncertainty about their likely moves or intentions. Most have taken positions that describe themselves as energy providers. Some land based businesses already active in the biofuel sector are slowly establishing satisfactory business arrangements with such companies. The problem for agriculture, as the business network develops, will be to negotiate terms in the long run that make production profitable for farmers.

The confidence required for the development of these businesses is impaired by the fact that, at present, there is no commitment to ethanol inclusion rates beyond 2010. This is badly needed. Equally, the taxation position requires careful handling to be set at just the right level to achieve a UK market response. It is important to avoid levels that encourage import substitution. It was noted that potentially adverse trends are emerging in the EU, with some States moving ‘back’ towards the UK position on ROs

The EU is providing an imperative for energy production without environmental damage but data is required. What seems to be needed is a mapping exercise that will analyse geographical factors, land use classification and energy production optimisation scenarios. This could enable the matching of incentives, policy stimuli and production aspirations. Related to this matching process, one important area of concern for the UK is forestry. This is an important source for increased biomass output but the incentives are lacking.

Participants identified a difficulty in encouraging take-up of community CHP schemes. It is not clear how local authorities and developers can link positively to identify communities where scope to exploit the technology exists or can be created. The RDA path mentioned in the Biomass Task Force recommendations and the positive Government response to that were noted, but scepticism remains. Some hope was expressed that local Planning offices could identify appropriate target communities.

Mention was made of knowledge gaps, of the public investment, of the incentive packages, and, importantly, of the public benefits. There was also a call for better access to the array of information on all aspects of land-based energy production. It was recognised that there is a great deal of information “out there” and participants noted the work of the National Non Food Crops Centre, Carbon Trust, the new Biomass Energy Centre and others. However a feeling of inaccessibility persisted, and useful sources seemed remote for those contemplating entry to the field. The production of renewables, it was said, was an area in need of extension services.

Conclusion.

This debate was joined by personalities from across the spectrum of leading edge experience and practice and academic, research opinion forming and policy development community in the land based renewables sector. The overwhelming impression is one of enthusiasm for the development of the sector, conviction that a nationally important and readily expandable resource is available to be tapped, and that policy is not yet “stepping up to the mark”. That said, the mood is that policy does not need to be heavily intrusive, and that, from relatively small incentives, simply applied with creativity and local sensitivity, huge potential across a range of technologies and products is available. The danger is that opportunities will be lost - when all the major imperatives point urgently in the opposite direction.

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Addendum.

Seminar participants were invited at the end of the debate to state in under one minute their most significant point or points from this debate. The following is a synopsis of those points.

1.1. We need to ensure systems are efficient in primary production sense - ie ratio of primary energy outputs to energy and land inputs. This boils down to crop and farm performance and minimal inputs. 1.2. R&D on production efficiency and creating opportunities and policy options is very pertinent - if we had not done that in the past, bioenergy from our land would not be an option now. 1.3. We really need to reduce the unit cost of small scale conversion technologies. So far, R&D has not been focused on that objective. There is the opportunity of linking the capital grants scheme to a managed effort to reduce unit costs through scaling up the production of key standard conversion technologies.

2. The real problem is that there are too many objectives for policy and too many solutions - power, heat, fuel, carbon, emissions, and price. We need to break these down and then identify solutions.

3. Extension services are crucially important to link the energy community with the land management body on the ground.

4.1. Greater emphasis on energy recovery from wood is needed - a heat target. 4.2 We need to identify the Net GHG per unit of public spend. 4.3 Much more needs to be done to enable farmers locally.

5.1 The subject needs to be seen organically - to take in the wider issues of sustainability and localised solutions.

6.1. We need to ensure that renewables policy is progressively simplified. 6.2. In the short term it needs to focus on the need for power, in the technical sense, that is energy delivered when it is needed, at the rate it is needed - a sense which is as relevant to transport fuels and heat as it is to electricity. Increasing energy prices in the conventional sector will then produce a diverse deployment of competing and competitive renewables which stands a chance of providing an economically compelling example to the developing world.

7.1. We have to close this "Henry Ford" gap - much more replication. 7.2 I wish I could believe that energy security issues will make a difference.

8. The whole process needs an environmental stamp.

9.1. The supply relationships, including with the large multiples need to be developed. 9.2. The policy needs and those of the real market need to be commensurate.

10. Energy efficiency needs to be pressed upon communities.

11. 1. On biofuels, more can be done. 11.2. Biomass for heat has to be viewed differently - this really is a new industry. 11.3. Markets are the key. 11.4. Scale is *so* important; a million hectares or more.....this has to be grasped.

12.1. We need the courage of our convictions to make decisions NOW - they really are needed NOW! Simple macro policy decisions that can be refined locally later. 12.2. Not the RDAs - they are hopeless.

13.1. We need diversity of options: biofuels are "nearly there" but bioenergy fuels from biomass are nowhere near. 13.2. Spatial issues need to be resolved - we have a disparate situation.

14. Public information needs to be improved - not all bio fuels are equally green, eg imports - in favour of farming and forestry options.

15. Consistency of policy is needed to enable the embryo biofuels industry to become established.

16.1. There are valid drivers for the sector apart from CO₂. 16.2. Environmental auditing will be necessary.

17.1. Investment in new methods, crops and capital equipment is badly needed and the feeling is the Government is NOT interested in this. 17.2. The Secretary of State needs to present energy delivery as an opportunity for farming.

18. 1. Farming wants to feel part of the real energy market. 18.2. Bio-refining is an important way ahead - there is no doubt about the value.

19. It is essential to develop a viable market for transport fuels.

20. This is a fascinating debate and its complexity is inescapable. The highest policy priority is global warming - and all else comes together with that. A coherent review or framework is needed - and within which measures are needed to enable farming to react and flourish.

21. We have to recognise the plurality of problems and solutions - so that we can optimise over

different timescales.

22. 1. It is a struggle to reconcile the energy and environmental objectives and exemplars are needed: at present we are making things more difficult.

23. Farming needs “more strings for its bow” - and badly needs encouragement.

24. Soil-carbon is an issue: we need to minimise emissions when growing the crops and we need to be sure we are growing the crops in the right places.

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