CAP REFORM CONSULTATION

Response from a broad coalition supporting short rotation coppice and the energy crops sector

Kevin Lindegaard, Director, Crops for Energy Ltd

27th November 2013

Crops for Energy
15 Sylvia Avenue, Knowle, Bristol BS3 5BX
Tel: +44 (0)117 9089057 Mobile: +44 (0)7989 333507

E-mail: kevin@crops4energy.co.uk
www.crops4energy.co.uk

Crops for Energy

This response is endorsed by the following organisations:

afbi Agri-Food and Biosciences Institute

University of Bath

Centre for Sustainable Energy

Carymoor Environmental Trust

CRL

Dorset County Council

IGGESUND HOLMEN GROUP

NFU

Murray Carter

REGRO

Renewable Energy Technology

rok wood

Roves Farm

rural development initiatives

StrawsonS energy

Turton Engineering

TV Bioenergy Coppice

Wiltshire Council
Where everybody matters

CAP REFORM CONSULTATION

Response from a broad coalition supporting short rotation coppice and the energy crops sector

Crops for Energy Ltd has almost 20 years' experience in the energy crops sector. We have sought to engage with likeminded individuals and organisations in order to respond to the CAP reform consultation and demonstrate the potential value of continued but more targeted support for the energy crops sector.

Our view is that woody energy crops in general and short rotation coppice (SRC) willow in particular are *multi-functional environmental crops* – they do much more than just produce an energy resource and could have a major economic and environmental impact. **Rather than being marginalised by the current CAP reforms these crops should be at the very centre of the next Rural Development Programme for England.**

We are particularly pleased to see the specific inclusion of SRC in the Ecological Focus Areas (EFA). We believe that SRC willow is an ideal crop to grow in EFAs and on other farmland for the following reasons:

- Use of woody biomass for both renewable electricity and renewable heat production can make a positive contribution to climate change targets and to the mitigation of greenhouse gas emissions and significantly reduce the cost of energy to individuals and businesses. SRC and other woody energy crops provide excellent land resource efficiency and a high energy return on investment.
- Increase in farm biodiversity: SRC plantations and their surrounds are thriving with wildlife. The crop provides habitats for a diverse community of birds, small mammals, flying insects, phytophagous insects, arthropod predators and soil micro-organisms. Many of these insects are predators and could be highly beneficial in controlling pests in adjacent food crops. At least 12 priority bird species with red or amber conservation status are frequently found in and around energy crop plantations.
- Improvements in water quality: Appropriately sited SRC plantations will intercept nitrate and phosphate run off from both diffuse and point sources, particularly if sited between the pollution origin and watercourses. Impressive results have been achieved with large scale water biofiltration from sewage treatment works and on a smaller scale from farm slurry storage and grey water sources.
- Flood defence: SRC planted on flood plains enhances sediment retention and delays the flow of flood water because of the very high number of stems per hectare. This effect is termed "hydraulic roughness". As a result, the peak flow is both delayed and significantly reduced, so diminishing the intensity of flood damage and allowing extra time to implement temporary flood protection measures downstream.
- Carbon sequestration: large amounts of carbon are stored in the soil due to the perennial nature of energy crops and their long duration which may exceed 25 years.
- Rebuilding bee and other pollinator populations. SRC willow coppice is unusual in providing crucial pollen and nectar sources during the late winter – early spring period when there are few other sources. Early pollen derived protein is key to building up insect population

numbers, which influences the level of pollination in both agricultural and wild plant populations later in the season.

- Improvement in local air quality: taller crops such as SRC filter airborne ammonia emissions from dairy, poultry and pig farms, landfills, sewage treatment works etc.
- Rehabilitation of contaminated land: the annual leaf litter return improves the soil structure and nutrient status of poor quality soils and greatly increases invertebrate populations.
- Control of soil erosion: SRC can stabilise fragile soils and reduce erosion on slopes and near watercourses.
- SRC could be used to build biosecurity barriers between farms to reduce the spread of livestock infections such as John's disease and bovine viral diarrhoea (BVD).
- SRC provides exceptionally rapid shelter belt of sufficient height to protect livestock, crops and properties, without dominating the landscape.

Other crop options can deliver some of these benefits but only SRC willow can provide this full package. The above applications are substantiated by international research carried out by respected universities, institutes and independent consultancies (see Annex 11).

It is important that planting of SRC in EFAs takes operational requirements into account. To be effective as an EFA measure the SRC needs to be vigorous and able to be mechanically harvested. The use of new improved willow varieties is essential as is access to herbicides and insecticides during the first two years of the crop's life.

Rural Development Funds should be targeted where they can have the maximum effect by offering multiple benefits. SRC willow is one of the few environmental crop options that also provide economic benefit through:

- Delivery of UK renewable energy targets under the EU Renewable Energy Directive
- Improving energy security and resilience of supply
- Delivery of significant greenhouse gas savings when used for power and heat applications
- Increasing rural employment opportunities
- Helping to reduce fuel poverty

Our analysis suggests that targeted planting of 20,000 hectares of energy crops plus the restoration of 75,000 hectares of undermanaged woodland could increase indigenous woodfuel stocks by 350,000 oven dry tonnes per year. On top of existing levels this would enable the UK to achieve almost 10% of the renewable heat target.

This aspiration could be achieved through several regional energy crops schemes (ECS) that are aimed at areas with specific needs. The Iggesund paperboard mill combined heat and power (CHP) plant in Cumbria, (in which £108 million has already been invested), is a project that is looking to commission locally grown SRC. The planting of 2,500 hectares of SRC could meet 10% of the plant's annual fuel demand. This would provide upland sheep farmers with a lucrative diversification option with the potential to increase their average gross margin from £159/hectare to £647/hectare.

Some areas of England (e.g. Cornwall, west Somerset, East Anglia, north Yorkshire and Cumbria have up to 60% of properties off the gas grid and therefore local people and businesses will be paying a high price for their heating fuel. Our modelled analysis suggests that a regional ECS could produce

£59 million revenue to farmers and contractors over 27 years and benefit local heat users by an average of £2.18 million per year.

The cost of a holistic regional ECS would be around £7.2 million or £2,870 per planted hectare. This is excellent value compared to trees planted under the English Woodland Grant Scheme (EWGS). The EWGS provides grant funding for 10-15 years with support ranging from £2,600 - £9,300 per planted hectare. In addition, it should be recognised that energy crops can make a rapid impact on renewable energy targets. By contrast, stands of trees planted over longer rotations will play no part in meeting our 2020 targets.

In order to maximise the benefits that energy crops can provide we need RDP funds to be made available for harvesting and processing machinery. This will help improve the economics of growing the crops, enhance the quality of woodfuel and open up more lucrative markets.

More detailed information and direct responses to the CAP reform consultation questions are outlined in the annexes below.

Annex 1: Ecological Focus Areas (EFAs)

We strongly support the inclusion of short rotation coppice (SRC) as an EFA option. The inclusion is justified by the wide range of environmental and social benefits that this crop can bring to farms and rural situations. These include:

- Rapid production of biomass fuel
- Increase in farm biodiversity
- Abundant supply of pollen and nectar for bees
- Flood mitigation
- Improvements in water quality
- Carbon sequestration
- Improvement in local air quality
- Rehabilitation of contaminated land
- Control of soil erosion
- Biosecurity barriers
- Shelterbelts and windbreaks

The coppice nature of SRC willow makes it a highly versatile crop. SRC also provides a habitat for a wide range of flora and fauna such as this Feathered Thorn caterpillar.

In addition, SRC can play a part in achieving several key national objectives such as

- Delivery of UK renewable energy targets under the EU Renewable Energy Directive
- Supporting energy security
- Delivery of significant greenhouse gas savings when used for power and heat applications,
- Increasing rural employment opportunities

It is important that planting SRC in EFAs is a practical option. It has been suggested that native species could be planted in linear strips, 10 metre wide without fertilizer or plant protection products. To be effective as an EFA measure the SRC needs to be vigorously growing coppiced trees. There are numerous high yielding SRC willow genotypes available which should be used as a mixture to provide diversity, disease resistance and high yield. Once established, SRC willow will normally require no input of chemicals for weed, insect or disease control. A well established crop will out-compete weeds and if weed control is necessary it can be carried out effectively using mechanical means. Planting genotypes mixtures is an effective disease and pest control strategy. We would however argue very strongly for the need to use chemicals (herbicides and insecticides) during the establishment process. Trials in Sweden indicate that when herbicides are not used during the establishment year 70% of the plants die and 95% of the biomass is lost. We would therefore seek permission to use appropriate chemicals at this establishment stage but say that no other chemicals will be used during the remaining 20 – 25 years of the plantations' life.

Replicated field trial showing the effect of chemical weed control on the establishment of SRC willow. The left plot (no chemicals applied) is dominated by thistles whilst the right hand side (herbicide treated) is a clean willow crop. (Swedish University of Agricultural Sciences, Alnarp)

A farm with 15 hectares of arable land may need 0.75 hectares of SRC as part of an EFA. If the crop was planted as a 10 m strip the farm would need a stretch of field 750 metres long. As EFA options are likely to be applied in small fields this approach would make it less economical to rabbit fence and harvest. We therefore suggest that blocks of SRC should be permitted.

We find it odd that the greening measures are limited to arable farms (**Q 14**). EFAs could be deployed in grassland areas in order to improve water quality, reduce erosion etc. We would encourage this practice in the future.

We hold the view that there should be a limited number of EFA options available and that these should add value to the farming landscape (**Q 15**). Some of the options listed seemingly allow the requirements to be met with little or no changes to farming practices. To be a proper greening measure there should be a discernible benefit to the environment – not a retention of the *status quo*. Planting SRC will provide such an improvement in most situations and should be encouraged.

Annex 2: Eco-system services offered by short rotation coppice

SRC willow planting should be encouraged under the new Environmental Land Management Scheme (ELMS) as this crop can provide a suite of ecosystem services which will enable multiple benefits from the same investment (**Q 29**).

Research suggests that SRC willow grown as part of a mixed farming system contributes positively to biodiversity[1,2] including farmland bird populations[3].

Pollen from male genotypes of SRC willow provides an important source of protein for breeding bee populations during the January to March period when other sources of pollen are very scarce (**Q 16**). The adult bees feed a mixture of pollen and nectar to their grubs but it is the protein content of the pollen that is essential for them to grow from an egg to an adult bee. When a colony expands in the spring the queen bee lays tens of thousands of eggs and there is a huge demand for pollen to feed the grubs. This can be in February or even earlier in mild years when temperatures exceed 12°C. Bees cannot store pollen in hives over winter so a profuse supply of SRC willow pollen could therefore play an important role in supporting bee populations and subsequently the pollination of food crops.

SRC provides an early and abundant source of nectar from female varieties (left) and pollen and nectar from male varieties (right).
(Images courtesy of Jason Ingram and Stig Larsson)

There are a number of willow breeding programmes in Europe. The selection of male genotypes has previously not been a main breeding objective. However, there is ample scope for male varieties to be made available that provide high biomass yields and abundant pollen. As SRC willow is planted in mixtures of up to 5 varieties it would be possible to tailor make a plantation with staggered flowering times so that the need for pollen could be serviced throughout the critical January to late March period.

[1] Rowe, R. et al. (2011) Potential benefits of commercial willow Short Rotation Coppice (SRC) for farm-scale plant and invertebrate communities in the agri-environment. *Biomass and Bioenergy*, 35, (1), 325-336.)
[2] Evaluating ecosystem processes in willow short rotation coppice bioenergy plantations. Rowe, R et al. (2013). *Global Change Biology Bioenergy*. Volume 5, Issue 3, pages 257–266, May 2013.
[3] Sage R. et al (2006) Birds in willow short-rotation coppice compared to other arable crops in central England and a review of bird census data from energy crops in the UK. *IBIS*. Volume 148, Issue Supplement s1, pages 184–197, March 2006

SRC willows could be planted as an EFA option adjacent to important crops (e.g. fruit and vegetables) which would benefit from the combination of shelter and increased pollinator activity, potentially leading to higher yields. Work carried out at Long Ashton Research Station in the 1970's suggests that yields of strawberries and French beans were increased by 50% and 25% respectively when protected by willow windbreaks[4]. This integrated approach to agriculture demonstrates how a fuel crop may be used to benefit a food crop.

SRC willow can have a positive impact on water quality. There is increasing concern about the negative effects of point source and diffuse pollution by nitrogen (N) and phosphorus (P) from farmland. AFBI in Northern Ireland has been running several trials at a range of sites in which municipal and /or industrial effluent has been applied to SRC willow. Even at highly elevated levels of N and P in the irrigation water there has been no evidence of increased levels in the groundwater or surface water associated with irrigation. The willow has been shown to act as a very effective biofilter for N and P. AFBI has also been carrying out research on the effectiveness of SRC willow in reducing surface runoff. While this work is ongoing it has demonstrated that SRC willow has great potential to be used as buffer strips or riparian strips which could intercept surface runoff and protect waterways.

The use of SRC willow and other coppiced trees is recognised as an option that can help alleviate the incidence of flooding[5]. This is achieved by their:

- Significant water use (willow coppice can use up to 1 million litres per tonne of dry matter produced per year)
- Greater "hydraulic roughness" which enhances sediment retention and slows down the flow of flood water thereby reducing the peak water flow downstream and increasing the time available for flood alleviation measures.

Using appropriately planted energy crops could therefore provide a low cost option for reducing the danger of flooding in areas that are too small to justify expensive flood defence measures. Such an initiative would be an example of climate change adaptation and provide a community based solution to a problem whilst also producing a crop of woodfuel for use in local buildings.

[4] Stott, K.G and Belcher A.R (1979) Living windbreaks: a review of work at Long Ashton. Report Long Ashton Research Station for 1978. 204-18.

[5] Woodland for Water: Woodland measures for meeting Water Framework Directive Objectives. Forest Research for the Forestry Commission and the Environment Agency. July 2011.
www.forestry.gov.uk/pdf/FRMG004_Woodland4Water.pdf/$file/FRMG004_Woodland4Water.pdf

Annex 3: Meeting future renewable energy targets

We are disappointed that supporting UK energy self-sufficiency by encouraging bioenergy crops was not more strongly stated in the list of priorities (**Q 20)**. There are significant opportunities for local development in off-gas areas, particularly for renewable heat applications. If SRC willow (and miscanthus) are encouraged in the right areas, they could deliver against a multitude of policy objectives for DECC, DEFRA and BIS such as:

- Retention of revenue in the local economy
- Increasing local jobs
- Reducing fuel poverty

The UK has to achieve EU targets for renewable heat, electricity and transport fuels by 2020 as part of the Renewable Energy Directive. Failure to achieve these targets could lead to heavy fines being imposed. The renewable heat target is the one that is most likely to be missed. However, continued support for the creation of local biomass supply chains, especially in off gas areas, will help reduce any shortfall.

There are a number of scenarios in relation to the 2020 RE targets.

1) The UK misses the renewable heat target and is forced to pay fines to the European Commission.
2) The UK achieves the renewable heat target through increased imports of woodfuel from North America and Europe.
3) The UK approaches and possibly achieves the renewable heat target through the use of home produced biomass with some imports.

In both of the first two scenarios revenue will leave the UK. However, with the third scenario more revenue is retained in the local economy, jobs are created, knowledge is gained and security of supply is maximised. Increasing locally produced woodfuel from energy crops and undermanaged woodlands should therefore be a very important aim of the current CAP reform and when combined with additional ecosystem services would provide substantial value for the UK tax payer (**Q 36**).

Our analysis suggests that targeted support through the RDPE could make it possible to achieve 9.5% of the 2020 renewable heat target from indigenous woodfuel from woodland and energy crops (Table 1). Unlike the aspirations for the previous Energy Crops Scheme this is achievable. This would increase the woodfuel output to 1,462,050 oven dry tonnes per year - a 32% increase on 2012 figures.

It should be noted that the latest Forestry Commission figures[6] for indigenous woodfuel production from softwood for 2011 saw a fall of 150,000 green tonnes compared to 2010. The Renewable Heat Incentive is already increasing demand for woodfuel and this will accelerate with zero carbon' Building Regulations standards. This combined with the huge popularity of wood-burning stoves will mean that very soon there is likely to be localised shortages of traditional forestry woodfuel. As a result of this shortfall there is a danger that the UK will rely disproportionately on biomass imports. Continued support of SRC and other energy crops is therefore integral if we are to stay on track to meet the 2020 targets sustainably from indigenous sources.

[6] http://www.forestry.gov.uk/website/forstats2012.nsf/0/824A4E0E2DDEDC858025731B00541EFF?open&RestrictToCategory=1

Table 1: Contribution of indigenous woodfuel to the UK Renewable Heat Target for 2020 (Does not include contribution from straw, waste wood)

Total renewable energy demand for 2020	223 TWh
Total renewable heat demand for 2020 (30% of target)	66.9 TWh

Current indigenous woodfuel	**Area (Hectares)**	**Green tonnes**	**Oven dry tonnes**	**Energy content (TWh)**
Softwood[7]	/	900,000	450,000	2.31
Hardwood[8]	/	400,000	200,000	1.03
Sawmill co-products[9]	/	593,000	296,500	1.52
UK Energy crops includes planned plantings[10] in 2013 and 2014	16,500	/	165,000	0.85
Total	/	/	**1,111,500**	**5.71**

Possible increase through CAP reform support	**Area (Hectares)**	**Green tonnes**	**Oven dry tonnes**	**Energy content (TWh)**
Bringing un-managed woodland back into management as part of Woodfuel WIG.	75,000	/	150,000	0.77
4 regional Energy Crops Schemes @ 2,500 hectares	10,000	/	100,000	0.51
SRC planting stimulated by greening measures (20% of arable land in England[11] is affected and 15% of farmers choose this greening option)	5,055	/	50,550	0.26
Planting of energy crops stimulated by RHI (non-grant funded)	5,000	/	50,000	0.26
Total	**95,055**	/	**350,550**	**1.80**

Total possible indigenous woodfuel used for heating in 2020	**1,462,050**	**7.51**
Delivered heating at an efficiency of 85%	/	**6.38**

% contribution to the heat target	**9.54%**

[7] http://www.forestry.gov.uk/website/forstats2012.nsf/0/824A4E0E2DDEDC858025731B00541EFF?open&RestrictToCategory=1
[8] http://www.forestry.gov.uk/website/forstats2012.nsf/0/187E23791CE53F068025735200491AFF?open&RestrictToCategory=1
[9] http://www.forestry.gov.uk/website/forstats2012.nsf/0/71E6F85F473E324480257321004EE20F?open&RestrictToCategory=1
[10] http://cdn.crops4energy.co.uk/wp-content/uploads/2013/08/Critical-appraisal-of-the-ECS-final-version.pdf
[11] https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/229803/structure-jun2013provcrops-eng-15aug13.pdf

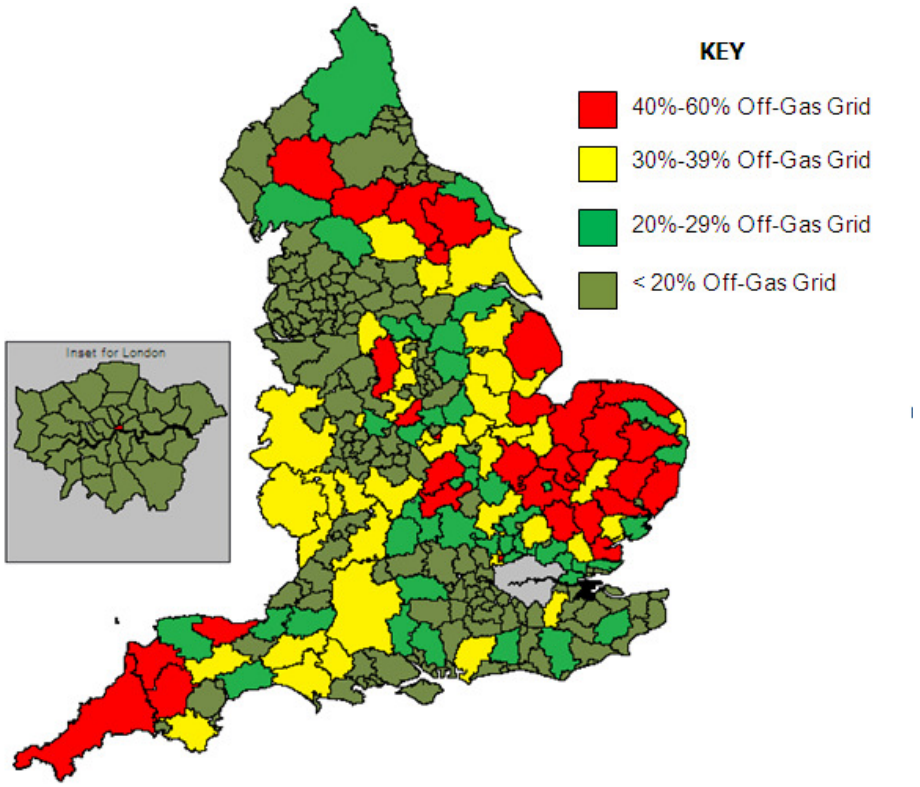
Our view is that planting 20,000 hectares by 2020 will create a vibrant sector that avoids the sort of boom and bust that occurred in the solar industry. Also, this will help create the economies of scale necessary to expand the industry towards playing a larger part in achieving 2030 and 2050 targets. Page 81 of the consultation document suggests that the Government intends to achieve 12% forestry cover by 2060 through planting an average of 5,000 hectares of woodland per year. (*Forestry and Woodland Policy Statement – January 2013*). We think that the Government should set a similar target of planting an average of 10,000 hectares per year of energy crops over the next 47 years. This would take the energy crops area up to 480,000 hectares and would mean that by 2060 woody energy crops alone would contribute 25.2 TWh of renewable energy (equivalent to 37.6% of the 2020 heat target).

Local woodfuel production should have overarching support from the RDP with tailored regional schemes. Local Enterprise Partnerships should be fully aware of the economic benefit that this can bring. Additional support should be provided by Local Action Groups with significant funds being made available through LEADER (**Q 41 & 42**). This programme has previously been a great help in encouraging farmers to create local food supply chains, and improve tourism opportunities. Local supply of woodfuel fits well into this ethos as it can provide multiple benefits to the rural economy through job creation and wealth retention. In addition, the opportunity to reduce off gas fuel bills should help lift people out of fuel poverty.

The production of indigenous woodfuel is a critical part of meeting future targets for renewable energy and carbon reduction. It will also enhance security of supply whilst increasing the revenue retained in local economies. We will not be able to achieve long term targets without energy crops. Supporting this sector at this point would enable economies of scale to be realised and help strengthen the industry (**Q 44**).

Annex 4: Regional Energy Crops scheme

We believe that responding to specific opportunities in a local area should be encouraged (**Q 32**). For instance, several areas of England are particularly poorly serviced by the gas grid and therefore rely on expensive alternatives for heating (e.g. oil, LPG, electric). Some areas such as Cornwall, the east of England, North Yorkshire and Cumbria have up to 60% of properties off the gas grid whilst areas of Somerset, Wiltshire and Dorset and the east Midlands have up to 40%. Regional energy crops schemes could help more farmers to link up with off grid properties and increase prosperity and rural jobs in these areas.



Map of off gas grid households by Local Authority area in England.
(Reference: Focal Research Green Agenda Analysis 2012[12])

In addition, there is a sound economic argument to support schemes where there are larger projects needing local fuel supply. For instance the Iggesund paperboard mill in Workington, Cumbria has a 50 MW combined heat and power plant which was completed in March 2013 at a cost of £108 million. This requires up to 500,000 tonnes of raw biomass per year. A regional ECS could help provide up to 10% of this fuel whilst also helping local sheep farmers to diversify a proportion of their farms into this more lucrative enterprise.

A proposed regional ECS should look to plant 2,500 hectares over 6 years. This is achievable and is based on a modest scaling up over the period from 2015 to 2020.

Year	2015	2016	2017	2018	2019	2020
Area (ha)	100	250	350	500	600	700

[12] http://analysis.focalresearch.co.uk/2012/green-agenda/analysis.php?s=which-local-authority-areas-have-the-most-households-off-gas-grid

We envisage a regional ECS being run by a small dedicated team located in the region that they are serving. The local knowledge of the officers involved will open up the possibility of targeting certain landowners so that SRC and other energy crop options are planted on the most appropriate sites i.e. "the right option in the right place to deliver the right outcomes" (**Q 29**).

Table 2 indicates the proposed costs of a regional ECS. The take up of energy crops in general and SRC in particular in England has been slow in the past. In order to overcome this barrier and ease cash flow in early years we propose a flat rate grant and interim payments in the first 4 years. In addition, for SRC planted in areas where there is a significant benefit to biodiversity or water we would propose an additional upfront contribution of £1,000. In order to make the scheme tightly managed and responsive to local needs we would also suggest an additional proportion of the budget for infrastructure support (e.g. planting machines and harvesters). Our proposed stimulus package would cost £2,870 per planted hectare

This is highly affordable compared to afforestation schemes offered by the Forestry Commission under the English Woodland Grant Scheme (EWGS). Our support package is more modest than virtually all the options under the EWGS. For instance, a new broadleaf woodland without additional contributions would currently cost a total of £7,300 per planted hectare on ex arable land and £3,700 per planted hectare in upland areas. The EWGS costs mentioned here do not include the administration of the scheme. Considering the agreements are 10-15 years long these are likely to be substantial. By contrast we have included this element into our support package. Hence, a regional ECS would demonstrate exceptional value for money (**Q 23**).

This is further demonstrated by the fact that every £1 of RDP investment will produce 320 kWh of energy over the lifetime of a plantation. This is equivalent to a cost to the public purse of 0.31 pence per kWh[13].

[13] Based on 1 hectare yielding 10 oven dry tonnes per hectare per year for 21 years. Calorific value of 5,140 kWh per tonne. Efficiency of heat production = 85%. Total delivered energy over the plantations lifetime of 22 years = 917,490 kWh. Government investment = £2,870/hectare.

Table 2: Proposed budget for a regional support scheme for Short Rotation Coppice

Duration of scheme	6 years
Area supported (hectares)	2500
Term of agreement with DEFRA	Up to 10 years

Elements of the scheme	**Notes**	**Cost**
Establishment grant	Flat rate establishment costs paying £1,250/ha	£3,125,000
Infrastructure grants	2 planters, 2 harvesters, 2 timber station - 75% grants	£750,000
Training and demonstration days	For contractors, consultants and farmers (2-3 courses/events per year)	£50,000
Enhanced payments	Up to 20% of plantings (500 ha) can get £1,000 one off payment for enhanced value e.g. water benefits, biodiversity	£500,000
Interim payments	£200 per ha per year for first four years to ease cash flow	£2,000,000
Administration of scheme	3 full time staff for 6 years	£750,000

Total cost of support scheme	**£7,175,000**

Cost per ha planted	**£2,870**

EWGS Comparison costs:
New broadleaf woodland delivering key priorities, planted on former arable land receiving a Woodland Creation Grant, £2000 additional contributions and 15 annual Farm Woodland Payments = **£9,300/ha**
New broadleaf woodland meeting UK Forestry Standard and delivering public benefits, planted on former arable land receiving a Woodland Creation Grant and 15 annual Farm Woodland Payments = **£7,300/ha**
New broadleaf woodland meeting UK Forestry Standard and delivering public benefits, planted on former unimproved land or land in the uplands receiving a Woodland Creation Grant and 15 annual Farm Woodland Payments = **£3,700/ha**

Annex 5: Potential economic outputs from regional support schemes

We have looked at the potential economic impact of regional energy crops schemes under two scenarios.

A regional scheme in Cumbria would supply fuel to the Iggesund paperboard mill CHP plant and provide farmers on marginal land with a potentially lucrative diversification option. Our analysis assumes medium SRC yields, market rates for woodfuel used in electricity production and replacement of sheep farming with a gross margin of £159/hectare[14]. The scheme would cost £7.2 million and over 27 years could increase local revenue to local farmers and contractors by £25.5 million[15] a 9.5% return on investment. On land used for SRC production the farmers' average gross margin would potentially rise to £647/hectare over the lifetime of the crop.

We have also investigated the economics of a regional ECS in a lowland area in which the predominant land use change was beef to SRC. In this case, rather than being sold for £80/odt the chip would enter local heat markets at £120/odt. As a result of this, local farmers and contractors would benefit by £59 million[16] over 27 years, a ROI of 26.8% from the £7.2 million grant invested. Farmers could see their average gross margin increase from £268/hectare (for autumn calving suckler cows) to an average of £1,109/hectare/yr.

In this situation, local heat users would also benefit by an average saving of £2.18[17] million per year over the lifetime of the 2,500 hectares planted. This is based on consumers (e.g. local hotels, golf clubs, schools etc.) paying 5p/kWh for woodfuel compared to 7p/kWh for oil. Overall, the local economy would be £107 million better off over 27 years - a 51.6% return on investment.

We predict that each regional ECS would lead to 24-29 full time jobs. This is based on two studies which suggest that either four jobs are created for each £1 million of capital invested[18] or 0.000945 full time posts are required to produce 1 oven dry tonne of SRC[19].

Our analysis suggests that the support of regional planting of energy crops could bring a significant boost to local economies and provide excellent value for UK taxpayers (**Q 23**).

[14] John Nix Farm Management Pocketbook. 43rd Edition. 2013.
[15] Farmer profit of £19.85 million. Profits to local contractors: £0.625 million for land preparation, £3.06 million for harvesting, £1.16 million for local haulage, £0.15 million construction of machinery & timber stations, £0.6 million staff costs, £0.05 million training provision
[16] Farmer profit of £53.38 million. Same contractor profits as above.
[17] Our assumptions for this are an average yield of 10 odt/ha/yr; Calorific value of oven dry wood = 5,140 kWh/tonne Average efficiency of boilers = 85%. Therefore 2,500 ha x 10 = 25000 odt/yr. At 5,140 kWh/tonne heat yield = 128,500,000 kWh. Delivered heat = 128,500, 000 kWh x 0.85 = 109,225,000 kWh. Annual expenditure on woodfuel = 109,225,000 x 0.05 = £5,461,250. Annual expenditure of oil would be= 109,225,000 x 0.07 = £7,645,750. Net saving = £2,184,500 per year
[18] Assumes four jobs per £1 million of capital expenditure. Originally based on the Bain study for the British Wind Energy Association (2008) suggesting four jobs per installed MW of onshore wind capacity. This was adjusted by ClimateChangeMatters to take account of small-scale community technologies generating more jobs. See: Let the People Invest at the following link: http://renewablematters.biz/available-reports.php
[19] Domestic energy crops; Potential and constraints review. Project 12-021. NNFCC for DECC. April 2012. www.decc.gov.uk/assets/decc/11/meeting-energy-demand/bio-energy/5138-domestic-energy-crops-potential-and-constraints-r.pdf

Table 3: Economic analysis of farm income: SRC replacing beef

Interest rates charged by your bank				
Positive Balance	2.00%			
Negative Balance	5.00%			
	Number/Unit		(£)	Total
Revenue				
Planting Grant (Flat rate)			£1,250	£1,250
Payment for enhanced measures e.g. biodiversity , water quality (0ne of payment of £1000 in year 1)			£1,000	£1,000
Interim energy crops payment (years 1-4)			£200	£200
	Yield		**Income**	
Yield in Year 4	25.2	tonnes	120	£3,024
Yield in Year 7	31.2	tonnes	122.5	£3,822
Yield in Year 10	31.2	tonnes	125	£3,900
Yield in Year 13	31.2	tonnes	127.5	£3,978
Yield in Year 16	31.2	tonnes	130	£4,056
Yield in Year 19	31.2	tonnes	132.5	£4,134
Yield in Year 22	31.2	tonnes	135	£4,212
Total	**212.4**			**£21,230**
Establishment				
Variable Costs				
Sprays			400	£400
Planting Material	15000	cuttings	0.06	£900
Nutrition (e.g. compost spreading)			20	£20
Gapping up			100	£100
Production Costs				
Cultivations			280	£280
Planting charge			300	£300
Cut back			45	£45
Vermin control i.e. rabbit fencing			600	£600
Total Establishment Costs				**£2,645**
On-Going Costs				
Harvesting: (harvests x harvest cost)	7		385	£2,695
Haulage of woodchip (per tonne)			10	£2,124
Processing of woodchip (per tonne)			10	£2,124
Nutrition (total between harvests)	6		20	£120
Total Costs Over 22 Years				**£7,063**

Cash flow Table (£/Ha)				
Year	**Costs**	**Revenue**	**Interest**	**Balance**
Year 1	£2,645.00	£2,450.00	-£9.75	-£195.00
Year 2	£0.00	£200.00	-£9.75	-£4.75
Year 3	£0.00	£200.00	-£0.24	£195.01
Year 4	£909.00	£3,224.00	£3.90	£2,513.91
Year 5	£0.00	£0.00	£50.28	£2,564.19
Year 6	£0.00	£0.00	£51.28	£2,615.47
Year 7	£1,029.00	£3,822.00	£52.31	£5,460.78
Year 8	£0.00	£0.00	£109.22	£5,570.00
Year 9	£0.00	£0.00	£111.40	£5,681.40
Year 10	£1,029.00	£3,900.00	£113.63	£8,666.03
Year 11	£0.00	£0.00	£173.32	£8,839.35

Year 12	£0.00	£0.00	£176.79	£9,016.14
Year 13	£1,029.00	£3,978.00	£180.32	£12,145.46
Year 14	£0.00	£0.00	£242.91	£12,388.37
Year 15	£0.00	£0.00	£247.77	£12,636.13
Year 16	£1,029.00	£4,056.00	£252.72	£15,915.86
Year 17	£0.00	£0.00	£318.32	£16,234.17
Year 18	£0.00	£0.00	£324.68	£16,558.86
Year 19	£1,029.00	£4,134.00	£331.18	£19,995.04
Year 20	£0.00	£0.00	£399.90	£20,394.94
Year 21	£0.00	£0.00	£407.90	£20,802.83
Year 22	£1,029.00	£4,212.00	£416.06	£24,401.89

Profit over 20 years	**£24,401.89**
Years	22
Av annual profit	**£1,109.18**

Comparison figures (John Nix 2013)

	Gross margin		
	Low	**Average**	**High**
Lowland suckler cows (spring calving)	/	£152	£413
Lowland suckler cows (autumn calving)	/	**£268**	£497

Annex 6: Renewable Heat Incentive

RDP schemes supporting the production of bioenergy need to evolve in harness with other key Government flagship policies such as the Renewable Heat Incentive (**Q 20**).

Ofgem who are responsible for delivering the RHI has recently introduced several measures (e.g. emissions controls, sustainability requirements) that if anything make it more difficult to grow and supply woody energy crops into local markets. There needs to be joined up thinking within Government departments (DEFRA, DECC) to ensure that sustainable production of bioenergy is encouraged, rather than thwarted by excessive bureaucracy. The new sustainability measures which require recipients of the RHI to source their fuel from an approved supplier will make it more likely that woodfuel will be imported from large scale woodfuel supply chains from the continent and North America.

Mechanisms that favour locally grown fuel need to be put in place so that farmers who wish to supply woodfuel to their local community can do this simply. We would encourage a relaxation to the sustainability guidelines for local suppliers (within 25 km of the end user) and an RHI tariff uplift which would stimulate end users to look locally for their woodfuel or engage local farmers to grow it on their behalf. This approach would fit in with LEADER which aims to deliver jobs and economic growth to rural areas (**Q 41**).

The biomass boiler at Dunham on Trent Primary School is supplied with SRC woodchip by Strawson's Energy. The SRC crop is situated at Manor House Farm, East Drayton less than 1 mile away. (Image courtesy of Farmers' Weekly)

Annex 7: Infrastructure requirements

RDP funds should be directed where they deliver practical results and economic benefits (**Q 35**). Energy crops infrastructure has not been well funded under previous schemes. As a result there are only a few SRC willow planting machines and harvesters in the whole of the UK.

- Planting machinery
    - Coppice Resources Ltd, Retford, Notts.
    - Murray Carter, North Yorks.
    - REGRO, East Yorks.
    - Turton Engineering, Hailsham, East Sussex

- For Harvesting
    - Coppice Resources Ltd, Retford, Notts. (Modified forage harvester producing chip)
    - Metcalfe's, North Yorks. (Modified forage harvester producing chip)
    - Phil Collins Contracting, Kington, Worcs. (Modified forage harvester producing chip)
    - Strawson's Energy, Retford, Notts. (Billet harvester)
    - Iggesund, Workington, Cumbria (Whole rod harvester)

Austoft harvester and 4-row step planter in operation.
(Images courtesy of Strawson's Energy, Northern Bioenergy)

It is impossible to build an industry without appropriate mechanisation. SRC is recognised as having a major role in helping the UK meet future renewable energy and carbon reduction targets. As a result targeted funds are needed in areas where the crop is well established e.g. Yorkshire, South of England, Northern Ireland and areas that are seeing an expansion in the area planted (Cumbria, South West). The planting of SRC as an EFA option will also increase the demand for locally available machinery.

With increased fuel costs, haulage is becoming prohibitively expensive. The cost of transporting a modified forage harvester and SRC header from Retford in Nottinghamshire to Taunton is around £400 in fuel alone for a return trip. Aside from the cost implications, employing outside contractors ensures that money leaves the region and the technical knowledge remains elsewhere.

For the SRC industry to develop and break the “chicken and egg” cycle there is an urgent need for targeted support for regional infrastructure. We feel a 75% grant is justified as it would be currently impossible to make a business case for bank lending as equipment utilisation rates are too low to justify capital investment on commercial grounds.

As well as planting and harvesting equipment there is a need for regional timber stations and processing facilities. It is extremely important that growers have ready access to local fixed or mobile equipment capable of drying and grading woodchips and producing pelleted fuels. Currently there are only two such facilities in England.

Premium quality woodfuel can be produced from SRC with mobile units.
Top left: Mobile woodchip grading facility developed by Regro removes dust and oversized particles
Bottom left: Koolfuel unit developed by Strawson’s Energy produces granulated wood chips.

The Farming, Forestry Improvement Scheme (FFIS) did not fund any equipment relating to energy crops. Similarly the third round of the Bioenergy Infrastructure Grant Scheme (BEIS) was shelved before funds could be allocated. Two bids had been made for SRC harvesting machinery that as a result did not receive funding. A targeted scheme is required to enable these gaps to be plugged. In our proposal for several regional energy crops schemes we have suggested a £750,000 budget which would provide funds for two planters, two harvesters and two timber stations. This would be adequate to manage the woodchip production from 2,500 hectares. Additional funding will be required if mobile milling and pelletising equipment is to be acquired.

We welcome the opportunity for a variety of funding mechanisms to be considered (Section 5.54). The opportunity to fund second hand items would enable existing machinery to be bought from other countries at a reasonable price (**Q 26**).

Annex 8: Opportunities for innovation

In recent years there has been a reduction in the amount of technology transfer from agricultural research organisations to farmers. The next round of the RDP should aim for greater integration between farmers and research institutions so the former can benefit from the latest innovations and academics can respond to the pressing requirements of farmers (**Q 39**).

There are various ongoing research and development projects both nationally such as the Supergen Bioenergy Hub[20] and the BBSRC Sustainable Bioenergy Centre (BSBEC)[21] and with European support such as ROKWOOD [22] and LogistEC[23] that could input directly into RDP funded bioenergy schemes.

ROKWOOD is a major European Union project with 20 partners from six countries (UK, Sweden, Germany, Spain, Poland and Ireland) which is attempting to understand the obstacles and barriers that face the woody energy crops sector and propose policy options that could help the industry gain momentum.

ROKWOOD is funded by the European Commission's Seventh Framework Programme (FP7) under the theme of 'Transnational cooperation between regional research-driven clusters'. Each of the six countries is represented by a regional cluster of organisations comprising a relevant research body, business entity and local authority. The UK's input is focussed on the South West of England. Crops for Energy Ltd are working alongside the Centre for Sustainable Energy and Dorset County Council.

The first phase of this project is now complete. This involved an in-depth and definitive regional analysis which attempted to answer the following questions:

- What's going on in the sector?
- Why aren't more farmers and land owners growing these crops?
- What is needed to get the sector moving?
- How can we access the support that is needed?

In early 2014 we will be working closely with industry representatives, key local stakeholders (Local Authorities, Local Enterprise Partnerships Local Action Groups), as well as local, regional and national policy makers to produce constructive and workable policy briefs for the woody crops sector both as part of CAP reform and through wider Government environmental, energy and climate change strategies. The ROKWOOD project therefore offers a highly innovative opportunity for the industry to provide direct input into the future direction of RDP schemes (**Q 40**).

[20] http://www.supergen-bioenergy.net/
[21] http://www.bbsrc.ac.uk/research/biotechnology-bioenergy/bsbec/bsbec-index.aspx
[22] http://www.rokwood.eu/
[23] http://www.logistecproject.eu/

Annex 9: Management of future RDP schemes

Future RDP supported schemes should be designed in such a way that they are flexible and if necessary enable changes to occur so that the budget is spent effectively (**Q 19**). The Energy Crops Scheme 2 had a budget of £47 million, but only £5 million of this will have been allocated by the time the programme ends. One minor change was implemented during the course of the scheme increasing the planting grant level from 40% to 50% of the upfront costs. Another change involved the reallocation of £10 million to create the Forestry Commission's Woodfuel Woodland Improvement Grant (Woodfuel WIG) which provided no support for the energy crops sector. Unfortunately, our view is that the ECS was not given a chance to succeed.

By contrast, the English Woodland Grant Scheme administered by the Forestry Commission underwent several tweaks throughout the life of the scheme to respond to new research outcomes and to encourage uptake and deliver against objectives. As a result the planned budget was spent in full.

Programmes need to be managed by organisations that are sympathetic to the objectives of the scheme, have the right process to administer and quickly assess eligibility as and when needed. Applicants to the ECS have been very critical of Natural England in its administration and facilitation of the scheme, citing delays in monitoring and approval procedures and processing of applications.

Any future scheme promoting energy crops should be based on scientific evidence and the organisation tasked with leading it should collaborate fully with the industry in order to make it a success. Furthermore, the performance of an awarding body should be judged on their ability to turn around applications in a set period (as is the case with Ofgem for RHI applications).

The ECS was too bureaucratic both in the application phase and in reclaiming the grant. Future support schemes should strive to reduce unnecessary paperwork and not duplicate efforts. A simpler flat rate grant (as was the case with the EWGS) would be much simpler and reduce form filling (**Q 24**).

Often there seems to be a great deal of scrutiny before grants are handed over but much less involvement thereafter. We would suggest that more of the checks should be carried out following an award to ensure that activities have been implemented to best practice standards. This would be more easily achievable through a localised targeted approach such as a regional ECS – an officer would be able to go out and visit several sites in one day because of their closer proximity (**Q 25**).

There needs to be more focus on evaluation of the grant aid that is delivered. For instance it would make sense to have an online map showing where grants have been provided and for what. Also, statistics should be analysed to make sure that a single area is not being overly supported with a high number of very similar projects. This would ensure that funds were shared more equally across a wider geographic area (**Q 23**).

A web-based platform dedicated to energy crops may be required to support the information-heavy needs of both interested parties, applicants and scheme participants, ideally with a dedicated 'help line' to resolve more complex queries. A national website could provide details for individual regional schemes and phone queries could be routed through to local staff (**Q 33**).

Support under the ECS 2 required the grower to have an end user contract in place at the time of planting or shortly after – this forced growers into taking what's on offer rather than developing their own more lucrative, local markets. Our view is that the necessity for an upfront contract stifles

innovation. The awarding body of new grant schemes should be given more power to deal with applications on a case by case basis. Applicants should be invited to offer evidence of the end use as part of the application form. This would provide the applicant with the opportunity to set out the aspiration they have for their crop. As SRC and miscanthus crops take 3-4 years to reach maturity growers should be given the full 5 years of the agreement to provide evidence that a boiler has been installed or a contract with an end user secured. Follow up checks will make sure that contracts for the crop are fulfilled (**Q 45**).

Our preference for the new Environmental Land Management Scheme would be indicative targeting but without hard boundaries (**Q 32**). Our view is that in order to derive the greatest multifunctionality (e.g. flood defence, erosion control, energy provision etc) from SRC that there would need to be some limited prescription. We would encourage additional grants for farmers planting these crops where they can benefit water and biodiversity most (**Q 28**).

Annexe 10: Case studies showcasing how RDP funds could help kick start the energy crops sector

1: Iggesund Paperboard Mill (Part of the Holmen Group)
This is a 50 MW combined heat and power plant based in Workington, Cumbria. The plant was completed in 2013 and cost £108 million. The plant requires 500,000 green tonnes of woodfuel per year and is currently offering a price of £70/oven dry tonne for SRC chip produced by local farmers. There is a growing local interest as this offers upland sheep farmers with a diversification option. However, the closure of ECS 2 in August 2013 came too early for this project which will result in revenue loss to the local economy.

How RDP funds could help:
A regional energy crops scheme would provide local farmers with the opportunity to diversify. Our analysis suggests that an holistic scheme costing £7.2 million could produce 10% of the annual requirements of the CHP plant and bring in £25.5 million to the local economy over 27 years. As a large area of SRC is envisaged there is need for locally available planting and harvesting provision. Also, mechanical weed control equipment would enable more marginal sites to be cultivated.


Left: Construction of the 50 MW biomass CHP plant (Image courtesy of Iggesund).
Right: The completed project with a local SRC crop.

2: TV Bioenergy Coppice
TV Bioenergy Coppice is a producer group of 9 SRC growers in Berkshire, Buckinghamshire, Oxfordshire northern Hampshire and Surrey. The original plans were to establish 1,000 hectares of SRC and sell the fuel to Slough Heat and Power (SLP). Unfortunately, the price offered to growers was very low and in many situations did not justify the harvesting of the crop. SLP closed down in 2013. Many of the crops are ready to be harvested but there is no local machinery to do this and few immediate markets for the fuel.

How RDP funds could help:
RDP funds could be used to provide a local harvester, grading facility and set up a timber station to amalgamate fuel and process it into a high quality woodchip. Additional funding could be used to help create local heat markets for the SRC produced. There are currently 96 hectares planted which could yield 1,370 tonnes of woodchip (30% moisture). This would be enough fuel for up to 7 secondary schools. RDP support would assist these growers and potentially attract other farmers in the Thames Valley to plant SRC.

3: Murray Carter
Murray Carter is a farming entrepreneur based in North Yorkshire with over 30 years' experience of growing SRC and breeding, testing and marketing improved willow varieties. Mr Carter was the driving force behind and one of the three sponsors of the European Willow Breeding Partnership based at the former Long Ashton Research Station. He currently owns the rights to multiply and sell all of the elite willow varieties produced from this venture.

How RDP funds could help:
If we are to meet our future renewable energy targets we will need to plant SRC in large volumes. The current maximum output from Ingerthorpe farm is 600 hectares of planting material per year. RDP funds could help expand the testing and production capability of the farm so that both UK market can be fully serviced and new European markets developed.

4: Regro
This is the UK's largest SRC producer group with 40 members and a combined area of 650 hectares. The group covers growers in Yorkshire and the east Midlands and was formed as a result of the closure of the Arbre bioenergy plant. RDP funds were used to help set up the group and buy planting, harvesting and processing equipment. The main market for the crop is DRAX power station. The area of SRC has not increased in recent years as a result of poor financial returns from the crop. Earlier this year the groups Austoft harvester caught fire and was written off leaving members with fewer local options for harvesting their crops.

How RDP funds could help:
RDP funds could be used to provide a replacement harvester and to help create local value added heat markets for the SRC produced. In many rural parts of north Yorkshire and the east Midlands up to 60% of properties are off the gas grid. RDP could help the group redirect its efforts into selling woodchip into smaller, more lucrative heat markets. If existing growers could be shown to be making more out of their SRC then others would also enter the market.

5: Roves Farm
Roves Farm in Wiltshire has around 50 hectares of SRC and is the largest grower in southern England. The crops were originally planted to supply the proposed Ambient Energy power plant which failed to get planning permission. In the wake of this, farmer Rupert Burr tried to set up a small scale dedicated biomass power plant in which the waste heat would be used to dry SRC willow chip and forestry residues. The processed fuel would then be sold into local heating and co- firing markets. Unfortunately, the project could not get "buy in" from Didcot Power Station operated by RWE and the project faltered. As a result of these two failed projects much of the SRC has grown beyond its rotation length and now is difficult to harvest conventionally. A grant from the Bioenergy Infrastructure Scheme (BEIS) has helped to purchase some essential equipment to process the crop but much of it remains an untapped resource. The farm is very near to a major industrial complex which includes the Honda car factory.

How RDP funds could help:
RDP funds could be used to bring back the SRC into full management and create local heat markets for SRC in Swindon and Wiltshire.

6: Miscanthus in the SW
Energy Crops Scheme planting records suggests that there are around 274 hectares of miscanthus within a 15 mile radius of Taunton town centre. The yield from these crops could potentially provide enough energy to heat an equivalent of 22 large secondary schools with swimming pools. Unfortunately, much of this biomass resource is currently without an energy market. Some

miscanthus is being sold to a local manufacturer of horse bedding whilst other growers are transporting bales to Cambridgeshire where it is converted to pellets before going on to Drax in Yorkshire. There has been little activity in to trying to create heat markets for these fuels and without local outlets and an attractive price for the crop, growers will lose interest and a valuable fuel resource will be lost.

How RDP funds could help:
One of the main issues with miscanthus is that it has a low bulk density and is expensive to transport. RDP funds could be used to set up a processing facility which could be used to densify the crop into pellets or briquettes. This would reduce the volume of the crop by up to 6 times and greatly increase its value, opening up markets for small scale heat production (in compliant boilers) across the SW. Up to 60% of properties in neighbouring west Somerset are off the gas grid.

7) Umberleigh Barton Farm
Jonathan Andrew is a partner in Umberleigh Barton Farm in Devon. In 2012, he installed a 130 kW biomass boiler to heat the farm house and four other properties as part of a district heating scheme. A proportion of the fuel demand will in future be provided by 4 hectares of SRC grown on the farm.

He says "I think the regional based approach you put forward is a model which could work. Now that our system is up and running it has strengthened my thinking that we and as many biomass users as possible should aim to be self-sufficient with our chip production or have much improved access to woodchip. Otherwise we remain reliant on deliveries and price rises from third parties who are scarcer in number than oil suppliers. Potentially this creates problems at vulnerable times of year when the need is greatest i.e. winter! I think the regional system would certainly improve availability of machinery and indeed if our trial of 10 acres is successful and machinery does become available locally we might be persuaded to plant further areas for supply to other local biomass users, subject to demand."

How RDP funds could help:
Currently there is no provision for harvesting this crop in the SW. As a result the SRC will be planted at wider spacings so that in the worst case scenario it can be harvested manually by chain saw. However, the hope is that by the time the crop will be harvested for the first time in 2017/2018 the RDP will have helped fund a locally available machine.

Annexe 11: Scientific studies, papers and reports that support the beneficial attributes of short rotation coppice

Biodiversity benefits

- Birds in willow short-rotation coppice compared to other arable crops in central England and a review of bird census data from energy crops in the UK
- Potential benefits of commercial willow Short Rotation Coppice (SRC) for farm-scale plant and invertebrate communities in the agri-environment
- Evaluating ecosystem processes in willow short rotation coppice bioenergy plantations.
- ARBRE Monitoring – Ecology of short rotation coppice: Four year study involving wildlife monitoring of commercial SRC plantations planted on arable land and arable control plots
- The effects on flora and fauna of converting grassland to short rotation coppice Four year study involving wildlife monitoring of commercial SRC plantations planted on grassland and grassland control plots
- Willow short rotation coppice commercially grown on agricultural land in Sweden – possibilities for improvement of biodiversity and landscape design.
- Willow as a diverse habitat benefiting pollinating insects in early spring
- Campaign for the Framed Environment: Consider enhanced management of willow

Potential for scaling up energy crop areas

- Estimating the supply of biomass from short-rotation coppice in England, given social, economic and environmental constraints to land availability
- 2050 Pathways Analysis
- EU bioenergy potential from a resource efficiency perspective
- UK Bioenergy Strategy 2011
- Biomass Task Force
- Why we need energy crops in the south west
- Why we need an energy crops scheme 3

Multifunctional uses

- Woodland for Water: Woodland measures for meeting Water Framework Directive objectives (biofiltration and flood defence)
- Willows beyond wetlands: Uses of *Salix* L. species for environmental projects (land reclamation, bioengineering, erosion control
- Purification function of Short Rotation Willow Coppice (biofiltration and phytoremediation)
- Growing Poplar and Willow Trees on Farms (willow and poplar as fodder for livestock)
- The practical use of short rotation coppice in land restoration
- The potential of SRC willow to reduce carbon emissions
- Growing returns: the role of land-use change in influencing GHG emissions

Social, Economic and Environmental Implications of Increasing Rural Land Use under Energy Crops

- Public opinion on energy crops in the landscape : considerations for the expansion of renewable energy from biomass
- Land use implications of increased biomass production identified by GIS-based suitability and yield mapping for Miscanthus in England
- A novel, integrated approach to assessing social, economic and environmental implications of changing rural land-use : a case study of perennial biomass crops
- Assessing the social, environmental and economic impacts of increasing rural land use under energy crops

Other impacts of energy crops

- Food vs. fuel: the use of land for lignocellulosic 'next generation' energy crops that minimize competition with primary food production
- Identifying potential environmental impacts of large-scale deployment of dedicated bioenergy crops in the UK
- Bioenergy: Environmental Impact and Best Practice
- Biomass: Carbon sink or carbon sinner?
- Effects of short rotation coppice with willows and poplar on soil ecology
- Bioenergy with Carbon Capture and Storage (BECCS) for Electricity: Land-use tensions
- Miscanthus, short-rotation coppice and the historic environment

Other publications

- Genetic Improvement of Willow for Bioenergy and Biofuels

Annexe 12: Contact details of people and organisations involved in this response

Neil Watkins
Alternative Fuels Manager
IGGESUND
Workington
Cumbria
CA14 1JX

Tel: 07780 480695
Email: neil.watkins@iggesund.com
Web: www.iggesund.com

Murray Carter
Ingerthorpe Hall Farm
Markington
Near Harrogate
North Yorkshire HG3 3PD

Tel: 01765 677887
Email: mmcarter@murraycarter.co.uk

Keith Richards
TV Bioenergy Coppice Ltd
Liberty House
New Greenham Park
Newbury
RG19 6HS

Tel: 01635 817420
Email: coppice@tvenergy.org
Web: www.tvbioenergy-coppice.co.uk

Chris Johnston (Environment and Renewable Energy Centre) & Alistair McCracken (Sustainable Agri-Food Sciences Division)
AFBI
Loughgall
Manor House
Loughgall
Armagh BT61 8JB
Tel: 0289 2681540
Email: chris.johnston@afbini.gov.uk
alistair.mccracken@afbini.gov.uk
Web: www.afbini.gov.uk

John Strawson
Strawson's Energy
Manor Business Park
East Drayton
Retford
Notts
DN22 0LG

Tel: 01777 248749
Email: john@strawsons.co.uk
Web: www.strawsonsenergy.com

Gareth Gaunt
Renewable Energy Growers Ltd
Eagle Farm,
Yokefleet,
Goole,
East Riding of Yorkshire,
DN14 7XY

Tel: 01430 441542
Email: info@energycrop.co.uk
Web: www.energycrop.co.uk

John Turton
J Turton Engineering Ltd
Woodpeckers
Coldharbour Road
Upper Dicker
Hailsham
East Sussex
BN27 3PZ

Tel: 01323 843819
Email: jt@turtonengineering.com
Web: www.turtonengineering.com

Dr Paul Adams
Sustainable Energy Research Team
4 East 3.3
Dept. Mechanical Engineering
University of Bath
Bath BA2 7AY

Tel: 01225 388388
Email: P.W.R.Adams@bath.ac.uk
Web: http://people.bath.ac.uk/pwra20/

Kate Hall (Sustainability Manager) & Pete West (Renewable Energy Development Officer)
Dorset County Council
County Hall
Colliton Park
Dorchester DT1 1XJ

Tel: 01305 228530
Email: K.M.Hall@dorsetcc.gov.uk
P.West@dorsetcc.gov.uk
Web: www.dorsetforyou.com

Alastair Shankland
Biomass Supply Chain Project Officer
Wiltshire Council
County Hall
Trowbridge
Wiltshire BA14 8JN

Tel: 01225 713811
Email: alastair.shankland@wiltshire.gov.uk
Web: www.wiltshire.gov.uk

Dr. Jonathan Scurlock
Chief Adviser, Renewable Energy and Climate Change
National Farmers' Union
c/o Agriculture House
Stoneleigh Park
Stoneleigh
Warwickshire CV8 2TZ

Tel. 024 7685 8568
Email: jonathan.scurlock@nfu.org.uk

Will Richardson
Director
Rural Development Initiatives Ltd.
Unit 9, Sycamore Business Park
Copt Hewick
Ripon
North Yorkshire HG4 5DF

Tel: 01765 609355
Email: will.richardson@ruraldevelopment.org.uk
Web: www.ruraldevelopment.org.uk

Rupert Farthing
Chief Executive
Carymoor Environmental Trust
Dimmer Lane
Castle Cary
Somerset
BA7 7NR

Tel: 01963 350143
Email: rupert.farthing@carymoor.org.uk
Web: www.carymoor.org.uk

Martin Holley
Senior Technical Project Manager - Research & Analysis
Centre for Sustainable Energy
3 St Peter's Court
Bedminster Parade
Bristol BS3 4AQ

Tel: 0117 9341419
Email: martin.holley@cse.org.uk
Web: www.cse.org.uk

Rupert Burr
Roves Farm
Sevenhampton
Swindon
Wiltshire SN6 7QG

Tel: 01793 763939
Email: info@rovesfarm.co.uk
Web: www.rovesfarm.co.uk

Johnathan Andrew
Partner
Umberleigh Barton Farm
Umberleigh House
Devon, EX37 9DX

Andrew Jolly
Renewable Energy Technology Limited
Suite 12B
Blackburn Business Centre
Davyfield Road
Blackburn
Lancashire BB1 2QY

Tel: 01254 680486
Email: andrew@renewable-energy-technology.co.uk
Web: www.renewable-energy-technology.co.uk

Mark Paulson
Coppice Resources Ltd
Sutton Grange
Sutton-cum-Lound
Retford
Notts. DN22 8SB

Tel: 01777 816265
Email: info@coppiceresources.co.uk
Web: www.coppiceresources.co.uk