# Rokwood

## Resource efficient production and utilization of woody biomass from SRPs

## European Best Practice and Key Findings

Rokwood partners at training workshop, Kingston Maurward College, Dorset (May 2015)

## Contents



www.rokwood.eu

**Rokwood is an ambitious three-year, six-country study which aims to make the regionallybased production of woody biomass economically attractive, technically feasible and environmentally sustainable.**

**Funded by the European Commission, Rokwood focusses on researching the development, implementation, monitoring and utilisation of woody crops grown in short rotation plantations (SRPs).**

The main objectives of the project include:

1. Creation of an overview of the main obstacles and barriers hindering the development of local biomass regions in Europe
2. Generation of at least 10 innovative co-operative project ideas tackling the technical barriers(e.g. harvesting, drying technologies)
3. Identification of financial resources for the development of innovative products and services in this sector
4. Reaching a maximum number of stakeholders by effective dissemination activities

# Introduction

Biomass is increasingly being seen as an important energy source for Europe. In 2009, the European Commission set binding targets for renewable energy: a 20% share of renewable energy in the European Union's overall energy mix shall be reached by 2020. In order to achieve this, a possible strategy suggested by the Commission is to triple the use of biomass energy compared with 1997. The greatest growth potentials for bioenergy (up to 50%) were identified in wood and agro-biomass.

For this reason, biomass production and trade have become a flourishing sector that requires innovative solutions to meet the current international demand. Compared to the conventional energy sector, the structure of the European biomass sector is characterised by SMEs. The industry of renewable energy currently employs more than 1.5 million people. Latest studies predict that, by 2020, nearly 3 million more jobs could be created, with the greatest potential for energy farmers, equipment manufacturers, installers, technicians, builders and engineers.

The demand for wood has been growing steadily in Europe during recent years and will further grow in the future. Due to the competition from different sectors (e.g. construction, manufacturing and power production) wood has become a scarce resource. A gap between supply and demand of hundreds of millions of tonnes of wood is predicted for 2020. One way to mitigate this scarcity is the production of wood in plantations of fast-growing trees such as willows and poplars. These are managed in a similar way to agricultural crops and harvested in short intervals of only a few years, and therefore referred to as short rotation plantations (SRPs.)

Besides their high productivity, SRPs offer further advantages such as providing landscape diversity, increased biodiversity compared to annual crops and numerous ecosystem services such as reduction in soil erosion and a possible approach to flood mitigation.

These promising attributes are not being fully exploited, however, as there are a variety of obstacles and barriers hindering or even preventing the further development of the SRP sector. These obstacles and barriers comprise, amongst others, missing or unfavourable legal framework conditions, missing financial support as well as various technical and non-technical barriers.

Rokwood is a three year trans-European research project which has attempted to confront these issues head on and find innovative ways to increase the market penetration of woody energy crops. The project is funded within the Regions of Knowledge (ROK) Programme of the European Union's 7th Framework Programme for Research and Technological Development (FP7).

The project involves a large consortia of 20 partners from six regional cluster countries (Northern Germany, South West England, Mazovia in Poland, Skäne in Sweden, Andalusia in Spain and the Midlands and Western Region of Ireland) as well as EUBIA, the European Biomass Industries Association who provide the means of disseminating the results to a broad range of stakeholders. The project partners have identified research requirements, proposed workable policy options and suggested joint activities with European and international partners.

Each cluster is represented by three partners, respecting the triple-helix concept (a business entity, a research entity and a local or a regional authority). The six clusters, in spite of their structural differences and levels of SRP engagement, face similar challenges in terms of developing the SRP market. Rokwood was intended to enforce the co-operation between these countries through a collective Joint Action Plan for tackling the most important obstacles and barriers on the European level. By connecting these clusters, Rokwood has striven to promote the exchange of established best practices and thus improve the economic growth of SRPs.

> *The Rokwood project has identified the main impediments and factors of success for the promotion of the use of woody biomass. This knowledge and know-how on SRPs is crucial to help this new sector, which needs a framework that fosters the technological, legal and market innovation and development.*
>
> **Samir Sayadi Gmada and Carlos Parra Lopez, IFAPA**

# Work packages

The Rokwood project ran from December 2012 to November 2015. The principal aim of the project was to increase the market penetration of woodfuel produced from short rotation plantations (SRP) by encouraging more dialogues between industry participants, researchers, policy makers and business.

## WORK PACKAGE 1
### Analysis of regional clusters state of play

Back in early 2013 project partners engaged in a major analysis of the factors that influence the SRP sector within their regions in order to prioritise and select those which could be best targeted by policymakers to help the industry expand. This process also served to identify key similarities and differences between the partner countries.

Each cluster performed an in-depth PESTLE analysis (Political, Economic, Social, Technological, Legal and Environmental factors) for their respective region to identify factors currently affecting the production and use of SRP, and those which are likely to affect it in the future. The PESTLE outputs were condensed into a more manageable form by the completion of a SWOT (Strengths, Weaknesses, Opportunities, Threats) analysis. The outputs of this exercise were used extensively in later tasks.

## WORK PACKAGE 2
### Definition of Joint Action Plan and Financial Plan

The middle part of the project involved activities that were designed to get beyond the obstacles that the SRP sector faces. Year 2 was dominated by the production of the Joint Action Plan (JAP), which essentially provides a route map on how to develop the SRP sector. The JAP brings together many of the outputs of the project into a single document and indicates the sort of research and innovation projects that are required. Alongside the JAP a Financial Plan (FP) was produced to identify suitable funding sources to finance its implementation.

The JAP was supported by two other significant outputs: an Agenda of Research Topics which identified and ranked research needs of the SRP industry according to importance in each country; and regionally specific policy briefs - a series of recommendations for policy makers, public authorities and government agencies to support the development, production and use of SRP derived woodfuel in their countries.

## WORK PACKAGE 3
### International co-operation strategy

In tandem with the JAP, the consortium developed an International Co-operation Strategy. Part of the Strategy involved individual clusters identifying countries or regions that they would like to engage with and identifying and making contact with SMEs and researchers with whom the clusters may have similar interests and could benefit from synergies. This work package had lots of links with other tasks throughout the project.

## WORK PACKAGE 4
### Measures towards the implementation of Joint Action Plan

The final year of the Rokwood project involved the first steps to implement the JAP principally by raising awareness. Each cluster ran training workshops, conducted site visits and engaged in staff exchanges. Based on the knowledge and technology gaps identified by the project the Rokwood consortium developed a catalogue of fifteen fully formed project ideas covering harvesting and processing, end use of SRP products and multifunctional uses of SRPs.

An important output of the project was a book of best practice case studies covering every step in the biomass supply chain, from initial business planning to the distribution and use of the heat and power produced.

## WORK PACKAGE 5
### Dissemination and exploitation

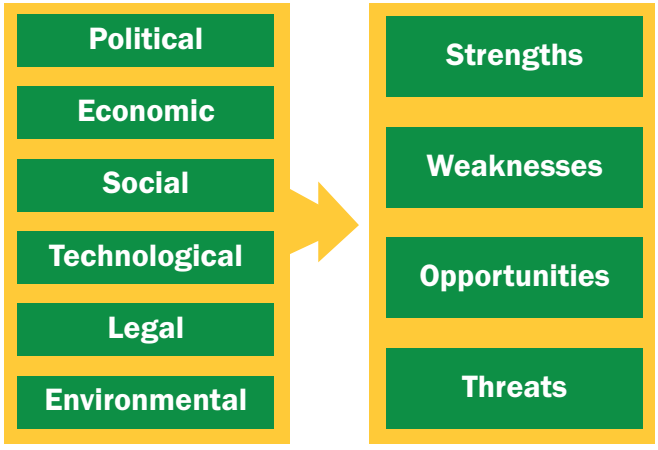
Throughout the project the consortium sought to promote the SRP industry through its own website, social media updates, project leaflets and downloadable reports, various project videos, presentations at conferences , attendance at trade fairs, joint publications in journals and trade press and a number of evening seminars/receptions for industry stakeholders and policy makers.

# PESTLE and SWOT analysis

The key objective of the PESTLE and SWOT analysis was to help each cluster identify all the factors that influence the SRP sector within their region in order to prioritise and select those which could be best targeted by policy-makers to help the industry expand. It also served to identify key similarities and differences between the partner countries, which helped develop a coherent approach for the clusters to work together in a mutually beneficial way.

Each cluster first performed an in-depth PESTLE analysis (Political, Economic, Social, Technological, Legal and Environmental factors) for their respective region in order to gather information for a SWOT (Strengths, Weaknesses, Opportunities, Threats) analysis. The PESTLE analysis represents a checklist of factors currently affecting the production and use of SRP, and those which are likely to affect it in the future. The factors can be at different levels (e.g. global, EU-wide, regional, local) and may vary in importance across levels and countries. Each cluster identified the key factors most relevant to their own country and ranked each in order of importance. The partners were encouraged to consult with expert stakeholders outside the cluster group, and in most cases a structured workshop was arranged to ensure a wide range of views was captured.

The follow-up SWOT analysis drew on the PESTLE outputs and other 'state of play' research undertaken during Year 1 of Rokwood. Each cluster populated a SWOT chart made up of four quadrants to identify 'internal' strengths and weaknesses within the SRP industry alongside external opportunities and threats. The most important factors in each quadrant (up to a maximum of 10) were then recorded.




Factors that could make up a 'common' SWOT across all the clusters were then discussed at a consortium meeting workshop. This aimed to identify common strengths, weaknesses, opportunities and threats from an economic, innovation and RTD perspective to inform the development of objectives, strategies and new research ideas for the Joint Action Plan.

SWOT factors varied widely across the clusters but there was a noted dominance of political and economic issues that could either be viewed as opportunities or threats depending on policymakers' decisions. Common Agricultural Policy (CAP) reform and the role of SRP in Ecological Focus Areas, government national policy and the extent to which SRP is prioritised and supported, and EU and/or national targets for renewables and emission reductions all featured highly in this respect, with most being viewed as opportunities. This made clear that with appropriate political encouragement, backed up by the right economic incentives, the SRP market could be kick-started to ultimately compete on an equal footing with many other players in the sustainable heat market. The wider issue of the increasing cost of fossil fuels was also noted by most clusters as a significant opportunity in this respect.

Common threats included a lack of local markets, with the more advanced clusters also highlighting the risk of local markets being affected by an increased import of cheap biomass fuel and the low prices attracted by the biomass power industry. The fact that SRP requires significant land take and a long term contractual commitment with the landowner was also recognised by most as a weakness. A general lack of public awareness of the industry, the supply chain and end-user benefits also featured highly as a weakness.

A number of factors were found to be specific to each country and/or region due to variations in market advancement, existing national/local policies and the local characteristics of the area. Example of these included 'flood defence' included as a strength by the UK cluster, which reflects the high incidents of flooding experienced in the cluster's south west region of focus, and regulations around landscape protection and nature conservation, which were viewed as threats by the German and Swedish clusters. Also the UK, Irish and Spanish clusters noted weaknesses in the lack of harvesting infrastructure and supply chain logistics, whilst the Swedish, Polish and German clusters identified a lack of profitable specialised machinery for SRP and lack of technological development to address this.

Developing and prioritising a 'common SWOT' for all clusters was challenging due to the differing characteristics, circumstances and priorities for each cluster but a summary of the SWOT outputs by theme is shown opposite. More in-depth findings of the SWOT are summarised in a report available via the Rokwood website. Arguably, this represents the core of the evidence base that was used by all clusters to formulate their country-specific Policy Briefs during Year 2 of Rokwood, but the findings have also usefully informed several other Rokwood activities such as the Joint Action Plan and the production of joint publications.

**Summary of outputs from the common SWOT analysis**

| | Helpful | Harmful |
|---|---|---|
| Internal origin | **Strengths**<br>• Carbon reduction<br>• Fuel security<br>• Regional benefits<br>• Ecosystem services<br>• Biodiversity | **Weaknesses**<br>• Competition for land<br>• Political will<br>• Lack of skills and infrastructure<br>• Lack of incentives<br>• Supply and demand |
| External origin | **Opportunities**<br>• Local heat networks<br>• Multifunctional benefits<br>• Diversification<br>• Rural regeneration<br>• Economic potential | **Threats**<br>• Political barriers<br>• Poor cash flow for farmers<br>• Market competition<br>• Technical issues<br>• Awareness and information |

# Research requirements

There has been research on SRPs for over 40 years. As a result of this we have tremendous knowledge on best practice cultivation methods, husbandry, breeding and selection techniques, pests and diseases and methods to combat these, storage parameters, combustion qualities, biodiversity, ecosystem services and multifunctional uses. It could be argued that the amount of research done is possibly more than an industry with just 50,000 hectares of commercial SRPs across Europe can justify. We know so much about SRPs but we are still struggling to get farmers to grow them. There is an evident hole between the outputs of research and the incentives provided by policy makers. We addressed this in the policy task.

However, even though there is a rich research base still more needs to be done. The aim of this task was to define regional and transnational research topics and match them by the importance level for each country. Not surprisingly, as this project is to a great extent driven by SMEs who are involved in the practical delivery of projects, this focussed on a lot of technical issues such as machinery improvement, woodfuel quality and environmental applications and non-technical areas or missing legal and financial support structures such as devising incentive schemes that could provide a financial tipping point and lead to more SRPs being planted, and the type of farmer that should be targeted to grow energy crops.

Each cluster was responsible for describing the research needs of their region or country, in terms of:

- Development perspectives (the current position and the broad issues that need to be addressed
- Strategic goals (the planned objectives that the research project will be striving to achieve), and
- Development activities (the actions that need to be undertaken in order achieve the required outcome or to answer the specific questions posed)

Six technical areas of research were identified.

1. **Resource mapping**
2. **Adaptation and agronomy**
3. **Production economics**
4. **Quality and standards**
5. **Technological advancements and refining supply chains**
6. **All round benefits to society**

Non-technical areas such as obstacles caused by lack of legal and financial support and lack of awareness were dealt with separately under the Joint Action Plan.

Based on this exercise an “Agenda of research areas to be addressed” was created which gathered knowledge about the research gaps of each cluster and identified cross-sectional research topics. The goal of the Agenda was to support later Rokwood activities such as the development of future project ideas as well as providing a useful document for partners to take forward with research councils in their own countries. The Agenda also enables partners to better recognize common topics with other countries, which should help in the creation of new projects and partnerships.

> *“The triple helix that characterises the structure of each regional cluster has made possible, from my point of view, real valuable working conditions. It is quite common that researchers are not so aware of the market needs, authorities do not know that much about the technical possibilities available that are beneficial for the environment and for business, and companies do not usually transmit their needs to both researchers and authorities. Thus, this project has made possible to create “regional discussion forums” that have helped us all to broaden our views. Moreover, this kind or interaction with other European regions has obviously made the discussion much richer.”*
>
> **Pilar Zapata Aranda, BioAzul**

**The potential benefits to society provided by the pollination services of SRPs (especially willow) are not widely appreciated and so far not quantified. Research in this field could help stimulate better financial incentives for SRPs.**

# Joint Action Plan

The Joint Action Plan (JAP) is one of the main outputs of the project and essentially provides a route map on how to develop the SRP sector across Europe. The JAP was informed by many of the previous outputs of the project (e.g. SWOT analysis, research requirements, policy improvements etc.) and collated these into a single document. Each cluster summarised their obstacles, interests, offers and needs according to the relevant order in their region, and transformed this into the "Ideal situation" towards which they would like the woody biomass sector to be driven. Based on this finishing point the clusters identified "Future Joint Actions" which represent the priority measures to take and these were sub-divided into activities or "Steps to implementation".

At the mid-project meeting in Goslar, Germany, partners discussed the ideal situation for their cluster regions, prioritised them and chose those to be worked on in the JAP. The methodology used for these discussions was the one known as 'World Cafe' in which a large group of people communicate with each other about subjects which are important to them. The World Cafe should lead to discourse in small groups as in street cafes. The participants during the exercise changed tables to bring their know-how and interests to different groups. At the end of the session the plenum discussed the results in a whole. It was revealed that many interrelations were possible even when dealing with regions at very different levels of development in the SRP sector.

The outcome of this exercise was the recognition of six joint actions and a total of 34 steps to implementation (or activities) that need to be taken to achieve an ideal situation for the SRP sector. This took the form of a catalogue of future activities, a timeframe for these activities and the allocation of tasks among the partners. Some of these were initiated during the final year of the project whilst others will have a timeframe beyond the project.

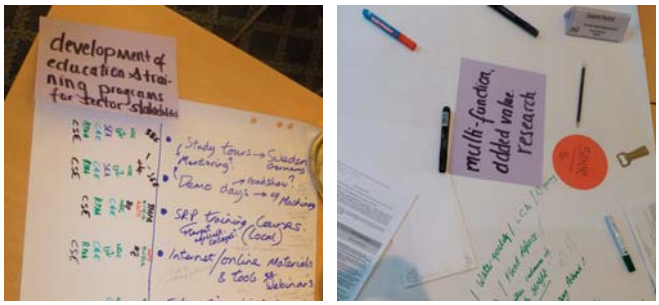
The six priority areas proposed in the Rokwood JAP are:

1. Development of SRP pilot and demonstration projects
2. Engagement in lobbying at the EU-level
3. Production of regional species and transnational agronomy guidelines
4. Knowledge transference of cultivation, logistics and end-use
5. Encourage multi-functionality and added value research
6. Develop education and training programs for sector stakeholders

This JAP was widely used within the consortium. Nevertheless, it contained information that could be considered as confidential for many partners, so it was decided that a public version should be prepared for dissemination and also to bring together possible future collaborators for the initiatives described. Thus a shortened, more user friendly JAP in a printable dossier format was produced as both a hard copy and uploaded to the website to be freely accessible to everyone.

**The JAP will remain relevent long after the Rokwood project finishes and will hopefully continue to inform the European Commission and national research councils on the sort of research and innovation projects that are required and influence the future direction of R&D spending on SRPs.**

However, the intention is not only to wait for future funding and initiatives to be tailored to our requirements but also to adapt our needs to existing and ongoing funding pots. To this end, alongside the JAP a financial plan was produced to identify suitable funding sources to begin its implementation. The consortium identified more than 20 regional and 40 national funding sources and at a European level, diverse calls under the Horizon 2020 programme: Interreg V, European Agricultural Fund for Rural Development, Life+, European Energy Efficiency Fund. As a result of this task, a catalogue of different programmes and funding sources that are potentially available in the regions and countries participating in Rokwood was created for financing SRP related R&D and facilitate the effective implementation of the JAP.




**Some of the outputs from the World Cafe exercise in Goslar (June 2014)**

*"This task has been quite important, as this is one of the main outcomes of the project. It has been quite difficult, as there were different views on what the JAP should look like, and this also had strong influence on other related activities. This was both a problem and an advantage; a problem, as it caused delays in this and other tasks, and an advantage as such discussions were actually enriching and the final document satisfies us all, as it is understandable, feasible, reasonable and achievable in the medium to long term."*

**Pilar Zapata Aranda, BioAzul**

# Policy briefs

During December 2013 to September 2014 partners took part in the task called 'Elaboration of policy briefs for the future implementation of strategies'. The aim of the task was to put together a series of recommendations for policy makers, public authorities and government agencies to support the development, production and use of SRP derived woodfuel in each of the partner countries. These recommendations took the form of 'policy briefs' and drew on the evidence base gathered from the outputs of the previous Rokwood work packages and tasks. Each cluster produced one Policy Brief, which was developed through a series of exercises that were intended to help identify and explore key issues, prioritise options and define recommendations.


Short rotation coppice in the UK
A briefing for policymakers

Introduction

Due to the regional focus of the Rokwood project, the briefs were inevitably shaped by the characteristics of each cluster region and were primarily focused on influencing regional policy (although this does vary to some extent, based on the structure of governance in each country).

There was a relatively high degree of alignment in the issues identified by the clusters, although the approaches to resolving each of these were more diverse. Six broad themes emerged, with each having been identified by more than one cluster as an area in which appropriate policy change is required:

1. All of the clusters identified the need to educate relevant groups about the benefits of SRPs (including multi-functional benefits, such as their potential for use as part of flood defence schemes), particularly farmers and policy makers.

2. Greater financial support is required in order to grow the SRP market, and there was general agreement that some of this additional funding should come from regional and/or national government.

3. A lack of local supply chains was identified as a barrier to uptake. The introduction of targeted subsidies as an incentive for growers was popular as a proposed solution to this.

4. Three of the clusters suggested that improved clarity in policy would support the expansion of SRP. Some ambiguity was noted in two areas of policy in particular; in Ireland this related to the definition of biomass in applications for funding, and in Spain and Germany land use categorisation was cited.

5. The importance of continued research and the development of resources was also noted by several partners, and the need for research funding and closer working between universities and industry was highlighted.

6. Finally, a lack of lobby groups supporting SRPs was identified, which is a particular issue due to the way that the topic 'falls between two stools' in terms of government responsibility.

Once finalised, the briefs were distributed widely to relevant stakeholders. Cluster members were also free to publicise their release on their own websites, and via newsletters and social media. Where possible, policy brief documents were also taken to events that were held in each of the participating regions for further dissemination. For example, the Spanish cluster handed out copies at their 'Granada es Verde' workshop and BIOPTIMA trade fair (amongst others), and the UK cluster distributed copies at a land energy workshop at Cambridge University and at a LogistEC seminar in Brussels. The Spanish policy brief was also featured in 'Energias Renovables' magazine.

**Using SRPS as a crop with more than one use was highlighted as a major area where the policy framework needs to be bolstered. Here a plantation of willow is being used to treat municpal waste water as well as providing an energy crop** (Photo: Chris Johnston, AFBI).

Clusters have reported that their policy briefs have generally been well received, however there has been some variation in the level of engagement that has been achieved in the different regions. The Spanish cluster has perhaps had the most success in this respect, with the briefs feeding directly into their Biomass Provincial Plan, which is to be adopted by the regional government. In Ireland, at the same time the policy briefs were developed, the government's Department of Communications, Energy and Natural Resources developed a draft Bioenergy Plan, which included the development of a Renewable Heat Incentive. This was one of the recommendations contained within the briefs.

Some partners have confirmed that they intend to keep using the policy briefs after the Rokwood project has ended. As the briefs are based on the political and economic landscape in each country at the time of writing, their ongoing relevance is dependent on the continuity of the existing conditions and so it is likely that these partners will need to revise the documents to account for new developments. For example, since the Swedish brief was first drafted, a new issue relating to increased competition due to the importation of waste for use as fuel in incinerators has become more prominent and the Swedish cluster have expressed their desire to address it.

*"Through Rokwood we've been able to bang the drum a little bit louder for energy crops. We have been doing this for years but Rokwood facilitated us with the opportunity to publicise the benefits of SRPs to a much wider audience".*
**Kevin Lindegaard, Crops for Energy**

*"The acceptance of SRPs in politics and the economy in EU member states is not as high as it should be. At the beginning of the project our main aim was to get together with other "players" involved in SRPs in other countries to find out the different targets and markets, to bring minds together and to find a bigger lobby.*
**Hans-Georg von Engelbrechten, Agraligna**

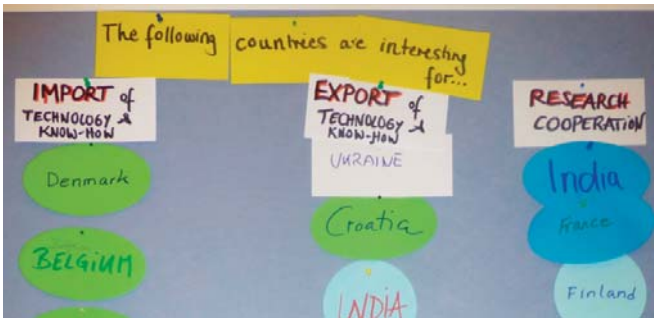
*"It's been really positive working with the UK cluster partners and networking with the Rokwood consortium members. The project helped us to influence local policy and future funding opportunities, including successfully lobbying the Dorset Local Enterprise partnership to include financial support for a biomass trade centre and biomass supply chains in the Dorset EU Structural and Investment funding programme 2015-2020.*
**Pete West, Dorset County Council**

# International co-operation and staff exchange

Global challenges such as climate change call for international co-operation to develop scientific solutions whilst global markets unleash opportunities for innovative European companies and research institutions. In order for the SRP industry to develop and respond to the current and future requirements for large volumes of sustainably produced biomass there needs to be much greater co-operation between SMEs and researchers in different countries, both in the EU and beyond. This task was an integral part of the Rokwood project enabling the consortium partners to identify and correspond with other SMEs and researchers with a view to:

- Sharing knowledge and experience
- Exploiting new market opportunities through partnerships and risk sharing
- Creating links that could lead to future collaborative research and development projects
- Working together to achieve a better policy framework

Each Rokwood cluster was tasked with finding out about the SRP and/or biomass production and use in 3-4 neighbouring countries and one broader, non-EU region (e.g. North America, China etc). The aim of this was to provide the consortium with a better understanding of the import/export opportunities with different countries. Following this, clusters identified countries or regions of the world that they wanted to engage with and detailed the technologies that could be imported to or exported from their region. In each case, partners needed to think about how this trade could be encouraged and how obstacles to internationalisation could be overcome.




**Internationalisation exercise identifying SRP trading/research partner countries.**

## SRP technology offer of the six Rokwood clusters

| | New SRP varieties | Planting machinery | Harvesting machinery | Processing machinery | Logistics | End use technology | Consultancy services | Mentoring services |
|---|---|---|---|---|---|---|---|---|
| N. Germany | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| Mid/W. Ireland | | | | | ✓ | | | |
| Mazovia | | ✓ | ✓ | | | ✓ | | |
| Andalusia | | | | | | ✓ | | |
| Skåne | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| SW England | ✓ | | ✓ | | ✓ | | ✓ | |

## SRP technology demand of the six Rokwood clusters

| | New SRP varieties | Planting machinery | Harvesting machinery | Processing machinery | Logistics | End use technology | Consultancy services | Mentoring services |
|---|---|---|---|---|---|---|---|---|
| N. Germany | ✓ | | ✓ | ✓ | | ✓ | | |
| Mid/W. Ireland | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | | ✓ |
| Mazovia | | ✓ | ✓ | ✓ | ✓ | ✓ | | |
| Andalusia | ✓ | | ✓ | | | ✓ | | ✓ |
| Skåne | | | | ✓ | | ✓ | | |
| SW England | ✓ | ✓ | ✓ | ✓ | | ✓ | | ✓ |

For each potential trading partner, clusters were asked to produce a shortlist of companies that would be worthwhile collaborators. In certain cases contact was made with relevant individuals to see if there was any possibility of developing a specific opportunity. Rokwood partners identified around 70 organisations outside the consortium that they would like to explore collaborations with. Germany and Sweden were most progressive in their desire to work in new markets. This is based around the fact that these countries generally have more to offer in terms of services and expertise. The four other Rokwood clusters are looking to gain from linking up with countries that are more developed in SRP or with their near neighbours.

Earlier Rokwood tasks had indicated areas where research was required urgently. Clusters were reminded to look back at these documents and then search the internet for researchers in their own country and other countries who could help in these fields. The aim was to create a network from which future research collaborations could evolve. Partners identified 99 scientists from 17 different countries outside the Rokwood consortium that they would like to explore collaborations with. The Spanish were very keen to establish research opportunities with eight South American researchers.

The raw lists of potential collaborators (both companies and researchers) will inform Rokwood partners of organisations active in SRP in Europe and worldwide. The sharing of the list will mean that more of the Rokwood partners will be able to exploit these contacts.

The Swedish cluster took up the opportunity to host a couple of trade missions, one from Lithuania and one from Ukraine. The participants of the Ukraine visit included representatives from the national Government of Ukraine, the regional governments of Poltava, Ivano-Frankivsk, Donetsk and Transcarpatia, an environmental NGO organization, one company called Ecosolum, the Swedish Embassy, the organisation Business Sweden and the United Nations Development Programme (UNDP).

A number of staff exchanges took place between clusters in order for Rokwood partners to learn more about how SRPs have been developed in different regions and gain from best practice. Sweden and Ireland were the clusters that accepted the most exchanges. Most of these took place between consortium members but some new links were made. For instance, English SME partner Crops for Energy created a new liaison between Teagasc, the crops research centre in Ireland and SP in Sweden who are both conducting research on combustion and emissions from SRP willow. Other exchanges were written up as best practice case studies (e.g. SRP self supply at Gurteen College) or enabled discussions that resulted in funding bids. The staff exchange between the Swedish and German clusters allowed partners to explore a common research project to develop a new SRP harvesting machine. The

**The Ukrainian trade delegation with Anders Nylander (SEA, 2nd from left) and Annika Henriksson (SEE, 5th from left). Volodymyr Lyashchenko of the United Nations Development Programme, later wrote to Annika: "On behalf of the official delegation from Ukraine I would like to express our appreciation for the remarkable work you did for organizing such wonderful meetings, visits and sharing the experience in energy crops cultivation. Thank you!"**

exchange between Bioazul and TTZ was used to discuss a proposal for a follow up to Rokwood called EU BIOMASS HUB which would take forward some of the recommendations in the Joint Action Plan.

*For me the internationality of the project was the most important thing. We had partners from 7 different countries (Belgium, Germany, England, Ireland, Spain, Sweden and Poland) with different backgrounds (research, business and politics) which made up a great mix and made work really interesting. Every partner had different knowledge and experience to contribute. Valuable contacts have been established that will reach beyond Rokwood.*
**Christoph Knauer, TTZ**

*If I had to start the project again from the very beginning I would definitively give more weight to the IPS. Internationalisation is a key point for us; enlarging our network is very important if we want it to survive. At the same time, engaging relevant stakeholders from our own regions was also a key point, and I think we all should have devoted more time to achieve this "massive involvement" we would have wished.*
**Pilar Zapata Aranda, BioAzul**

*The staff exchange programme encouraged territorial cohesion, especially concerning demonstration projects, technology and management approaches among Rokwood partners. In addition, the staff exchanges contributed to the improvement of knowledge regarding available technologies, investment, and performance of bioenergy systems.*
**Samir Sayadi & Victor Hugo Durán Zuazo, IFAPA**

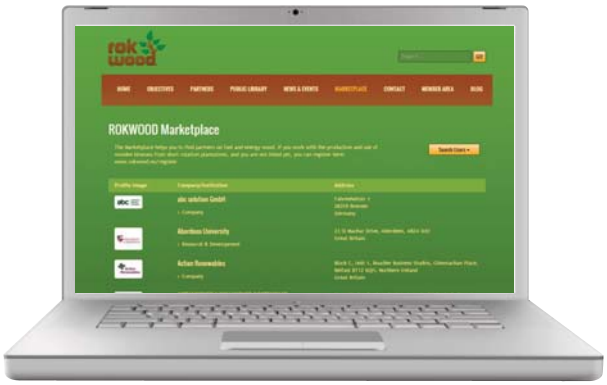
**Mike Pearson, Principal of Gurteen College, Tipperary, Ireland in his willow crop. Mike was instrumental in setting up a woodfuel self-supply project which heats the whole college. He hosted C4E in an exchange and then agreed to speak at the English training event – the aim of this was to help Kingston Maurward College to use their willow in a similar way.**

## Expanding the Network

Here are some of the organisations we've reached out to, worked with, liaised with and helped during the project:

BIOENERGY CROPS
Association of Applied Biologists
afbi Agri-Food and Biosciences Institute
Carsan Biocombustibles
BBE
WHA Wood Heat Association
C.A.R.M.E.N.
energy crops
irbea
energy technologies institute
Fast WOOD
Forest Research The Research agency of the Forestry Commission
HERO
Action Renewables the future of energy, today
KINGSTON MAURWARD COLLEGE
LOGISTEC Logistics for Energy Crops Biomass
ROTHAMSTED RESEARCH
kwf
iberia biomass
INMECAL
regensw delivering sustainable energy
REGRO
ECOSOLUM GROUP www.ecosolum.com
UNDP Ukraine
StrawsonS energy
1913 we make it grow
AEBIOM EUROPEAN BIOMASS ASSOCIATION
UNIVERSITY OF BATH
tubocás "Fabricando el futuro"
SUPERGEN Bioenergy Hub
cagasc Agriculture and Food Development Authority

# Dissemination




The project partners established a set of instruments to ensure that the largest possible group of stakeholders benefits from the key findings, project outputs and mutual learning activities.

Within the first month of Rokwood, a website was developed (**www.rokwood.eu**) to inform people about the project and its objectives. On the website the user finds detailed descriptions of the project partners and links to interesting projects with similar topics. The main outputs, such as the Joint Action Plan, Best Practice Booklet, Policy Briefs, Public Project Reports and dissemination material are gathered in the Public Library Section. In the News & Events Section there are details of workshops, seminars and conferences organized by Rokwood and other external events that could be interesting for stakeholders.

In order to attract users to the website a set of social media accounts were created. Twitter, Facebook, LinkedIn and YouTube are used to cross-publish content developed within the project. This strategy helps to reach as many stakeholders as possible by using these different channels. The Twitter account (**@RokwoodEU**) also shared items of interest posted by users we followed, often organisations and individuals with an interest in SRPs. Today we

**Kevin Lindegaard, C4E (top) and Pete West, Dorset County Council (left) are interviewed for the Rokwood videos.**

**The Rokwood video has been watched more than 500 times on YouTube.**

have over 200 followers, 45% of whom are based in the UK, 12% in the USA and 12% in Spain. This reflects the fact that we tweet almost entirely in English and focus on events and news in the UK and Spain (the clusters that have engaged most with the social media strategy).

Another very successful tool to facilitate cross-border co-operation in research is the Rokwood marketplace (**www.rokwood.eu/marketplace**) where stakeholders of the sector can register to start networking activities with market actors across Europe and the world. Today more than 300 companies, research institutions, regional competence centers and other stakeholders are registered in the database. That this tool works is proven by a common proposal for a follow-up project developed by Rokwood partners and registered marketplace members.

> *"I think the written outputs and the videos produced during the project are very informative, relevant and professional looking. These resources will serve the sector well as they document best practice which is already being conducted as well as making suggestions on what is required going forward in term of policy instruments and project ideas".*
> **Kevin Lindegaard, Crops for Energy**

# Project ideas

Projects like Rokwood involve a lot of partners from several countries and different perspectives working together over a number of years. This provides a fertile breeding ground for new ideas. Through the Joint Action Plan (JAP) and other project outputs, Rokwood should play a big part in influencing the future direction of R&D spending. An important part of the second half of the project involved gathering the many ideas together to establish a better platform for further pan-European co-operation.

Based on the knowledge and technology gaps identified in previous activities Rokwood partners developed a catalogue of 15 project ideas covering three broad themes:

1. Harvesting SRPs and processing the biomass
2. End use of SRP products
3. Multifunctionality (added value) of SRPs

Some of these aim to plug distinct gaps in the market (e.g. machinery provision) whilst others look at ways to replicate best practice or further develop the work of Rokwood and increase the availability of information to growers. Example project ideas include:

- Development of an affordable small scale willow harvester
- Development of machinery for use on sloping land and wet soils
- Pilot SRP plantations for flood mitigation and wastewater treatment
- Investigation of SRP as a feedstock for the pulp and paper industry
- Pellet production from SRPs
- SRP online information hub
- International SRP study tour programme

Each of these areas of interest has been developed into a fully formed project idea complete with project title, description, goal, short agenda, tasks description and distribution, expected costs and funding possibilities. In addition, as a follow on from the International Co-operation Strategy, partners were better able to identify prospective partners from outside the consortium. Potential partners have been approached in Northern Ireland, Denmark, Italy, Austria, Czech Republic, Lithuania, Latvia and Ukraine.

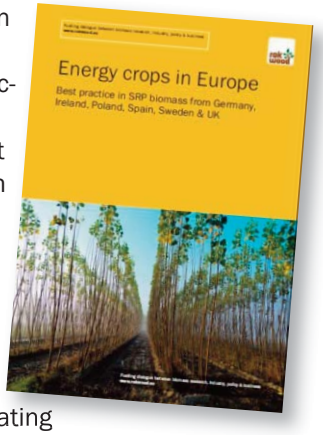
This is a very valuable outcome of the project. Many European funded projects have less time to plan which inevitably means that there will be some weaknesses. As a result of this exercise some of the initial groundwork is done ensuring that Rokwood partners and colleagues from other organisations will be able to progress more rapidly once a suitable funding call is announced.

Already, one project proposal has been written and submitted to the EC in June 2015. It was framed within the call "ISIB-2-2014/2015 Closing the research and innovation divide: the crucial role of innovation support services and knowledge exchange", and it maintained many of the Rokwood partners, having at least one representative per cluster (UK, Spain, Sweden, Poland, Ireland and Germany), and also includes new partners from neighbouring regions Latvia, Romania, Czech Republic and Italy.

# Project highlights

The final part of Rokwood involved the first steps to implement the Joint Action Plan (JAP). Each cluster has run training workshops, conducted site visits, engaged in staff exchanges, promoted the project through publications and presented at conferences. For many of the consortium partners these facets of the project have provided the highlights.

An important output of Rokwood was a book of best practice case studies covering every step in the biomass supply chain, from initial business planning to the distribution and use of the heat and power produced. This authoritative document has been downloaded over 1,000 times, and is almost certainly the first time that such a wealth of information from SRP practitioners has been brought together into one volume. Many of the inititives described such as the self-supply of SRP woodfuel at Gurteen College and district heating at Beuchte Energy Village could and should be replicated elsewhere. Furthermore, the use of SRP as biofilters as demonstrated in Northern Ireland and Sweden exemplify the wider opportunities for multifunctional benefits and efficient land use.




From the outset of the project the co-ordinator TTZ stated that there was freedom within the project to adapt the description of work and make the tasks fit the local needs of the clusters. Some of the partners have looked to really add value and go beyond the deliverables in the description of work.

The English cluster has used the project to challenge entrenched views about SRPs and educate policy makers, conservationists, wood fuel suppliers and farmers about the opportunities that SRPs provide. As a result the cluster made a big effort in policy tasks and tried to engage with particular groups in their training sessions and site visits. During the English cluster meeting in Bristol an evening seminar was hosted for policy makers and key local influencers. Kevin Lindegaard of Crops for Energy was very proactive speaking at numerous conferences about the Rokwood project. As a result of talks at the International Bioenergy Conference in Manchester (March 2013) and the Supergen Annual Assembly (Nov 2014), the UK research community is well aware of the project and should be ready to work towards future R&D needs.

Project partners have sought to make links with other European funded projects. A strategic relationship was made with the sister project, LogistEC (Logistics for Energy Crops Biomass, **www.logistecproject.eu**), leading to two Rokwood partners, Kevin Lindegaard and Annika Henriksson, speaking at LogistEC events in Brussels. These events gave us an opportunity to have our voices heard and input into their project outputs – each workshop was attended by EU policy makers and produced a list of recommended actions to help the sector grow.

> *In our opinion the members of some clusters co-operated very efficiently, providing each other with valuable inputs and joining forces to reach common targets. Some made significant efforts to invite to site visits and events a large number of external stakeholders from across the sustainable woody biomass production sector. These events showed how the SRP sector in the hosting country compared to the SRP framework at the EU level, and were fruitful occasions for debate for farmers, technology providers, business actors, researchers and policy makers. They allowed the most relevant results of the project to be presented to a large and varied audience.* **Valeria Magnolfi, EUBIA**



The Irish cluster set up key linkages within their region. They held a half day workshop in May 2014 in Athlone, Co. Westmeath. As part of this, the Rokwood partners and Barry Caslin of Teagasc organised a group of willow growers from the Midlands, who had previously had no contact with each other, to meet and form a group for information and knowledge exchange. This group has developed since then and have met up a number of times independently of the Rokwood project. They also liaised with Irish Bioenergy Association (IrBEA) who held the inaugural meeting of their energy crops sub-group at the same workshop, at which participants from both the Republic of Ireland and Northern Ireland met to develop a strategy to address the challenges of the energy crops industry on both sides of the border.

The Swedish cluster needed to spend less time trying to create links in their region as the industry is already well established there. Instead they used the supply chain for training visitors from abroad. They hosted two training seminars for large SRP producers: Klasmann-Deilmann (who have planted 2000 hectares of willow in Lithuania) and Energy Crops Vattenfall (who are involved in poplar cultivation in Germany). In addition, they also ran a training workshop for a new Romanian willow grower who is planning large plantations in the Danube region and welcomed a trade delegation from Ukraine.

The German site visit to the Beuchte Bioenergy Village was a particular favourite of many partners (see country profile). This demonstrated how SRP poplar could be grown and used to heat 65 houses via a heat network, and provided another great vehicle for training: Agraligna hosted a group visit from Poland and Clemens von König made a presentation at the English cluster's training seminar.

In its final 6 months, Rokwood forged links with two important organisations that run conferences/exhibitions to make sure the outputs of the project are disseminated as widely as possible. In June 2015 Rokwood had a side event *Short Rotation Plantations: A winning Strategy for Sustainable Production and Efficient Use of Wood Biomass* at the European Biomass Conference and Exhibition (EUBCE) held in Vienna. In October 2015, the project will conclude with a 3 day international conference in Brussels run by the Association of Applied Biologists called *Biomass and Energy Crops V*. One whole session and an evening reception for non-conference delegates will be devoted to Rokwood.


**Photos: Opposite page, clockwise from top L : Networking at the Bristol evening reception for policy makers (Jan, 2014); Christoph Knauer (TTZ) presenting at the EUBCE side event in Vienna (June 2015); Annika Henriksson (SEE) being interviewed for Polish TV with translation by Łukasz Drzewaszewski (GZ) (May 2015); Rokwood sponsored members meeting of the UK Wood Heat Association are shown the billet harvester at Strawson's Energy (June 2015); Susanne Paulrud (SP) leading a training seminar for a Lithuanian company UAB Klasmann-Deilmann Bioenergy (July 2014). This page: (top) Annika Henriksson (SEE) and Kevin Lindegaard (C4E) at the LogistEC seminar "Impact of Energy Crops" at COPA-COGECA, Brussels (Dec 2014); (below) Delegates at the Biomass Granada is Green event (March 2014).**

## Outputs from the project

| | N. Germany | Mid/Western Ireland | Mazovia, Poland | Andalusia, Spain | Skåne, Sweden | South West England | Total |
|---|---|---|---|---|---|---|---|
| Training courses | 1 | 4 | 1 | 3 | 5 | 5 | 17 |
| People who have received training | 20 | 95 | 32 | 260 | 53 | 124 | 584 |
| Site visits | 5 | 7 | 4 | 2 | 27 | 7 | 52 |
| Staff exchanges | 2 | 4 | 5 | 2 | 3 | 3 | 19 |
| Articles produced | 4 | 3 | 2 | 13 | 2 | 5 | 29 |
| Conferences attended | 6 | 6 | 1 | 3 | 3 | 12 | 19* |
| Conference presentations | 4 | 2 | 0 | 3 | 4 | 10 | 23 |
| Organisations signed up to Rokwood marketplace | 34 | 14 | 83 | 45 | 14 | 45 | 235 |

*19 unique conferences (some clusters attended the same conference)

# Legacy

The need for sustainable sources of locally produced biomass is widely recognized but despite over 30 years of research and development and 25 years of policy support there are still only around 50,000 hectares of SRPs planted in the EU28. In some of the countries represented by Rokwood such as Sweden and UK the area of SRPs has fallen rapidly in recent years. The Rokwood partners have attempted to understand the reasons for this lack of penetration and propose measures to reverse this trend and kick start the industry.

Rokwood has been successful in a number of ways: the showcasing of best practice should help redress some widely held entrenched views on the useability of these biomass fuels. In addition, the project has thrown light on many multifunctional uses of SRPs that should be exploited to benefit local communities. The lack of any lobbying power has meant that the sector has been in the past the recipient of numerous policy measures that have failed. Rokwood has enabled sector participants to produce coherent policy wish lists that have a greater likelihood of influencing policy makers. The project has also facilitated greater networking opportunities amongst SMEs which should help develop partnerships and improve export opportunities. The agenda of research requirements will hopefully lead to funding being channeled into more applied areas that will benefit project practitioners.

> *Until now there is no positive reaction in our region which has been caused by the Rokwood Project. But from our business experience we know that it needs a longer time-period to get movement.*
>
> **Hans Georg von Engelbrechten, Agraligna**

> *At present, it's rather hard to notice any direct impact of the project on SRPs production in our region. But this is a slow process and I think that through new contacts and knowledge-exchange we may see some changes in the future, especially when we seek new energy sources for the people in our community. These ideas can be combined with possible EU donation programs, especially for farmers thinking about biomass production not only for their own needs, but also larger markets. Some changes can occur at this moment, independently from our own actions but as a result of contacts made during the site visits.*
>
> **Łukasz Drzewaszewski, Gmina Załuski**

> *We believe that biomass in general – and SRPs specifically – have the potential to make a significant contribution to the Spanish and Andalusian sustainable energy mix and that their multifunctional characteristics further justify their use as an environmentally and economically beneficial energy crops. Even when the Rokwood ends in November 2015, the Spanish cluster will keep on working to help all stakeholders have a clearer view of local biomass and SRP energy crops, organizing promotional events and social media campaign, and fund raising for new projects.*
>
> **Victor Hugo Duran Zuazo, Carlos Parra Lopez & Samir Sayadi Gmada, IFAPA**

# History of SRPs in Europe

SRPs have been considered as an option for biomass energy and fibre production for over 40 years. Initially, interest was sparked in the early 1970s by the potential shortage in pulp wood used for paper and cardboard production. Work in Northern Ireland suggested that fast growing coppiced willow could potentially meet the industry's needs from large areas of low grade farmland. This potential land use also received significant attention in the wake of the oil crisis of 1973 and the subsequent supply shortages and price increases.

Countries like Sweden and Northern Ireland, with low levels of indigenous fossil fuels were particularly exposed to this issue and endured fuel rationing. In the light of this incident the need for greater security of energy supply became important and research on willow for biomass energy began in these two countries as well as at Long Ashton Research Station in Bristol, England which was the holder of the world's largest willow germplasm collection.

Initial work focussed on agronomy, spacing and rotation length to determine the most economical stocking density and best yields. In Sweden in 1977, there was a nationwide collection of fast growing willows supported by the farming magazine Land and the Swedish University of Agricultural Sciences in Uppsala in order to provide a good basis for a breeding programme. Around the same time, SRP poplar research was also being initiated in Germany and Italy. The initial research efforts suggested that high yields could be achieved on marginal land and an industry started to develop. The first commercial willow plantings took place in Sweden in 1981. Cuttings suppliers were offering large volumes of material from 1985, the first step planter was developed in 1986 and Svalöf-Weibull AB began commercial willow breeding in 1987.

The industry began to grow with the introduction of set-aside in 1988 under the Common Agricultural Policy (CAP). This programme imposed production quotas and forced farmers to take a proportion of their land out of

**Five-year-old Eucalyptus glaucescens at Dartington, Devon shows the high yielding capabilities of SRPs**

food production in order to control the over-supply of agricultural commodities such as milk and grain. There were suggestions at the time that 6 million hectares of UK farmland would need to be removed from food production. SRPs emerged as an attractive diversification option.

Other geo-political factors also stimulated the industry. The realisation that over reliance of fossil fuels was causing the world to warm led to the Earth Summit in Rio in 1992 and the signing of Kyoto Protocol 1997. The need to reduce carbon emissions on a massive scale led some countries like Sweden and Denmark to adopt carbon taxes. This gave a favourable advantage to renewable energy and home grown biomass production.

The introduction of a planting grant in Sweden led to a mini boom in planting in the mid-1990s. At its peak there were 18,000 hectares planted and over 1,250 growers. Also, numerous harvesting machines were developed. However, the reduction of compulsory set-aside from 15% to 10% in 1996/97 brought about a huge slump. Planting levels fell from 2,000 to 200 hectares in the space of a year and 10-15 cuttings producers left the market. During the years that followed the Swedish market shrunk. This was due to the removal of crops - some plantations had been established on poor land hundreds of kilometres from heating plants and were not economical. In addition, the price paid to farmers has reduced due to competition from imported biomass.

The UK saw a similar (albeit smaller) boom and bust in the SRP sector on two occasions. The Arbre Energy project was supported by the UK Government's Non Fossil Fuel Obligation and European development funds and created a market for around 1,500 hectares of SRP willow. The plant was built but never became fully operational and was closed in 2002. Despite the introduction of an establishment grant, farmer confidence was badly affected and planting levels fell from a peak of 422 ha in 2000 to just 65 ha in 2002. The introduction of policy favouring the co-firing of energy crops with coal led to a gradual increase in planting (peaking at 502 ha in 2007) but this again plummeted due to uncertainty because of the cessation of the Energy Crops Scheme for 18 months, the abandonment of set-aside and the sudden increase in cereal prices at this time.

In many countries there has been a similar trend with relatively large areas being established in a short time followed by a rapid decline. For instance: over 1,500 hectares of willow was planted in the whole of Ireland (NI and Republic) between 2006 and 2011; 6,000 ha of poplar was planted in Lombardy, Italy between 2003-2008; and 6,500 hectares of poplar planted in Germany in the 2000s.

In most of these western European countries the current SRP market is static with very little planting going on. Around 100 hectares of willow was planted in the UK in 2015. The recent introduction of short rotation coppice as an Ecological Focus Area option under the current CAP so called "greening" measures might have some impact but the low weighting (0.3) compared to other options such as buffer strips discriminates against SRP as it requires as much as five times the amount of land to be taken up compared to other measures.

The current areas of growth for SRP are in Eastern Europe. Large plantations have been planted in Lithuania, Latvia. Poland and Ukraine over the last 3-4 years and this looks set to continue.

Throughout the history of the SRP sector there have been key breakthroughs in research and technology development. For instance, there are numerous breeding and selection programmes for SRPs in Sweden, UK, Italy, Belgium, Germany, Poland and Spain. From these efforts there are some exceptional, high yielding and disease resistant varieties. In addition, planting and harvesting technology has been developed making it easier to ensure a good establishment and ensure the biomass is harvested efficiently.

# Focus on Skåne, Sweden

| | |
|---|---|
| **Population** | 1.3 m |
| **Area (ha)** | 1.09 m |
| **Area of SRPs today (ha)** | 2,042 |
| **Forest cover (ha)** | 390,00 (35.7%) |
| **Installed capacity of biomass** | 1,840 MWth |
| **Biomass installations** | 33,140 heating & 33 district heating/CHP plants |
| **Area of agricultural land (ha)** | 510,000 (46.3%) |
| **Predominant agricultural land use** | Arable and livestock |

**Rokwood partners:**

SalixEnergi Europa

Scania's Association of Local Authorities

SP Technical Research Institute of Sweden

Skåne is in the Swedish part of the Swedish-Danish Öresund region and has very good agricultural land dominated by cereal production. There are around 1,800 hectares of SRP willow and 200 hectares of single stem poplar.

There are 33 municipalities and all of these are heated by biomass district schemes. The vast majority of the SRP produced in the region is consumed in these. Most of the district heat schemes are small scale (5-10 MW) but there are 10 larger combined heat and power (CHP) plants ranging from 50-100 MWth. There are many 100-1000 kW biomass boilers heating farms mainly using straw but some are using wood chips. In recent times some estates have built boilers of 2-4 MW to supply to a nearby district heat net as well as for their own use. This provides a very successful business model for the owner/operator.

**Direct chipping of willow with a JD forage harvester with a HSAB head (June 2013)**

The area of SRP in Sweden has decreased during the last four years due to the drop in energy prices and an oversupply of biomass. The situation in Skåne is better than elsewhere, partly because the import of waste has not affected the use of local biomass as much as in other regions. Nevertheless, there has been little new investment, and many harvesting machines are being exported, mainly to eastern Europe. There have been two positive developments, however, with the opening of a 110 MW CHP plant at Örtofta in 2014 and the re-opening of the 55 MW heat plant at Flintrännan this year. Both are likely to include willow in the fuel mix and improve the market situation for SRP in Skåne.

*"The SRP market is comparatively well developed in our region, so we are mainly interested in the export market for Salix varieties, Salix cuttings, SRP machinery and knowledge. We have run training seminars for companies from Ukraine, Germany, Lithuania and Romania who are planning large-scale (500-3,000 ha) Salix-growing projects and want to learn from us. It is difficult to charge for this training since the companies see it as a marketing activity for us. However, the time from the first contact with potential clients to an actual business deal can be years, and for a small company like ours it is difficult to allocate resources with a long term perspective. Rokwood provides this opportunity."*

**Annika Henriksson, Salix Energi Europa**

**Demonstration of chipping baled willow (June 2013).**

**Rokwood funds assisted in getting this excellent Swedish publication by Susanne Paulrud of SP about using willow as fuel for small-to-medium boilers (50 kW – 2MW) translated into English.**

# Focus on Andalusia, Spain

| | |
|---|---|
| **Population** | 8.4 m |
| **Area (ha)** | 8.76 m |
| **Area of SRPs today (ha)** | 150–170 |
| **Forest cover (ha)** | 2.54 m (29%) |
| **Installed capacity of biomass** | 1,555 MWth |
| **Biomass installations** | 23,431 heating and 18 power plants |
| **Area of agricultural land (ha)** | 3.85 m (43.9%) |
| **Predominant agricultural land use** | Olive plantations |

**Rokwood partners:**

Institute of Agricultural and Fishery Research & Training (IFAPA)

ASAJA Granada

BioAzul

Agencia Provincial de la Energía de Granada

*"We identified that one of the main problems associated to SRPs development in our region was ignorance. Farmers don't even know that that planting SRPs is an option, and as long as we have plenty of other biomass resources, it is difficult to promote anything.*

*The best thing about Rokwood was being able to see real projects related to SRPs already working in different regions of Europe, learn about these possibilities and promote similar project opportunities in our region with the know-how and contacts needed to accomplish them."*

**Gonzalo Esteban López, Agencia Provincial de la Energía de Granada**

*"Our participation in Rokwood was seen as a good opportunity to look at new opportunities for our farmers as agriculture is becoming more difficult every year. In Granada poplars are very common but the prices are very low. The project gave us some new ideas that we hope to put into practice in our territory."*

**Javier Morales Luque, ASAJA Granada**

The SRP sector in the Spanish region of Andalusia is still in development. There are lots of ongoing trials and certain types of SRPs (e.g. poplar, Paulownia and Eucalyptus) can grow well and produce good yields as long as the plantations are irrigated. The hot, arid conditions and scarcity of water need to be overcome if the SRP sector is to grow in the region. This could be achieved through harnessing the multifunctional qualities of SRPs and irrigating them with waste water.

It is difficult for the sector to gain a foothold as there is a lack of awareness amongst farmers and policy makers and a lack of a good legal framework to promote SRPs and incentivise biomass power plants. There is also competition from the large volume of cheap waste biomass produced from the olive industry. The Spanish cluster would like to see SRPs being grown on marginal and abandoned land where they would not be competing with other crops and providing sustainable and stable biomass supplies for local industrial heat and district heating projects.

A recent opportunity has been developed in northern Granada with the construction of the Tupellet wood pellet production plant that will use SRPs as a feedstock.

**Rokwood partners are shown around a Paulownia trial at SAVB (Andalusian Society for Biomass Upgrading) in the Campillos municipality (Jan 2013).**

**The Spanish cluster held a training event in March 2015 which involved a visit to SRP trials on the Patronato Rodriguez Penalva and the new Tupellet pellet plant in Granada.**

# Focus on Midlands and Western Ireland

| | |
|---|---|
| **Population** | 1.1 m |
| **Area (ha)** | 3.25 m |
| **Area of SRPs today (ha)** | 117 |
| **Forest cover (ha)** | 340,000 (10.5%) |
| **Installed capacity of biomass** | 94 MWth |
| **Biomass installations** | 951 heating boilers |
| **Area of agricultural land (ha)** | 2.05 m (63.1%) |
| **Predominant agricultural land use** | Livestock |

**Rokwood partners:**

Biotricity Limited

Dublin Institute of Technology & Dublin Energy Lab

Western Development Commission

The Irish Cluster region comprises two separate regions, the Midlands (Laois, Offaly, Longford and Westmeath) and the Western Region (Donegal, Leitrim, Sligo, Roscommon, Mayo, Galway and Clare). Around 75% of the total population are based in the West.

Agriculture in the region is dominated by grassland supporting a signficant beef and dairy industry. The use of SRPs is underdeveloped with an area of just 117 hectares planted to date (mostly in the western counties). There is limited arable land in either region so Common Agriculture Policy (CAP) "greening" measures such as ecological focus areas (EFAs) will have no impact on the SRP area.

**Alan Fox, Managing Director of HDS Energy shows Rokwood partners plans for the 15 MW biomass CHP plant at Belrath, Co. Meath which will be fuelled by locally grown SRP willows (Nov 2014).**

The region has significant peat bogland areas with industrial scale peat processing and power generation. Ireland's energy use is dominated by fossil fuels (93%) with a highly centralised electrical generation system. Renewable energy accounts for circa 6.5 % of the national total with wind energy accounting for about 50% of this. The small SRC willow sector in Ireland commenced around 2007 in response to the development of renewable electricity feed in tariffs (FITs) for bioenergy, (which stimulated a number of proposals around the country for biomass based CHP), mandatory requirements for co-firing at peat burning power plants, and supported by the initiation of establishment grants.

There are significant opportunities for using SRPs in these regions particularly for heat. A large proportion of properties in rural areas are off the gas grid and rely on expensive oil heating. The region has a low level of forest cover so SRPs could provide a rapid growing, local source of sustainable biomass.

The Irish Bioenergy Action Plan includes a proposal for a Renewable Heat Incentive. It is anticipated that this will be introduced in 2016 and incentivise large commercial users to install biomass systems.

> *"There is a lack of support for the SRP industry in Ireland and an over focus on traditional forestry as a source of biomass. The SRP sector in Ireland is still hugely undeveloped, and it will take some years before changes will be made to this. This will involve the need for policy changes to promote and encourage planting of SRPs so that an economically viable return is available to the grower. This could be facilitated by the further development of the bioenergy scheme, changing the classification of energy crops to make them competitive with traditional forestry on an income and taxation basis and increasing training / knowledge sharing in the sector."*
>
> **Pauline Leonard, Western Development Commission**

> *"Rokwood provided local stakeholders with training, knowledge, information and expanded networks, regionally, nationally, and EU wide. The site visits to different regions provided an excellent learning experience to understand the complexity of the regional differences in relation to their renewable energy strategies and in particular their regional biomass and SRC sectors".*
>
> **Patrick Daly, Dublin Institute of Technology**

# Focus on Mazovia, Poland

| | |
|---|---|
| **Population** | 5.3 m |
| **Area (ha)** | 3.56 m |
| **Area of SRPs today (ha)** | 1,100 |
| **Forest cover (ha)** | 850,000 (23.8%) |
| **Installed capacity of biomass** | 2,480 MWth |
| **Biomass installations** | 32,262 |
| **Area of agricultural land (ha)** | 2.31 m (65%) |
| **Predominant agricultural land use** | Fruit, vegetables, potatoes, cereals |

**Rokwood partners:**

Gmina Załuski

Mazovian Agricultural Advisory Centre

EKSPERT-SITR

The Mazovia region is in the mid north east of Poland and includes the capital city Warsaw. The agricultural land use is varied with production of cereals, potatoes, fruit, vegetables, dairy, pork, beef and poultry. Most farms are small with an average farm size of just 8.55 hectares.

There is some interest in SRPs with a current area of around 1,100 hectares being grown. This is mainly being used to supply large combined heat and power (CHP) plants.

**PGNiG's Siekierki plant in Warsaw - the biggest combined heat and power (CHP) plant in Europe (May, 2015)**

**A representative of PGNiG talking to Susanne Paulrud (SP) and Anders Nylander (SEA). May, 2015.**

70% of the heat demand of Warsaw is provided by PGNiG Termika's Siekerki (2,078 MWth and 622 MWe) and Zeran (1,560 MWth and 364 MWe) plants. SRP willow biomass is supplied from several large plantations within 200 km of Warsaw. In 2011, 160,000 tonnes of willow chip was used at these two plants. Unfortunately, this figure has fallen since due to the collapse in value of "green certificates" in Poland.

Nevertheless, there is an increasing demand for biomass and this bodes well for SRP. Whereas, there is limited potential for increasing woodfuel supplies from forestry sources, there is a large potential resource of 280,000 ha of uncultivated and fallow land that could be suitable for SRP cultivation. Furthermore, unlike some of the other clusters, Poland has a large number of young farmers and it may be possible to get them more interested SRPs.

> *We can very often use brochures, books and claim knowledge from the Internet, but still it is a questionable source of gaining information. Especially, when someone doesn't know where to start and there are a limited number of specific guides consisting of the basic knowledge needed to go further. Rokwood enabled many people from different circles to meet and exchange knowledge and experience in a much more straightforward way. My knowledge about biomass usage for energy and heat production has risen radically throughout the last three years. Before Rokwood, we even hadn't had the proper knowledge about biomass usage in our own country. We rather had imagined that biomass was a less effective and much more expensive energy source. Now the situation, the awareness has changed, and we see biomass in a completely different light.*
>
> **Łukasz Drzewaszewski, Gmina Załuski**

# Focus on Northern Germany

| | |
|---|---|
| **Population** | 19.5 m |
| **Area (ha)** | 13.77 m |
| **Area of SRPs today (ha)** | 2,500 |
| **Forest cover (ha)** | 2.37 m (17.2%) |
| **Installed capacity of biomass** | 500 MWth |
| **Biomass installations** | 7,500 |
| **Area of agricultural land (ha)** | 6.91 m (50.2%) |
| **Predominant agricultural land use** | Cereals, pasture |

**Rokwood partners:**

ttz Bremerhaven

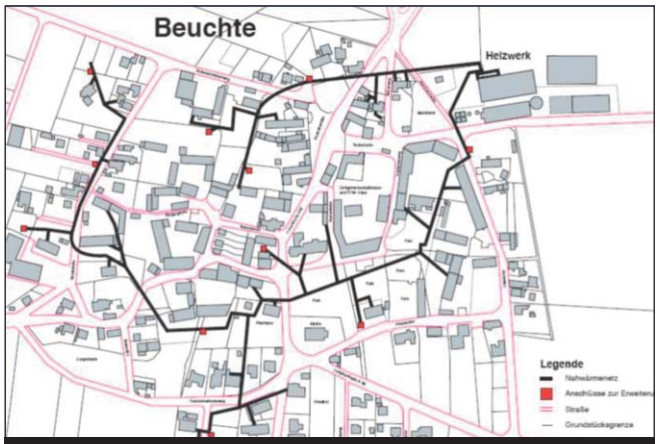
Agraligna

Regional Planning Authority Altmark

Due to climate change, limited fossil energy sources and the risks of nuclear power plants, the German government has initiated the "Energiewende", a transformation process aimed at an energy system based on renewable energy. Biomass is an essential part of this process, and the *Nationaler Biomasseaktionsplan für Deutschland* programme was released in 2009. In parallel, the German government implemented several financial programmes to support the growth of the bioenergy-economy, especially the Renewable Energy Act.

The political toolset has been very successful, leading to increasing numbers of bioenergy plants. However, the increase in utilization of biomass for energy production also caused an intensive critical discussion in Germany about limited resources, the competition of food vs. fuel, agricultural monocultures and tropical deforestation - finally leading to a significant reduction of the financial support of bioenergy projects in 2014. Thus, the current political support for bioenergy projects is very limited in Germany.

Northern Germany is the Rokwood cluster with the largest SRP area. This is mainly poplar although there is also some willow. The cluster partners are very keen to promote SRPs as a way of reducing the impact of flooding as part of floodplain forest management and reducing nutrient emissions into rivers and lakes. In this way, SRPs could play a part in achieving targets of the European Water Framework Directive.




**Layout of district heating network at the village of Beuchte. Sixty-five houses are heated with SRP poplar grown on nearby farmland.**

> *In our cluster region we have the 'best practice' example of Beuchte, a small village where 65 houses are joined to a district heating system fueled by woodchips produced from 30 hectares of local SRPs and operated by our partner Agraligna. The example of Beuchte was repeatedly presented to project partners through staff exchanges and training workshops, many of whom wish to replicate the initiative in their countries.*
>
> **Christoph Knaeur, TTZ Bremerhaven**

> *Beuchte is a village of 400 inhabitants like thousands of others across Germany. If it is possible to start this in Beuchte then it is possible to do it anywhere.*
>
> **Clemens von König, Agraligna**

**Top: Rokwood partners visit the Beuchte Bioenergy Village boiler house (June 2014). Below: Clemens von König (Agra) shows partners around poplar plantations used to fuel the Beuchte Bioenergy Village.**

# Focus on South West England

| | |
|---|---|
| **Population** | 5.3 m |
| **Area (ha)** | 2.38 m |
| **Area of SRPs today (ha)** | 93 |
| **Forest cover (ha)** | 250,000 (10.5%) |
| **Installed capacity of biomass** | 280.3 MWth |
| **Biomass installations** | 3,414 heating boilers |
| **Area of agricultural land (ha)** | 1.91 m (80.4%) |
| **Predominant agricultural land use** | Livestock and dairy |

**Rokwood partners:**

Centre for Sustainable Energy (CSE)

Crops for Energy

Dorset County Council

The South West of England is dominated by livestock farming: 75% of the land is grass or rough grazing (representing 29% of all English grassland) and this is home to around a third of the English beef and dairy herd and a fifth of its sheep. Around 37% of land in the South West is designated nationally for its landscape quality and includes two National Parks, 14 Areas of Outstanding Natural Beauty and just under a quarter of the Sites of Special Scientific Interest (SSSI) in England. There are tighter restrictions on growing energy crops in designated areas.

The current area of SRPs in SW England is 93 hectares although there are also around 900 hectares of miscanthus. There are no biomass power stations in the region and a large amount of the energy crop biomass is exported to Drax Power Station nearly 400 km away. There are significant opportunities for SRPs in the region based on their multifunctional attributes. The SW has a high dependency on oil heating in rural areas, low woodland cover, many areas that are prone to flooding and issues with diffuse water pollution from agriculture. Planted appropriately, SRPs could provide several benefits to society from a single plantation.

The UK Government introduced the world's first Renewable Heat Incentive in 2011. The South West is the leading region for biomass boiler installations. Around 2,500 have been installed since the Rokwood project started but only a few are using energy crops.

**Kevin Lindegaard (C4E) talks to Rokwood partners and other stakeholders at Fenswood Farm, Bristol (Jan 2014). The farm hosts trials for the Rothamsted Research willow breeding programme**

**Andrew Wear of Fernhill Farm addresses Rokwood partners about his wetland eco system using willows and other plants for cleaning effluent from the farm (Jan 2014).**

> *Energy crops are a hard sell in the UK. Farmers have seen projects fail and markets disappear and are reluctant to plant. You get the impression that policy makers are a bit bored by the subject – it's as though they think that energy crops have had their fair share of incentives. Within the biomass industry there is reluctance to embrace SRPs especially in the small scale heat sector. And then there are some conservationists who really should be supporting us (as we're fighting the same battles) but instead are often a thorn in our side. We've engaged with all these people during Rokwood. It's a slow process but I'm convinced that mindsets are gradually changing.*
>
> **Kevin Lindegaard, Crops for Energy**

> *Hopefully the project has gone some way towards raising the profile of SRPs in the South West, for example by inviting key policymakers to the seminar in Bristol last year, by distributing the policy briefs, and by inviting current and potential stakeholders to site visits and workshops. It is also hoped that these activities will lead to new projects in the South West that are practical and/or research-based.*
>
> **Martin Holley and Annette Lamley, CSE**

# Biodiversity in SRPs

Apart from producing usable biomass, SRPs provide a host of additional benefits including erosion control, soil improvement, water quality improvement, flood defence and windbreaks. They can also be beneficial to wildlife, and increase levels of flora and fauna on farmland. This is quite contrary to the received wisdom that they are sterile monocultures. These pictures on this page were taken in SRP plantations across Europe from Ireland to the Czech Republic. We've given this some prominence in our final publication in order to share the message that SRPs can provide fuel whilst adding diversity to the landscape, helping to safeguard biodiversity and providing other ecosystem services.










**TOP ROW** Bird's nest in willow, Czech Republic (©Jan Weger); Caterpillar of lesser willow sawfly feeding on willow (©Rothamsted Research Ltd); Fieldfare in willow, UK (©Rufus Sage); Roe deer in front of SRP willow, Sweden (©Nils Erik Nordh). **CENTRE ROW** SRPs tolerate inundation and their many stems help prevent soil erosion and potentially reduce the flow of flood water. (©Kevin Lindegaard); Willow can provide shelterbelts and windbreaks for horticultural crops (©Kevin Lindegaard); bumble bee foraging for nectar on willow, UK (©Jonathan Carruthers). **BOTTOM ROW** Feathered thorn caterpillar on a willow, UK (©Kevin Lindegaard); hens and ducks feeding in an enclosed SRP willow plot, Czech Republic (©Jan Weger); leaf litter from SRPs improves the nutrient status of poor quality soils and increases invertebrate populations (©Kevin Lindegaard)

# SRP crops compared

**Salix** *(Common names: willow, osier, sallow)*

| | |
|---|---|
| Native range | Northern temperate zones |
| Typical rotation length | 3 years |
| Stocking rate (plants/hectare) | 15,000 |
| Mass density (kg/m$^3$) | 400 |
| Typical yield range (dry tonnes/ hectare/year) | 8-10 |

**Populus** *(Common names: poplar, aspen, cottonwood)*

| | |
|---|---|
| Native range | Northern temperate zones |
| Typical rotation length | 3-5 years |
| Stocking rate (plants/hectare) | 1,667 or 6,000 |
| Mass density (kg/m$^3$) | 430 |
| Typical yield range (dry tonnes/ hectare/year) | 8-10 |

Pic: John Purse, Prima Bio

**Eucalyptus** *(Common name: gum tree)*

| | |
|---|---|
| Native range | Australasia |
| Typical rotation length | 10 years |
| Stocking rate (plants/hectare) | 1,667 |
| Mass density (kg/m$^3$) | 450 |
| Typical yield range (dry tonnes/ hectare/year) | 10-15 |

**Paulownia** *(Common name: foxglove tree)*

| | |
|---|---|
| Native range | North America and Asia |
| Typical rotation length | 10-15 years |
| Stocking rate (plants/hectare) | 1,667 |
| Mass density (kg/m$^3$) | 300 |
| Typical yield range (dry tonnes/ hectare/year) | 7-14 |

**Alnus** *(Common name: alder)*

| | |
|---|---|
| Native range | Northern temperate zones |
| Typical rotation length | 15 years |
| Stocking rate (plants/hectare) | 2,500 |
| Mass density (kg/m$^3$) | 550 |
| Typical yield range (dry tonnes/ hectare/year) | 3-5 |

**Betulus** *(Common name: birch)*

| | |
|---|---|
| Native range | Northern temperate/boreal zones |
| Typical rotation length | 20 years |
| Stocking rate (plants/hectare) | 5,000 |
| Mass density (kg/m$^3$) | 640 |
| Typical yield range (dry tonnes/ hectare/year) | 2-4 |

**Robinia** *(Common name: black locust)*

| | |
|---|---|
| Native range | North America |
| Typical rotation length | 5-7 years |
| Stocking rate (plants/hectare) | 6,666 |
| Mass density (kg/m$^3$) | 770 |
| Typical yield range (dry tonnes/ hectare/year) | 7-10 |

# The future for SRPs in Europe

## An SME perspective

I've been involved in SRPs for almost 20 years. When I began my career in the mid-1990s there was every suggestion that energy crops were going to be a really big part of future agriculture. There had already been 20 years of research and development and significant areas were being planted in Sweden and the UK. But instead of gradual and consistent growth, the industry has seen several localised surges in activity followed shortly afterwards by inertia. Across Europe there have been similar trends – anywhere where there is a significant area of energy crops grown there was once a favourable policy framework, followed by a few years of intense planting and then a rapid depression due to a market failure, a policy change or an increase in global commodity prices. Any embryonic sector like the energy crops industry finds itself vulnerable to these sorts of things – it is so easy for green shoots to be nipped in the bud. After 40 years of R&D the SRP sector can lay claim to just 50,000 hectares in the EU 28. Considering the utilised agricultural area is 176 million hectares this area is miniscule.

Yet despite this lack of penetration, forward energy plans continue to point to a massive role for fast growing trees and energy grasses. The most recent example, in the UK suggests that planting energy crops on 10% of the farmland (1.8 m hectares) could provide 6.3% of the UK's energy demand. This could reduce the cost of meeting UK's 2050 carbon targets by more than 1% of GDP*. To put that in perspective, these savings would be worth more to the economy than the entire current output from UK agriculture (0.7% of GDP in 2014).

At the same time, researchers continue to find more benefits that can be derived from these crops such as ecosystem services and multi-functionality. The suggestion is that SRPs have a positive energy balance of over 20 to 1. So, for every 1 unit of energy in you get 20 out. That makes for pretty good land use efficiency. On top of that you might get several uses from the same area of land – such as energy, improvements of local water quality and flood defence. Woodland and forestry do these things as well but SRPs achieve better results in a fraction of the time. Furthermore, instead of depriving us of precious land, these crops actually work in harmony with food production by offering beneficial insects and pollination services – SRP willows can provide abundant pollen and nectar at a time of year when there aren't many food sources available for foraging bees. We need pollinators to keep working for us so we can continue to produce fruit and vegetables. Potentially SRP willows could help rebuild bee populations and, who knows, if there are more bees around there may also be higher food crop yields as a result. You can potentially get so much value by planting these crops on a small fraction of the land and as SRPs are permanent crops they provide productivity and services for over 20 years. And all the while, these perennial crops are quietly locking up carbon in the soil.

The need is there and the benefits should be clear to everyone. Farmers need to be encouraged to plant and crucially, be rewarded financially for the benefits that these crops bring. It's time for long term planning and uninterrupted incentives that will lead to a sustainable growth industry. For farmers to grow SRPs and energy grasses they need certainty: few will risk a 20 year investment unless there is some guarantee that they will make money and the returns are favourable compared to other crop options. As long as we expect farmers to take the large proportion of the risk we will get nowhere. Also, the perceived wisdom that SRPs create sterile monocultures needs to be challenged and politicians and policy makers must have courage in their convictions and respond positively to the scientific outputs from research bodies. If public money pays for research and the findings point in one direction then we need to follow this course, not ignore it or go the opposite way.

Time is short – we have 15 years to 2030 and 35 until 2050. If we really want to make a positive difference to the planet we need to act now. Rokwood has helped lay a platform to build on. There is a future for SRPs in Europe – now is the time to start realising the potential.

**Kevin Lindegaard**
**Crops for Energy Ltd (October 2015)**

* Bioenergy: Enabling UK Biomass. An insights report by the Energy Technologies Institute (www.eti.co.uk/bioenergy-enabling-uk-biomass)

**Rokwood partners meeting, Warsaw 2015**


## List of Rokwood partners, and people who worked on the project

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Our apologies if we've left anyone off this list!

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