



European Network for  
Rural Development

EN

**EU RURAL REVIEW**  
No 28

# MAINSTREAMING THE BIOECONOMY



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## Introduction

The theme of this EU Rural Review is mainstreaming the bioeconomy. With the spotlight firmly focused on how society can manage its natural resources in a sustainable way, rural areas around Europe are increasingly getting primed and ready to reap the benefits of the bioeconomy. The rollout of the new EU Bioeconomy Strategy is set to accelerate this process further.

In 2018, the European Commission relaunched its EU Bioeconomy Strategy and Action Plan. The updated approach builds on insights gained since the original strategy was published in 2012.

The bioeconomy is defined as, “those parts of the economy that use renewable biological resources from land and sea – such as crops, forests, fish, animals and micro-organisms – to produce food, materials and energy”<sup>(1)</sup>.

With a turnover value of €2.3 trillion and accounting for 8.2 % of the EU’s workforce, the bioeconomy is already central to the success of the EU economy. Now the ambition is to do even more. And to do it sustainably. The updated strategy provides a comprehensive roadmap to scaling-up the bio-based sectors and unlocking investments and markets. It is targeting the rapid deployment of local bioeconomies across Europe.

The renewed EU approach also aims to better understand the ecological boundaries of the bioeconomy. A sustainable, thriving bioeconomy serves several policy priorities. It can build a carbon neutral future in line with the climate objectives of the Paris Agreement, as well as support the modernisation of the EU industrial base through the creation of new value chains and greener, more cost-effective industrial processes.

A sustainable and circular bioeconomy can turn bio-waste, residues and discards into valuable resources and can stimulate the innovations and incentives to help retailers and consumers cut food waste by 50 % by 2030.

While a sustainable bioeconomy can benefit the economy, society and the environment everywhere, it has a special relevance for rural development practitioners. That is because the bioeconomy covers all sectors and systems that rely on biological resources (animals, plants, micro-organisms and derived biomass, including organic waste) which are themselves typically strongly associated with rural areas. The bioeconomy thus includes and links: land ecosystems and the services they provide; all primary production sectors that use and produce biological resources (notably agriculture and forestry but also fisheries and aquaculture); and all economic and industrial sectors that use biological resources and processes to produce food, feed, bio-based products, energy and services. The fact that the processing of biomass is most efficiently done at source, highlights its strong economic potential for rural areas.

Simply put, the full deployment of a sustainable European bioeconomy is expected to create jobs and growth in rural areas through the growing participation of primary producers in local bioeconomies, and through diversification of their local economic activities. The value chain opportunity thus

(1) European Commission, DG Research and Innovation, <https://ec.europa.eu/research/bioeconomy/index.cfm>



encompasses both farmers and rural SMEs not linked to primary production.

The EU strategy foresees a strong and fast-growing start-up ecosystem in the biotechnology sector. Reaching full potential will require investment, innovation, the development of strategies, and implementation of systemic changes across sectors such as agriculture, forestry, food and bio-based industries.

Strengthening European competitiveness and creating jobs is a core objective of the EU's approach to the bioeconomy. Besides supporting innovation and fostering market development for bio-based products, the bioeconomy offers important opportunities for new jobs, regional economic development and improved territorial cohesion, including in remote or peripheral areas.

An ENRD Thematic Group on Mainstreaming the Bioeconomy<sup>(2)</sup> is providing insight into how bioeconomy policy can be used to support rural areas. The ENRD's Rural Bioeconomy Portal<sup>(3)</sup> is another useful source of information about the latest thinking and provides real-life examples. Getting it right means not only significant new sources of income for farmers and foresters; it will also boost local rural economies through increased investment in skills, knowledge, innovation and new business models – as recommended in the Cork 2.0 Declaration<sup>(4)</sup> of 2016.

## STRUCTURE OF THE PUBLICATION

### 1. A bioeconomy policy for rural areas

An introduction to the EU Bioeconomy Strategy from a rural perspective.

### 2. Capturing value in rural areas

An examination of bioeconomy value chains and how they can be calibrated to benefit rural areas.

### 3. Policy support to drive change

A consideration of the various European Agricultural Fund for Rural Development (EAFRD) tools for supporting the rural bioeconomy and of how to combine different support instruments.

### 4. Attracting new investment

How can rural entrepreneurs finance their bioeconomy projects? A number of financing options for bio-based business projects in rural areas are profiled.

### 5. Tailored regional and local approaches

A look beyond the EU Bioeconomy Strategy to see what local and regional actors can do to enhance the rural bioeconomy.

### 6. Building momentum

A profile of the different approaches rural areas can take to raising awareness, creating buy-in and developing the new skills needed to power the bioeconomy.

**The ENRD Contact Point**

(2) [https://enrd.ec.europa.eu/enrd-thematic-work/greening-rural-economy/bioeconomy\\_en](https://enrd.ec.europa.eu/enrd-thematic-work/greening-rural-economy/bioeconomy_en)

(3) [https://enrd.ec.europa.eu/greening-rural-economy/bioeconomy/rural-bioeconomy-portal\\_en](https://enrd.ec.europa.eu/greening-rural-economy/bioeconomy/rural-bioeconomy-portal_en)

(4) The Cork 2.0 Declaration expresses key concerns of rural communities and possible policy responses, [https://ec.europa.eu/agriculture/sites/agriculture/files/events/2017/cork-declaration-berlin/cork-declaration-2-0\\_en.pdf](https://ec.europa.eu/agriculture/sites/agriculture/files/events/2017/cork-declaration-berlin/cork-declaration-2-0_en.pdf)



# 1. A bioeconomy policy for rural areas

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This article explores the origins and evolution of the bioeconomy in Europe, and how it can be supported in rural areas. The resultant new bioeconomy value chains could be a catalyst for rural development and improve the sustainable use and management of natural resources.

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ORIGINS

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A SUSTAINABLE BIOECONOMY

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THE RURAL DEVELOPMENT OPPORTUNITY

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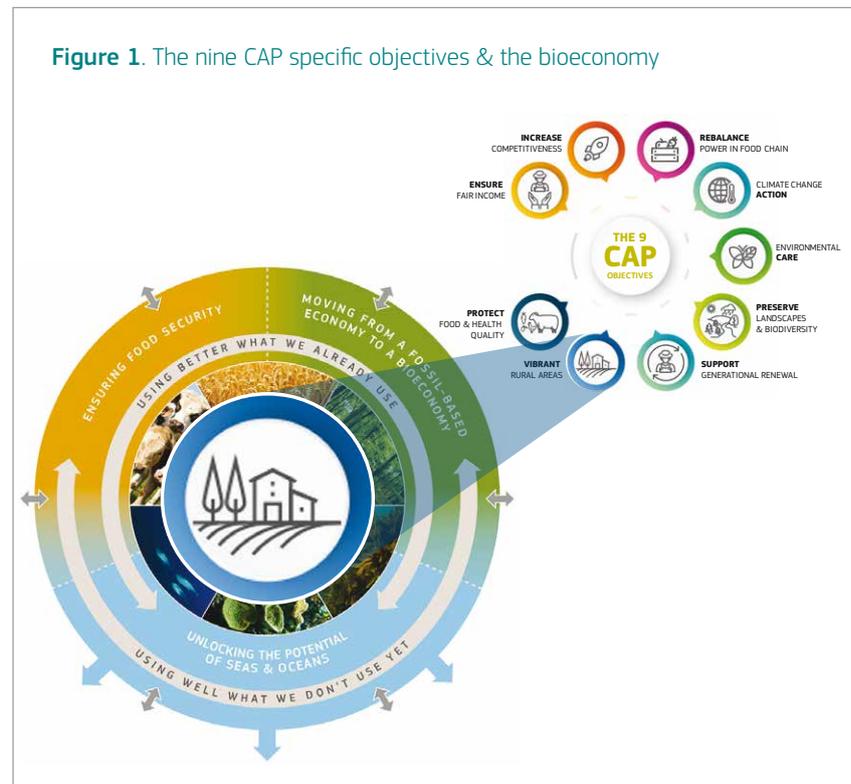
ENABLING THE CIRCULAR BIOECONOMY

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## ORIGINS

The term bioeconomy may be relatively new, but the concept behind it has formed the basis of human society for generations. “Before the industrial revolution and the discovery of fossil fuels, European and other economies were essentially bio-based. The production of food, feed, fuel and fibre and hence biomass has always been instrumental for economic growth and development.”<sup>(1)</sup> Yet the reliance on certain resources that have enabled the growth and development of most modern economies has come under scrutiny from both rising societal challenges (climate change and environmental degradation linked to an undermining of natural resources), as well as the recognition that many of the resources on which society relies, are finite. This has not been a sudden awakening, rather a gradual gaining of momentum around an idea that Europe needed to be more resource efficient in the way its economy developed.

The EU’s Bioeconomy Strategy was adopted in 2012<sup>(2)</sup>, setting out key definitions and needs from the bioeconomy but focusing primarily on research. Its objectives, which remain largely unchanged, focus on paving the way to a more innovative, resource efficient and competitive society that reconciles food security with the sustainable use of renewable resources for industrial purposes, while ensuring environmental protection. To this end the strategy identifies five objectives for the bioeconomy: Ensuring food security; Managing natural resources sustainably; Reducing dependence



on non-renewable sources; Mitigating and adapting to climate change; and Creating jobs and maintaining EU competitiveness.

The goal of bioeconomy policy is therefore not simply to increase agricultural or biomass output, but notably to deliver more sustainable resource use, mitigate and adapt to climate change and promote sustainable growth. The bioeconomy is therefore closely linked to the circular economy agenda, one of resource efficiency, the reuse of resources, and more sustainable consumption and production patterns. The adoption of the EU Circular Economy Strategy and Action Plan in 2015 moved European thinking forwards in relation to how resource

efficiency should be achieved across the economy – bio included.

A review of the EU’s Bioeconomy Strategy followed in 2017<sup>(3)</sup>. It concluded that more investment was needed, that emerging policy objectives needed to be addressed (including global commitments to the UN Sustainable Development Goals and climate mitigation), and clear indicators defined to ensure the bioeconomy operates within natural resource limits. The 2018 roadmap ‘Update of the 2012 Bioeconomy Strategy’ reinforced the main purpose of the bioeconomy strategy and provided an updated action plan with three key objectives and 14 concrete measures, emphasising the delivery of a circular

(1) H. Hoff, F.X. Johnson, B. Allen, L. Biber-Freudenberger, J.J. Förster (2018) *Sustainable bio-resource pathways towards a fossil-free world: the European bioeconomy in a global development context*, Policy Paper produced for the IEEP Think2030 conference, Brussels, October 2018.

(2) European Commission (2012) *Innovating for sustainable growth: A Bioeconomy for Europe*, <https://publications.europa.eu/en/publication-detail/-/publication/1f0d8515-8dc0-4435-ba53-9570e47dbd51/language-en/format-PDF/source-102979648>

(3) European Commission (2017) *Review of the 2012 EU Bioeconomy Strategy*, [https://ec.europa.eu/research/bioeconomy/pdf/review\\_of\\_2012\\_eu\\_bes.pdf](https://ec.europa.eu/research/bioeconomy/pdf/review_of_2012_eu_bes.pdf)

bioeconomy focused on delivering the UN Sustainable Development Goals and EU commitments to greenhouse gas emission reduction, whilst further contributing to rural development. The three-tiered plan aims to: 1) strengthen and scale up the bio-based sectors, unlock investments and markets; 2) deploy local bioeconomies rapidly across the whole of Europe; and 3) understand the ecological boundaries of the bioeconomy.

The recognition of the need for increased investment is crucial. In addition to the €100 million Circular Bioeconomy Thematic Investment Platform set up under the first point

mentioned above, research investment is being realised through the proposed increase in research and development funding targeted towards agriculture and the bioeconomy.

Central to enabling the bioeconomy in the EU will be the Common Agricultural Policy (CAP) with the tools and budget available to deliver change in agriculture, forestry and wider rural sectors. The new Bioeconomy Strategy emphasises the impact on rural areas and the need to empower primary producers in value chains.

Beyond 2020 the CAP will aim to deliver against nine specific objectives (Figure 1) all of which could be facilitated through development

of a sustainable bioeconomy. The bioeconomy features explicitly as one of the CAP's objectives – in relation to 'vibrant rural areas' – specifically "Promote employment, growth, social inclusion and local development in rural areas, including bio-economy and sustainable forestry"<sup>(4)</sup>. Each Member State will be tasked with drawing up a CAP Strategic Plan to outline their targets and expected results according to these nine objectives. It is therefore essential that the CAP strategic plans are aligned to the aims of the EU Bioeconomy Strategy and that public funds through the CAP are used to support the sustainable development of the EU and Member State bioeconomies.

## A SUSTAINABLE BIOECONOMY

At its heart, the idea behind the bioeconomy is one of transition, a change from a culture of over consumption and resource depletion, to one where economic growth goes hand-in-hand with the rebuilding of natural resources on which an economy relies. Growing within ecological boundaries captures part of this ideal, yet it is all too easy to think that the bioeconomy can replace the fossil economy directly. It can't, at least not yet.

The material consumption per capita in the EU is orders of magnitude larger than can be met through the use of biomass from conventional production systems and approaches alone. Many countries in the EU rely on imported food, either from neighbouring countries, or beyond. The development of the bioeconomy should therefore encourage sustainable and synergistic resource use, rather than adding to resource pressure.

"A new bio-based economy or bioeconomy can help to address the dilemma of meeting increasing demand for goods and services of a growing and more wealthy population, while at the same time halting the over-exploitation of resources and degradation of ecosystems and biodiversity and also mitigating climate change. [...] The transition to such a bioeconomy as part of an overall sustainability transition promotes green and inclusive growth, moving beyond low-productivity 'natural economies' and high-input fossil economies which have come to their limit" (*Hoff et al*, 2018).

Developing within existing resource availability means that the bioeconomy itself needs to be highly efficient, targeted at the delivery of priority products and services for society and feeding into an economy that is increasingly circular. The

delivery of a wider circular economy (i.e. where overall consumption is reduced and based on principles of reuse and recycling) is a precondition of a successful and sustainable evolution of the bioeconomy.

Traditionally bioeconomy activities have been seen very much from a production perspective, i.e. what can be produced from biomass to replace or complement non-renewable materials in the economy. The Bioeconomy Stakeholder Manifesto<sup>(5)</sup> (2017) notes, "advancements in bioeconomy research and innovation uptake will allow Europe to improve the management of natural resources and to open new and diversified markets in food and bio-based products. This will be important in order to cope with an increasing global population, rapid depletion of many resources, increasing environmental pressures and climate change, as Europe needs to radically change its

(4) [https://ec.europa.eu/commission/sites/beta-political/files/budget-may2018-cap-strategic-plans\\_en.pdf](https://ec.europa.eu/commission/sites/beta-political/files/budget-may2018-cap-strategic-plans_en.pdf)

(5) [https://ec.europa.eu/research/bioeconomy/pdf/european\\_bioeconomy\\_stakeholders\\_manifesto.pdf](https://ec.europa.eu/research/bioeconomy/pdf/european_bioeconomy_stakeholders_manifesto.pdf)

approach to production, consumption, processing, storage, recycling and disposal of biological resources.”

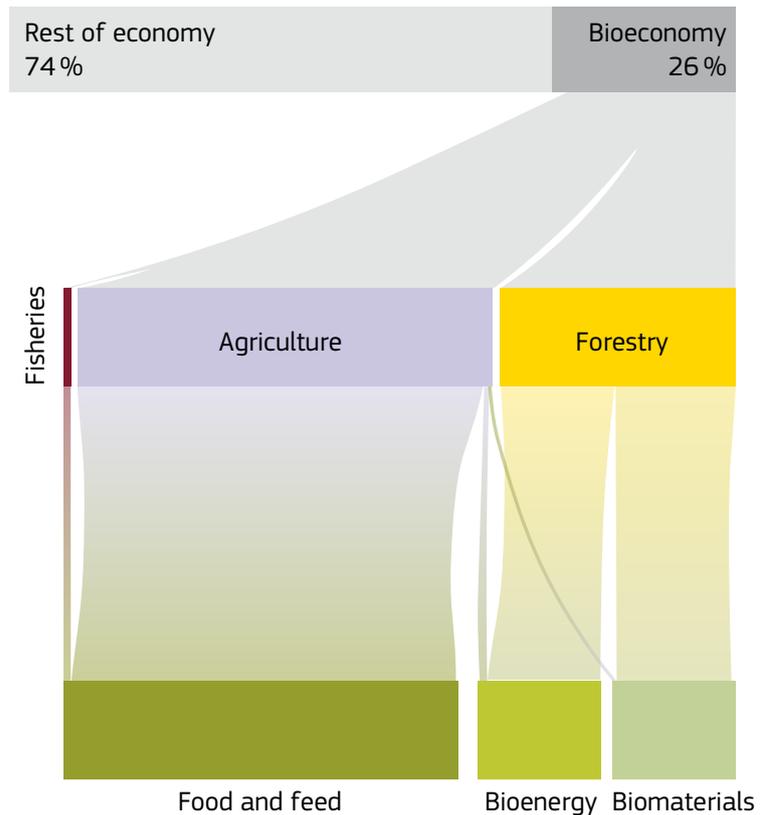
This approach has helped to realise new value from materials that would otherwise need to be disposed of (such as animal manure, food waste, and harvesting residues) and in many cases, improve resource efficiency. In turn, this has created new value chains in the rural economy, whilst supporting a greener society.

Yet whilst the replacement of fossil and non-renewable materials and energy is essential in greening the European economy, it is only part of the picture of what could be a more sustainable and circular bioeconomy. The bioeconomy can, and one could argue should, include all the economic benefits that arise from the management and use of natural resources. Within that scope one can look beyond the production of biomass for materials, chemical and energy, and include the management and protection of natural habitats and landscapes, including the management of water flows and recycling of nutrients and organic matter back to soils, which help to protect and support societies and much, much more. These service-based bioeconomies already exist, and are part of the fabric of rural society, supported through Rural Development Programmes (RDPS). Yet they rarely feature in Member State bioeconomy strategies.

**Figure 2. Bioeconomy material flows in the EU economy** (EEA Report No 8/2018)

Agriculture currently constitutes about 63% of the total biomass supply in the EU, forestry 36% and fisheries less than 1%. Food and feed account for 62% of the EU's biomass use, with materials and energy each representing around 19%.

**Material flow**



Sources: JRC Biomass project; 2016 Bioeconomy report (Ronzon, et al., 2017); Eurostat MFA.

**THE RURAL DEVELOPMENT OPPORTUNITY**

The major part of the bioeconomy can be traced back ultimately to land managed by farmers and foresters. Fisheries and aquaculture are important too but currently represent a much smaller share of the bioeconomy (220 000 jobs, € 11 bn turnover and € 7 bn in value added).

The production of biomass, be it timber or crops, feeds the bioeconomy and brings employment to rural areas. The estimated current benefits of the bioeconomy to agriculture and forestry are 9.7 million jobs, a turnover of € 430 bn or nearly € 200 bn in value added to the economy<sup>(6)</sup>. Developing

novel bioeconomy value chains from this biomass creates further value – such as in Ireland where private companies, research institutions and farmers set up an EIP-AGRI project that will help farmers improve their income by becoming biomass processors rather than just suppliers

(6) <https://www.mdpi.com/2071-1050/10/6/1745>



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### CASE STUDY: SERVICE-BASED BIOECONOMY VALUE CHAINS

**ESPUBIKE, Spain** – RDP support financed the design of a circular cyclist trail of 146 km across the regional park Sierra Espuña. The project also funded the development of a website (<http://espubike.com/en/>) and social network profile to attract interested visitors. The route supports the local economy as bikers who follow the route are potential consumers for the local business around the itinerary and has boosted a sustainable type of tourism in the area. The route is there to take advantage of the high quality, well managed natural landscape.

- [https://enrd.ec.europa.eu/projects-practice/espubike\\_en](https://enrd.ec.europa.eu/projects-practice/espubike_en)

**Promoting traditional food products in Mazovia region, Poland** – A Polish NGO used European Agricultural Fund for Rural Development (EAFRD) funding to develop a culinary trail, a food contest and a series of educational courses. The Culinary Trail of Mazovia was launched promoting local producers and increasing their visibility including through a film and a book. A culinary contest was created to give prizes to the best local and traditional products of Southern Mazovia.

- [www.razemdlaradomki.pl](http://www.razemdlaradomki.pl)
- [https://enrd.ec.europa.eu/projects-practice/promoting-traditional-food-products-mazovia-region-poland\\_en](https://enrd.ec.europa.eu/projects-practice/promoting-traditional-food-products-mazovia-region-poland_en)

of raw biomass. The project will provide new opportunities to diversify agricultural production and contribute to reducing GHG emissions in the agricultural sector<sup>(7)</sup>. It will be crucial that primary producers and rural actors are empowered in these novel value

chains, and able to capture a fair share of the value added.

However, these figures take a narrow view of the bioeconomy and focus only on the economic activities related to the production and manufacturing of biomass. The employment and

value added linked to tourism, avoided negative impacts (such as flooding) due to effective land management, and nature benefits are not quantified, but would raise this value considerably (see service-based examples on this page). The new EU Bioeconomy Strategy recognises some of these broader concepts, from the preservation of nature and restoration of healthy ecosystems to the increased carbon sink capacity of soils and forests.

Rural Development support through the CAP is an important source of funding to realise the benefits of the bioeconomy in rural areas, particularly in the development of value chains, associated infrastructure and facilities. In turn, the development of the bioeconomy offers the potential to support the CAP objectives such as viable food production, sustainable management of natural resources and climate action, balanced territorial development, and ensuring a fair income to farmers. Delivering that shift requires considering environmental and social needs: supporting value addition within rural areas and more resource efficient, environmentally beneficial and climate sensitive practices, alongside delivering new, innovative end products.

With the majority of European citizens living in urban areas, there is a natural flow of biomass, nutrients and added value from rural areas to urban, i.e. from where biomass is produced to where most products are manufactured, sold and consumed. One of the opportunities in developing new sustainable rural bioeconomy value chains is in strengthening the linkages between rural and urban areas, and developing new ways of ensuring that value, materials, nutrients and energy can be made to flow back to

(7) [https://enrd.ec.europa.eu/sites/enrd/files/bioeconomy\\_casestudy\\_ie\\_biorefinery.pdf](https://enrd.ec.europa.eu/sites/enrd/files/bioeconomy_casestudy_ie_biorefinery.pdf)

these primary sectors, to farmers and foresters.

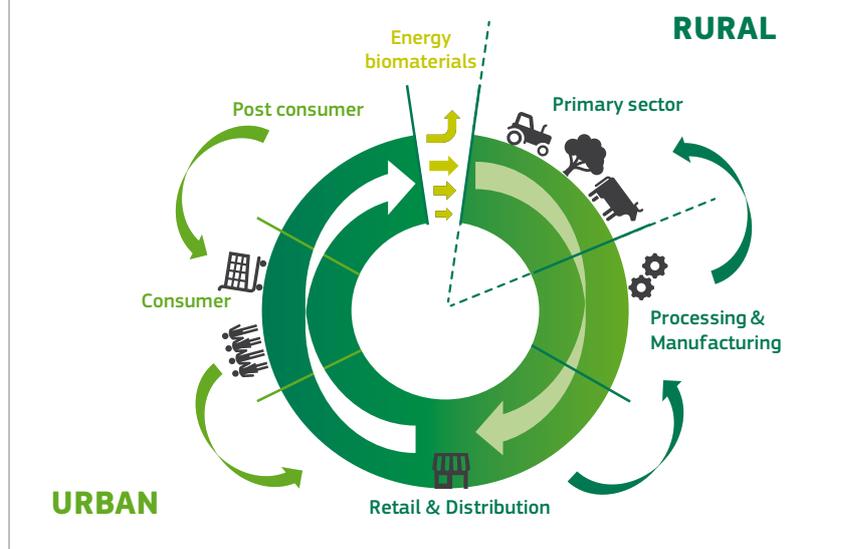
Figure 3 depicts a circular-bioeconomy value chain that allows the flow of biomass and value starting from primary sectors in rural areas, moving through manufacturing, retail and ultimately to consumers in urban ones, to make its way back to rural areas.

It is important to ensure that rural actors, particularly primary producers, benefit from (in terms of added value) and are incentivised to be part of the circular bioeconomy and to reduce pressure on natural resources. Ensuring that post-consumer materials, such as nutrients from composted food and other biomass, flow back to rural areas is one of the challenges faced when implementing the circular bioeconomy, requiring dedicated measures and policies, as well as transport and supply networks. It is also important to recognise that circularity can happen at any point in the value chain, rather than only at the end-of-life phase.

Integrating circularity into existing bioeconomies, and closing nutrient, energy and material loops, should enable this, such as the example in Ikšķile community (Latvia) which has captured waste orchard fruit to produce juice for local consumption (see case study on this page). However, this is not without its challenges and relies on the development of well-functioning bioeconomy value chains that build on the use of wastes and resources, and where products are designed for recovery.

Service-based value chains, such as those associated with rural tourism, do not involve material flows, but generate economic, environmental and social value based on the natural assets of rural areas, through for example accommodation on farm stays, guided tours or equipment rental. These activities further help

Figure 3. Circular bioeconomy – the rural-urban link



to diversify farm incomes, increasing rural employment and reducing the exposure to risk stemming from dependence on production alone (e.g. crop or animal disease, drought).

Value added from the bioeconomy should be delivered at all stages of the supply chain from producers (farmers, foresters) to processors, final product manufacturers and consumers. In turn, consumers need to recognise their role as facilitators of the bioeconomy,

in the decisions they make when buying food and other agricultural and forestry commodities. A circular bioeconomy implies both farm-to-fork and fork-to-farm thinking.



### NEW SERVICE AT IKŠĶĪLE COMMUNITY – JUICE PRODUCTION<sup>(1)</sup> (LATVIA)

A local association observed that many people in the community with private orchards were unable to consume all of the ripe autumn fruit from their trees. Sometimes people were throwing away their excess apples and pears, yet buying fruit juice for their personal consumption. The association purchased a fruit shredder, modern juice pressing equipment, packaging equipment and a small fruit dryer. The resulting local community service was made mobile to enable the equipment to be brought directly to the customer. The project saw excess fruits being turned into juice instead of wasted. It provided a boost to the local economy and reduced food waste. Around 400 local community members use this service each season. The consumption of local fruits (apples, pear and berries) increased including at the local school contributing to healthier diets for the students.

(1) [https://enrd.ec.europa.eu/projects-practice/new-service-ikskile-community-juice-production\\_en](https://enrd.ec.europa.eu/projects-practice/new-service-ikskile-community-juice-production_en)

## ENABLING THE CIRCULAR BIOECONOMY

Developing new product-based and service-based bioeconomy value chains requires planning and the engagement of a wide variety of rural actors. Having a clear message and direction is essential. This means bringing together what can quite often be disparate plans and strategies into a coherent vision for rural areas. These strategies can include Member State's long-term, low-emission strategies<sup>(8)</sup>, and existing bioeconomy and circular economy strategies. The new post 2020 CAP Strategic Plans offer an opportunity to bring together such strategies and frame their objectives in a coherent way, linked to financial and other support mechanisms.

Whilst the bioeconomy is well established, developing new value chains can take time, require long-term investments, and new knowledge and skills. This means bringing together new rural actors with existing ones to explore, develop and innovate, renewing efforts to engage and empower rural actors who already struggle to have a voice in the more established agri-food chain. Doing so requires support, advice, and education. This should also include mechanisms that reward first movers, and also protect them from the risks associated with a sector reliant on an evolving pool of technology and knowledge. Flexibility to adapt and change will also be important, avoiding system lock-in – whereby choices prevent change.

As sustainable rural bioeconomy value chains develop, it will be important to make sure they capture value in rural areas (see page 11), by using

### A VALUABLE BIOECONOMY RESOURCE

The ENRD Thematic Group (TG) on 'Mainstreaming the Bioeconomy' brings rural development practitioners from different Member States together to examine how the bioeconomy is working in rural areas. Its objective is to encourage the development of sustainable bioeconomy value chains in rural areas that promote economic growth and employment.

Since September 2018, the TG has been working to analyse national and regional bioeconomy strategies and investigate current initiatives in EU Member States. Its work is providing insights into the opportunities that exist to develop bio-based business models in rural areas.

On the occasion of the ENRD Seminar 'Bioeconomy: Seizing the opportunity for rural Europe'<sup>(1)</sup> on 3 July 2019, the TG presented recommendations on how to best support the development of sustainable bioeconomy under the EU's current Rural Development Programmes and the future CAP Strategic Plans.

Complementing the work of the TG, the ENRD's Rural Bioeconomy Portal<sup>(2)</sup> is a useful repository of European and national policy documents, inspiring sustainable bioeconomy project examples and news and events about the rural bioeconomy.

(1) [https://enrd.ec.europa.eu/news-events/events/enrd-seminar-bioeconomy\\_en](https://enrd.ec.europa.eu/news-events/events/enrd-seminar-bioeconomy_en)

(2) [https://enrd.ec.europa.eu/greening-rural-economy/bioeconomy/rural-bioeconomy-portal\\_en](https://enrd.ec.europa.eu/greening-rural-economy/bioeconomy/rural-bioeconomy-portal_en)

the CAP and other complementary policy instruments to drive change (see page 19), and getting buy-in from local actors (see page 37) through approaches tailored to local and regional contexts (see page 32) that bring new investment (see page 26). The development of small-scale business models and simple, inexpensive technologies that primary producers can adopt on their own would play a role in empowering them in this emerging sector. These themes are explored further in this edition of the EU Rural Review, building on the work of the ENRD Thematic Group on Mainstreaming the Bioeconomy<sup>(9)</sup>.

(8) The Regulation on the governance of the Energy Union is part of the 'Clean Energy for all Europeans' package. A requirement of the Regulation is that Member States prepare long-term low emission strategies with a 50 years perspective, in order to cost-effectively achieve long-term Paris Agreement goals, [https://eur-lex.europa.eu/resource.html?uri=cellar:ac5d97a8-0319-11e7-8a35-01aa75ed71a1.0024.02/DOC\\_1&format=PDF](https://eur-lex.europa.eu/resource.html?uri=cellar:ac5d97a8-0319-11e7-8a35-01aa75ed71a1.0024.02/DOC_1&format=PDF)

(9) [https://enrd.ec.europa.eu/enrd-thematic-work/greening-rural-economy/bioeconomy\\_en](https://enrd.ec.europa.eu/enrd-thematic-work/greening-rural-economy/bioeconomy_en)



## 2. Capturing value in rural areas

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Capturing and retaining bioeconomy value in rural areas offers much potential for future growth. This article examines what bioeconomy value chains are and how they can be calibrated to benefit rural areas.

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**BIOECONOMY IN RURAL AREAS**

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**BIOMASS AND RURAL BIOECONOMY VALUE SYSTEMS**

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**BUILDING A SUSTAINABLE RURAL BIOECONOMY**

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**CREATING RESILIENT VALUE SYSTEMS**

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**BIOENERGY AND NEW OPPORTUNITIES IN FORESTRY**

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## BIOECONOMY IN RURAL AREAS

Agriculture and forestry have a long history of injecting value into the European economy. They are also at the centre of the European bioeconomy, providing vast amounts of biological resources, and together covering 84% of EU territory. These sectors are in turn strongly linked with rurality. This means that rural areas, which provide homes and livelihoods for millions of people, play a major role in mitigating climate change through carbon sequestration and are at the heart of the movement to shift away from non-renewable materials and energy sources. Over the long term, a flourishing bioeconomy should contribute to creating more jobs and growth in rural areas, and potentially to the repopulation of certain regions.

A sustainable rural bioeconomy depends on multiple factors, including the creation of resilient and local value chains that promote the circular and cascading use of biological resources. In order to understand what kind of value chains or systems should be developed, it is essential to first characterise the specific bioeconomy potential of a given rural area and the types of value that local rural biomass can provide.

Following the approach taken by the EU Bioeconomy Strategy, the terms ‘biomass’ and ‘biological resources’ are used here interchangeably, both referring to ‘animals, plants, micro-organisms and derived biomass, including organic waste’<sup>(1)</sup>. In the rural context, this covers a diverse set of

resources from trees to microbiomes in the soil.

Urban farming and municipal biowaste refineries have been promoted to great fanfare all over the world and are a great way to introduce the idea of bioeconomy to an urban public, but the real biomass wealth can be found in rural regions. Indeed, areas with lower population density provide biological resources and value that can be used and created across sectors.

Through centuries of working the land and managing forests, rural regions have made a sizeable contribution to the economy. Europe is home to a wide variety of climates and soils, resulting in diverse biomass that is suitable for many uses, including very high-value innovative ones. Some examples include energy crops, agricultural, aquatic and forest biomass sidestreams (residues), horticultural and non-wood forest products.

This biomass can be turned into bioenergy and biofuels (e.g. ethanol), chemicals (e.g. adhesive components, sugar alcohols) and bioproducts (e.g. bioplastics). Current practices involve the transportation of large amounts of biomass from production sites (fields) to processing sites and with little thought given to sidestreams and waste, which leads to value loss and low benefit redistribution to local communities.

Thus, new approaches to value creation and different business models are needed to keep biomass transformation local as long as possible and with as little loss as

possible. Over the long term, the aim should be to create interconnected sustainable local circular bioeconomies that come together to form a strong EU-wide circular bioeconomy.

While very important, rural bioeconomies are nevertheless largely dependent on the production phase – on the land, waterways and forests that produce the biomass. With a changing climate and with many areas expected to experience more severe weather phenomena<sup>(2)</sup>, e.g. prolonged droughts or ‘seasonally uncharacteristic’ frosts, biomass production can be disrupted. Local communities may face, and some are already facing, the need to find more adapted and reliable biomass varieties (see for example, the work performed by the EIP-AGRI Focus Group on Forest Practices & Climate Change<sup>(3)</sup>). Moreover, the markets for biomass, bioenergy and biofuels, and bio-based materials and products, can be volatile. Any new practices and business models introduced must take this into consideration and provide ways for value chain actors to weather shocks, for example through diversification of biomass sources and the building of strong value systems that accept multiple inputs and provide diverse outputs.

In addition to fulfilling its economic potential, the development of the bioeconomy in rural areas should also be done while keeping in mind the close links and balance between the land and forest uses, ecological limits, and the livelihoods and well-being

(1) European Commission (2018) *A sustainable bioeconomy for Europe: strengthening the connection between economy, society and the environment – Updated Bioeconomy Strategy*, [https://ec.europa.eu/research/bioeconomy/pdf/ec\\_bioeconomy\\_strategy\\_2018.pdf](https://ec.europa.eu/research/bioeconomy/pdf/ec_bioeconomy_strategy_2018.pdf)

(2) European Academies’ Science Advisory Council (EASAC) (2018) *Extreme weather events in Europe: Preparing for climate change adaptation: an update on EASAC’s 2013 study*.

(3) [https://ec.europa.eu/eip/agriculture/sites/agri-eip/files/eip-agri\\_fg\\_forest\\_practices\\_climate\\_change\\_final\\_report\\_2018\\_en.pdf](https://ec.europa.eu/eip/agriculture/sites/agri-eip/files/eip-agri_fg_forest_practices_climate_change_final_report_2018_en.pdf)

of the local population<sup>(4)</sup>. Changes and new practices on the ground will have environmental and social impacts; great care must be taken to ensure that they do not endanger the long-term rejuvenation benefits for rural regions. For example, forest management practices should take into account the value of harvested

wood and the renewal of stocks but also the upkeep of the services provided by forested areas, such as providing habitats for a wide variety of species, influences on local climates and contribution to overall population well-being by providing access to nature. This multidimensional view of the development of the bioeconomy

is gradually making its way to the mainstream, via EU-funded actions requiring sustainability assessments<sup>(5)</sup>, updated legislative texts<sup>(6)</sup>, and increased engagement from civil society in the development of policies and practices.

## BIOMASS AND RURAL BIOECONOMY VALUE SYSTEMS

The value of biomass should not and cannot be simply equated to its value in monetary terms; it should be considered across the three pillars of sustainability. Biomass has economic potential, environmental importance and a social impact on multiple stakeholder groups. The success of rural bioeconomy value systems depends on all three areas being incorporated during the development process.

The notion of the 'value chain' was first introduced by Michael Porter in the 1980s to analyse a single company's activities and the flow of value creation and loss as those activities took place. As no company operates in a vacuum, it can be expanded to a 'value system' (or 'value web'), where the different value chains of suppliers, customers, distributors and other actors linked to the company's business are taken into consideration. The study of a whole value system and the flows among actors allows for increased efficiency, innovation through new actors and links, and a better overall use and sharing of resources. However, the analysis of large, complex value

systems can be challenging. While supply chain or value chain managers can perform this type of analysis on a smaller scale, it typically is a much more complex exercise involving specialists and academics.

At a more manageable and local scale, synergies and collaborations can be sought among local actors along and across value chains to optimise value creation and retention. This type of practice is referred to as industrial symbiosis/synergies and is being implemented throughout Europe. It is not limited to industrial zones but can be a great asset in rural areas. One of the earliest examples of

industrial symbiosis on a large scale in Europe is the Kalundborg industrial park in Denmark. It brings together an increasing number of partners that are currently exchanging 20 resources, as diverse as biomass, gypsum and steam<sup>(7)</sup>.

As originally defined and to maximise utility, in order to be considered an industrial symbiosis node, there must be a cluster of at least three entities that exchange at least two different resources (materials, energy, water or by-products)<sup>(8)</sup>. The aim of creating industrial synergies is to optimise resource use and close material loops, while ideally also lowering



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(4) See for example, Zabaniotou, A. (2018) *Redesigning a bioenergy sector in EU in the transition to circular waste-based Bioeconomy – A multidisciplinary review*, J. Clean. Prod., <https://doi.org/10.1016/j.jclepro.2017.12.172>

(5) [http://ec.europa.eu/research/participants/docs/h2020-funding-guide/cross-cutting-issues/climate-sustainable-development\\_en.htm](http://ec.europa.eu/research/participants/docs/h2020-funding-guide/cross-cutting-issues/climate-sustainable-development_en.htm)

(6) Such as Article 5 (5) of the European Agricultural Fund for Rural Development setting out 'Union priorities for rural development' in the 2014-2020 programming period, or the European Commission proposals for the CAP post 2020.

(7) <http://www.symbiosis.dk/en/>

(8) Chertow, M. (2007) 'Uncovering' Industrial Symbiosis. *Journal of Industrial Ecology* 11(1).

transportation and disposal costs. This type of approach also allows for further extraction of value from resources by finding new ways of keeping resources in the economy longer.

While some industrial synergies have formed organically through local stakeholder discussions (e.g. in the case of Kalundborg), funding agencies and policy-makers have also been called on to provide platforms where bioeconomy actors can find each other and create new connections and develop more efficient local business models<sup>(9)</sup>. One such example involving the forestry sector in Sweden is the industrial symbiosis network in Avesta, Sweden<sup>(10)</sup>, which has a long-established history and involves a sawmill and the energy company delivering district heating. Whereas industrial symbiosis used typically to be small scale, involving a few actors, it is evolving into the pooling and sharing of resources that can benefit a wider range of parties and the environment. New symbiosis strategies such as the Paper Province<sup>(11)</sup> in Varmland, Sweden, developing a multi-bio refinery that uses local industrial waste to produce renewable bio-based products, symbolise this more ambitious approach.

Indeed, historically, many rural areas have developed specialisations with a focus on a limited number of crops or raw materials, which are then transported over long distances for further processing with crop or material residues considered as waste. This approach quickly removes biomass value from rural areas to intermediary and industrial zones, often lacks efficiency and creates a very small and specialised local job market.



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### BIOGAS PTOLEMAIDA, GREECE

The case of Biogas Ptolemaida<sup>(1)</sup>, as illustrated as part of the SYMBI Interreg project<sup>(2)</sup>, is an example of industrial symbiosis centred on biological resources<sup>(3)</sup>. The company transforms slaughterhouse and agricultural by-products into biogas and then electricity and organic fertiliser. The original idea behind the collaboration was to find the best solution for complying with environmental legislation obligations for all the parties involved. Overall, this symbiosis node includes the bioenergy and organic fertiliser production unit, two municipal wastewater treatment plants, a slaughterhouse, a local cheese production unit and other agricultural enterprises located in the rural regions around Ptolemaida.

Although the initial costs linked to the biogas station were high and the set-up required the acquisition of new knowledge, this was facilitated through EU-backed projects. The early-stage cooperation also required willingness from all stakeholders to shoulder the risks linked to setting up a new operation.

- (1) <https://www.interregeurope.eu/policylearning/good-practices/item/1895/biogas-industrial-ecosystem/>
- (2) <https://www.interregeurope.eu/symbi/>
- (3) For further examples of industrial symbiosis, although not specifically related to the bioeconomy, see the SYMBI project 'Good Practices' page (<https://www.interregeurope.eu/symbi/good-practices/>) and the Finnish Industrial Symbiosis System (FISS) (<http://www.industrialsymbiosis.fi/>).

Local rural industrial symbiosis nodes can help resolve this issue, especially considering that there are currently several bioeconomy innovations in the pipelines of start-ups and research institutes, often based on agricultural and forest sidestreams and residues. Once these innovations reach an adequate technological readiness level and move beyond the pilot phases, they can be expected to take part in industrial symbiosis cooperation, with preference given to rural area

installations that make use of local decentralised bioenergy sources and are close to biomass sources. The building of such rural industrial symbiosis nodes not only develops the local economy but also provides ways for actors to diversify their income sources, either by monetising by-products and waste streams or by creating new service opportunities, for example linked to rural tourism.

(9) BIO-TIC project (2015) *A roadmap to a thriving industrial biotechnology sector in Europe*, <http://www.industrialbiotech-europe.eu/wp-content/uploads/2015/08/BIO-TIC-roadmap.pdf>

(10) <http://industriellekologi.se/symbiosis/avesta.html>

(11) <https://paperprovince.com/eng/about/>

## BUILDING A SUSTAINABLE RURAL BIOECONOMY

Renewable biological resources are often considered to be the sustainable alternative to non-renewable and fossil-based materials and fuels. While they are renewable, natural resources can be overexploited and face decreasing yields and the loss of great ecological diversity.

Some resources have already been put under strain: for example, degraded soils can be observed in many parts of Europe due to various factors, from forest fires in southern regions to acidifying air in northern ones<sup>(12)</sup>. The loss of EU agricultural productivity due to the most common form of soil degradation, soil erosion

by water, has been estimated at an annual 0.43 %, representing an important loss for the EU agricultural sector<sup>(13)</sup>.

In forests, some management practices promising quick yields (e.g. monocultures) have led to a loss in biodiversity that needs to be addressed. Biodiversity has an impact on the long-term productivity of forests; a large-scale worldwide study has shown that a 10 % decrease in biodiversity can lead to a 3% loss in productivity for forested areas<sup>(14)</sup>. Although the losses can appear negligible at first glance, over time they will inhibit the viable development of the bioeconomy

as well as limit the attractiveness and productivity of rural areas for future generations.

Thus, sustainability should be a top priority when considering biomass sources and their uses. Some decisions may lead to immediate economic benefits yet may risk causing irreparable damage and become a negative investment over time. The building of strong value systems in rural areas, based on good communication among all stakeholders and a shared vision of the future, can help alleviate such problems.



### 'OLEOTOURISM', SPAIN

When linked to primary production or natural assets, tourism can be a source of bioeconomy revenue generation. The increased interest in 'ecotourism', which aims to promote more responsible travel practices that respect the environment and the well-being of the local population, is an opportunity for rural areas.

The Spanish region of Andalusia was one of the most affected areas during the economic downturn in the late 2000s. Local rural regions, along with urban centres, are still recovering and suffer high unemployment rates. Increased tourism to the area has been part of the recovery process, especially in areas surrounding cities such as Seville and Malaga. Offers and activities linked to rural tourism are also explored, including so-called 'oleotourism' to help explore the traditions and customs of olive groves and olive oil production<sup>(1)</sup> and high value-added 'eco-luxury' stays<sup>(2)</sup>.

These activities can plug into existing value networks and further promote the long-term viability of the local rural (often purely agro) enterprises by further increasing the outputs and value proposed to consumers<sup>(3)</sup>.

While rural tourism can help rejuvenate the region, as it has done in urban and coastal areas, it can also come at a cost for sustainability. One of the main areas of concern is water scarcity: Andalusia is one of the hottest regions in Europe and has gone through many droughts in the last decades. Thus, the development of sustainable rural tourism requires discussion and agreement among the different stakeholders involved (e.g. holiday-makers, land and forest owners, farmers, policy-makers, local authorities). This approach has begun in some areas but is slow moving due to issues such as local populations being uninformed on sustainability issues<sup>(4)</sup>.

(1) Millán Vázquez de la Torre, María Genoveva, Luis Amador Hidalgo, and Juan Manuel Arjona Fuentes, *El oleoturismo: una alternativa para preservar los paisajes del olivar y promover el desarrollo rural y regional de Andalucía (España)*, Revista de Geografía Norte Grande 60 (2015): 195-214.

(2) E.g. La Donaira (<https://ladonaira.com>)

(3) See for example <https://www.elmundo.es/andalucia/2018/07/12/5b477897e5fdea62728b459b.html>

(4) Vázquez de la Torre, Genoveva, Luis Hidalgo, and Juan Arjona Fuentes, *Sustainable Rural Tourism in Andalusia: A Swot Analysis*, International Journal of Advances in Management and Economics 2.1 (2013).

(12) SoCo Project (2009) *Down to earth: Soil degradation and sustainable development in Europe*, [https://esdac.jrc.ec.europa.eu/ESDB\\_Archive/eusoils\\_docs/other/EUR23767\\_Final.pdf](https://esdac.jrc.ec.europa.eu/ESDB_Archive/eusoils_docs/other/EUR23767_Final.pdf)

(13) Panagos, Panos, et al., *Cost of agricultural productivity loss due to soil erosion in the European Union: From direct cost evaluation approaches to the use of macroeconomic models*, Land degradation & development 29.3 (2018): 471-484.

(14) Liang, Jingjing, et al. (2016) *Positive biodiversity-productivity relationship predominant in global forests*, Science 354.6309.

## CREATING RESILIENT VALUE SYSTEMS

The viability of rural bioeconomy value systems is highly dependent on their resilience and their ability to weather out changes in climate, biomass and markets. A specificity of many biological resources is their seasonality. Value systems built around specific forms of biomass must account for this to be viable. Can several types of local biomass be used as an input, with staggered harvesting periods? Can the biomass be stored in an efficient and cost-effective manner for processing throughout the year? These are the questions that all value systems must consider. In practice, this requires close collaboration among farmers, forest owners, processing structures and other actors to achieve a balanced year-long operating load.

Biomass production and harvesting are impacted by extreme weather events and other natural phenomena. A resilient system should be able to survive such events and return to normal functioning as soon as possible. Due to climate change, some parts of the world are already seeing drastic increases in such types of events and many other parts will soon also experience this. This should be considered when assessing the potential of bioeconomy value systems. This preparation should be done on top of the preparation for climate change in general, where certain areas will see changes in the types of biomass they are able to produce.

The resilience of Atlantic rural regions to climate change was explored as part of the 'RiskAquaSoil' InterReg project<sup>(15)</sup>. Three critical points were highlighted: the need for more



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appropriate soil management; more effective water management; and an increase in local community involvement and development of risk management skills. For each point, there is no 'one size fits all' solution. For example, water management requirements vary, with some Atlantic regions facing increased river floods while those far from river basins must deal with droughts. Moreover, the steps to take to increase resilience involve multiple actors in the value network and not just those directly involved in the biomass production. The local community, including institutions such as insurance companies, must adapt their offers to the increasing threats.

The need for a cohesive local community was also pointed out by the 'RETHINK' project<sup>(16)</sup>, which looked at 14 case studies and established

five overarching resilience principles for rural regions. The importance of social cohesion was one of the key points as it helps promote the viability of a region through continual and dynamic responses to challenges such as demographic changes and changes in production. Among other benefits, the authors pointed out that developing strong links between actors can help non-farmers' view of agriculture and mitigate the risk of opposition to new agricultural activities and the encroachment of developments on arable land.

(15) <http://whitakerinstitute.ie/project/risk-aqua-soil/>

(16) Ashkenazy, Amit, et al., *Operationalising resilience in farms and rural regions—findings from fourteen case studies*, *Journal of Rural Studies* 59 (2018): 211-221.

## BIOENERGY AND NEW OPPORTUNITIES IN FORESTRY

### Bioenergy – decentralised energy production for industrial revival

In the EU, 17.5 % of energy consumption comes from renewable sources, slightly below the 20% set by the Renewable Energy Directive for 2020. Of this renewable energy, 63 % is bioenergy and is produced from biomass<sup>(17)</sup>. Worldwide, the Intergovernmental Panel on Climate Change's (IPCC) scenarios for energy transition show that bioenergy could potentially contribute up to 50% of the primary energy worldwide by 2050<sup>(18)</sup>.

Bioenergy relies on three main streams: forestry, agriculture and waste. Forestry currently makes the largest contribution but agricultural biomass has potential to fulfil expanding needs for biofuels and biogas. As the worldwide reliance on biomass for energy (transport, heat and electricity) increases, there is a need to avoid competition for resources and land use between food, feed, material and chemical production and bioenergy and biofuel production. This pressure on land use in turn promotes innovative industrial solutions, to increase efficiency and diversify potential feedstock, including use of sidestreams that have previously been considered as waste<sup>(19)</sup>. At European level, a shift towards locally-available renewable feedstock should also promote energy security, with lower reliance on fuel imports<sup>(20)</sup>.

Rural areas have a major advantage when it comes to bioenergy production – the biomass is close by. This favours energy that is produced and consumed locally as it reduces transportation needs that would cut into profits and increase emissions. Decentralised, tailor-made bioenergy production also allows the tackling of issues such as waste management and the keeping of benefits. The development of rural bioenergy plants is, nevertheless, not always without issues as many stakeholders involved, such as farmers, local government representatives and local inhabitants, might have contradictory needs<sup>(21)</sup>. The implementation of a bioenergy plant may require high up-front investment which can be divisive when allocating local resources. In addition, the existing logistics and contracts for local biomass may have to change which may disadvantage the incumbents. Moreover, the change in the landscape can put off the local community, requiring multiple discussions and clear communication of the expected positive outcomes of the generation of local bioenergy. The inclusion of bioenergy as one of the goods being exchanged in a value network provides a way of bringing local entities on board.

Picardie Biomasse Energie (PBE) in France provides bioenergy (electricity

and thermal) from local sustainably sourced biomass. This successful company, which has created several dozen local jobs, links several local stakeholders and allows further industrial development in a very rural area. A large portion of the biomass used at the site comes from agricultural and forestry waste streams, following strict environmental codes<sup>(22)</sup>, and collected within a 250 km range to limit transport costs and emissions. The electricity produced is added to the national grid and the thermal energy is used by a large food processor as part of its canning process as well as by other businesses<sup>(23)</sup>. Previously, the thermal energy was produced using fossil fuels.

Several sources of biomass for bioenergy already exist that do not create direct competition for food and feed and others are being developed. For example, species such as poplar and willow can be grown on marginal lands that are not suitable for viable agriculture. Moreover, they provide ecoservices that make them candidates to be included in value networks; besides high biomass productivity for bioenergy, they can be used as inputs for bioengineering and serve as species for land reclamation projects<sup>(24)</sup>.

(17) [https://bioenergyeurope.org/wp-content/uploads/2019/03/Key-Findings-2018\\_final.pdf](https://bioenergyeurope.org/wp-content/uploads/2019/03/Key-Findings-2018_final.pdf)

(18) O. Edenhofer, R. Pichs-Madruga, Y. Sokona, K. Seyboth, P. Matschoss, S. Kadnert, et al. (2011) *IPCC special report on renewable energy sources and climate change mitigation*, Cambridge University Press, Cambridge United Kingdom and New York, NY, USA.

(19) Monforti, F., et al., *The possible contribution of agricultural crop residues to renewable energy targets in Europe: a spatially explicit study*, *Renewable and Sustainable Energy Reviews* 19 (2013): 666-677.

(20) [https://bioenergyeurope.org/wp-content/uploads/2019/03/Key-Findings-2018\\_final.pdf](https://bioenergyeurope.org/wp-content/uploads/2019/03/Key-Findings-2018_final.pdf) (p. 13)

(21) Zabaniotou, A. (2018) *Redesigning a bioenergy sector in EU in the transition to circular waste-based Bioeconomy – A multidisciplinary review*, *J. Clean. Prod.*, <https://doi.org/10.1016/j.jclepro.2017.12.172>

(22) <http://www.akuoenergy.com/fr/cbem>

(23) <https://pbenergie.com>

(24) Washington State University (Extension). *A roadmap for poplar and willow to provide environmental services and build the bioeconomy* (2018).

## Forestry – diversification opportunities for maximum value creation

Forests cover around 43 % of the EU territory<sup>(25)</sup> and provide raw material for many established applications such as furniture and paper production; they also provide some of the best locations for tourism.

Diversification in products from forestry started early on when more and more value was extracted from sidestreams that were once considered to be waste. The full potential of forests is realised when non-wood forest products (NWFP) are also considered in their full capacity. NWFPs are defined by the Food and Agriculture Organization (FAO) as, “products of biological origin other than wood derived from forests, other wooded land and trees outside forests,” and cover thousands of products, including fungi, fruits, flowers, leaves, bark,

and animal products (e.g. honey). While the total estimated value of NWFPs represents only around 10 % of the value of roundwood, it can be a large part of the value system for areas where wood removal is not profitable (see the Del Monte de Tabuyo case study on page 40).

When comparing supply and demand, current European production of NWFPs cannot and is not expected to increase in ways that would meet demand. Nevertheless, value can be obtained either by increasing production or by increasing added value. The European NWFP production is often of a very high standard and is able to position itself in the high-end segment of the market. This can be achieved with certifications (e.g. organic production), careful branding

(e.g. artisanal production with territorial label) and partnerships (e.g. local produce used in a renowned restaurant). Furthermore, activities surrounding NWFPs can be developed to bring in tourism revenue (e.g. mushroom-picking guided tours).



### DEMONETERBO: CREATING A NEW VALUE CHAIN

Proteins are an essential part of a healthy diet, both for humans and animals. Currently the EU imports around 70 % of its protein requirements, as the demand for meat products is increasing (thus increasing protein demand to supplement the feed) while the farming of protein-rich crops has decreased in the last decades<sup>(1)</sup>.

As part of an effort to reverse the trend, the DemoNetErbo network was established in Germany bringing together farms growing protein rich crops, such as peas and beans, to share knowledge and best practices to master legume farming, and establish sustainable local value chains for legume-based food and feed. This kind of endeavour benefits from a supportive policy environment as for example the European Parliament has voted a resolution calling for a strategy for the promotion of protein crops<sup>(2)</sup>.

Peas and beans provide ecosystem services that greatly benefit farmers; most notably they perform biological nitrogen fixation. This allows for reduced fertiliser use during

the growing of the legumes but also for the subsequent crops, making them ideal as part of crop rotations. Despite the benefits, pea and bean cultivation on a large scale is mostly absent in Europe as farmers are reluctant to enter the market due to lack of knowledge of best seed varieties and established value chains for their harvest. The DemoNetErbo network has tackled these two issues, along with several others, through information sharing and discussions that brought diverse groups of stakeholders together. The results are promising – several farmers have now incorporated legumes into their fields and some local farming communities have come together to establish cooperatives that manage the storage of legumes, meal production and mixing facilities for the production of feed<sup>(3)</sup>. These types of initiatives create new local value chains that lower transport needs, ensure a fair remuneration for farmers and provide a high level of traceability for livestock farmers and consumers.

(1) [http://www.europarl.europa.eu/RegData/etudes/etudes/join/2013/495856/IPOL-AGRI\\_ET\(2013\)495856\\_EN.pdf](http://www.europarl.europa.eu/RegData/etudes/etudes/join/2013/495856/IPOL-AGRI_ET(2013)495856_EN.pdf)

(2) [https://ec.europa.eu/info/sites/info/files/food-farming-fisheries/plants\\_and\\_plant\\_products/documents/report-plant-proteins-com2018-757-final\\_en.pdf](https://ec.europa.eu/info/sites/info/files/food-farming-fisheries/plants_and_plant_products/documents/report-plant-proteins-com2018-757-final_en.pdf)

(3) [http://www.demoneterbo.agrarpraxisforschung.de/fileadmin/user\\_upload/Bilder/Bioland\\_WSK\\_AB\\_Engemann\\_Aufenanger\\_Schwein.pdf](http://www.demoneterbo.agrarpraxisforschung.de/fileadmin/user_upload/Bilder/Bioland_WSK_AB_Engemann_Aufenanger_Schwein.pdf)  
(local value chain – protein-rich plants, harvesting, storage and mixing as part of cooperative, animal feed distribution)

(25) <https://ec.europa.eu/eurostat/web/products-eurostat-news/-/EDN-20190321-1>



### 3. Policy support to drive change

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The bioeconomy is strongly supported by rural development policy. This article illustrates how the current EAFRD measures and other EU funds can support a more sustainable bioeconomy and deliver change on the ground. It also looks ahead to the possibilities offered by the CAP Strategic Plans for the next programming period.

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THE BIOECONOMY AND RURAL DEVELOPMENT

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PARTICIPATORY PLANNING FOR A MORE SUSTAINABLE BIOECONOMY AT LOCAL LEVEL

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IMPLEMENTING A SUSTAINABLE BIOECONOMY PLAN

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OPPORTUNITIES IN THE CAP STRATEGIC PLANS

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## THE BIOECONOMY AND RURAL DEVELOPMENT

The bioeconomy sits at the heart of rural development, because society's need for economic, social and environmental change requires a sustainable and resource-efficient approach to using our rural resources. Although the initial debate about the role of the bioeconomy often focused on ensuring food security and producing biomass to replace non-renewable energy sources, the future bioeconomy should provide a wider range of goods and services, whilst supporting more diverse rural businesses and jobs.

Rural land management provides protective environmental services to urban areas, which are increasingly important as the effects of changing climate and weather patterns are felt. These include, for example, flood water storage upstream, protection from forest wildfires and improvements in air quality.

A significant, but not always recognised, part of the bioeconomy are the services that rural areas provide for urban-dwellers to enjoy nature and rural landscapes

(increasingly seen as contributing to health and well-being) through green tourism, forest or farm-based recreation and educational facilities. This in turn draws income to the rural areas in return for more sustainable long-term management of landscapes and biodiversity.

Public funding is needed to catalyse, support and enable the transition to the more sustainable, broader-based, circular bioeconomy envisaged in the EU and national bioeconomy strategies.

## PARTICIPATORY PLANNING FOR A MORE SUSTAINABLE BIOECONOMY AT LOCAL LEVEL

Six EU Rural Development policy priorities form the basis for rolling out support from the European Agricultural Fund for Rural Development (EAFRD) in the 2014-2020 programming period. These broader policy priorities are broken down into specific areas of intervention, known as Focus Areas (FAs)<sup>(1)</sup>, many of which can be relevant for promoting the bioeconomy.

Two priorities are especially relevant for promoting sustainable rural bioeconomy: Priority 4 'Restoring, Preserving and Enhancing Ecosystems' and Priority 5 'Resource-efficient, Climate-resilient Economy'. However, support under Priority 1 for fostering knowledge transfer and innovation in agriculture, forestry and rural areas, Priority 2 which targets competitiveness in the agricultural sector and sustainable forest management, alongside Priority 6 regarding local development or

diversification aspects also have a key role to play.

Member States' Rural Development Programmes (RDPS) set out quantified targets against the selected FAs and outline the programme Measures selected and their allocated funding that will be used to reach the targets.

A major advantage of the current rural development Measures under the Common Agricultural Policy (CAP) is the ability to tailor and adapt many of them to local or regional needs. To do this effectively for a more sustainable rural bioeconomy implies planning at a well-defined, small-scale territorial level. This means bringing together key players from local communities to work with primary producers and those involved in developing product-based and service-based value chains. Efforts spent at this stage will pay off later when implementing an agreed plan that is already 'owned by' the key

actors, who understand the benefit of well-targeted support measures.

This preparatory stage takes considerable time and effort, and may require skilled facilitation and substantial knowledge gathering. The key stages in the planning process can all be supported by EAFRD support Measures (as illustrated in the text box about participatory planning on page 21).

In some cases, projects under other EU funds, now or in the future, could make a significant contribution to bioeconomy development, through research, innovation and practical demonstrations of innovative methods of production or good practice. These other funds complement EAFRD support by funding different activities, at a different scale or over a longer time period, and are accessible to a wider range of actors such as government, researchers and NGOs. Examples include EU-funded research,

(1) For more about Rural Development priorities and FAs see [https://enrd.ec.europa.eu/policy-in-action/rural-development-policy-figures/priority-focus-area-summaries\\_en](https://enrd.ec.europa.eu/policy-in-action/rural-development-policy-figures/priority-focus-area-summaries_en)

## PARTICIPATORY PLANNING SUPPORT FOR A SUSTAINABLE BIOECONOMY

### 1. Identifying opportunities for a new local or regional bioeconomy

This requires understanding local needs, the potential resource base, and where and how value can be added and employment provided. If a regional strategy is in place this step may already have been taken. If not, the Rural Development Programme (RDP) Managing Authority may consider providing support under M20 (for technical assistance).

### 2. Gathering the key players and making connections

The individuals who can play a part in developing proposals for a circular bioeconomy and new or improved value-chains need to be engaged. This 'brainstorming' phase can be supported by a number of RDP Measures to fund facilitated group working and research, including:

- Establishing an EIP-AGRI Operational Group<sup>(1)</sup> focused on a specific bioeconomy-related issue/opportunity (M16.1). To kick-start the discussion on setting up a new group, useful information and ideas may be found in the EIP-AGRI Focus Group reports that have assessed many different innovation opportunities, for example 'benchmarking farm productivity and sustainability performance', and the recently launched group on 'diversification opportunities through plant-based medicinal and cosmetic products'.
- Supporting horizontal and vertical cooperation among supply chain actors for the establishment

and development of short supply chains and local markets (M16.4).

- Extending the work of an existing LEADER Local Action Group (LAG) (M19). In Belgium, for example, LEADER organised the 'Academy on Tour' initiative to help (potential) agri-food entrepreneurs to develop their business ideas into concrete plans. They took part in a one-day visit to another country, with opportunities for working together during the day.

### 3. Checking environmental sustainability

Comparing the different opportunities and ensuring that individually and collectively they contribute to more sustainable long-term management of natural resources is the next important step. It can be supported by the Measures identified above and by support for studies associated with the maintenance, restoration and upgrading of the cultural and natural heritage of villages, rural landscapes and high nature value sites; this covers related socioeconomic aspects, as well as environmental awareness actions (M7.6).

### 4. Preparing a plan of action on the bioeconomy

For the final stage of preparation rural development funding can be targeted at drawing up plans for the development of municipalities and villages in rural areas, and plans for the protection and management of Natura 2000 sites and other high nature value areas (M7.1)

(1) <https://ec.europa.eu/eip/agriculture/en/my-eip-agri/operational-groups>

such as the 'BioStep' guidelines on stakeholder participation in bioeconomy strategies<sup>(2)</sup>, and the 'AGRIMAX' project establishing the technical and economic viability of using bio-refining processes on agri-food waste to deliver new bio-compounds for the chemical, bio-plastic, food, fertilisers, packaging and agriculture sectors<sup>(3)</sup>. In Portugal, the LIFE project 'No\_Waste' is testing the potential of mixing compost with ash from burning forest residues and organic waste from pulp and paper production, and using this to improve very acid soils degraded by mining<sup>(4)</sup>.



'No\_Waste' project, Portugal

© No\_Waste

(2) <http://www.bio-step.eu/results/publications/>

(3) <https://www.bbi-europe.eu/projects/agrimax>

(4) <https://www.lifenowaste.pt>

## IMPLEMENTING A SUSTAINABLE BIOECONOMY PLAN

Implementing a sustainable bioeconomy plan may require changes to and improvements in many aspects of rural businesses. These can include where relevant:

- improving existing supply and value chains, and developing new ones;
- changing land management practices and systems to ensure that the farming and forestry sectors safeguard their soils and productive capacity in the face of the impacts of climate change;
- changing the way natural resources are managed to ensure they will still be available for future generations to use;
- providing environmental public goods including biodiversity and high nature value landscapes, as a resource for bioeconomy services;
- adding value to existing products and creating new ones in a circular bioeconomy;

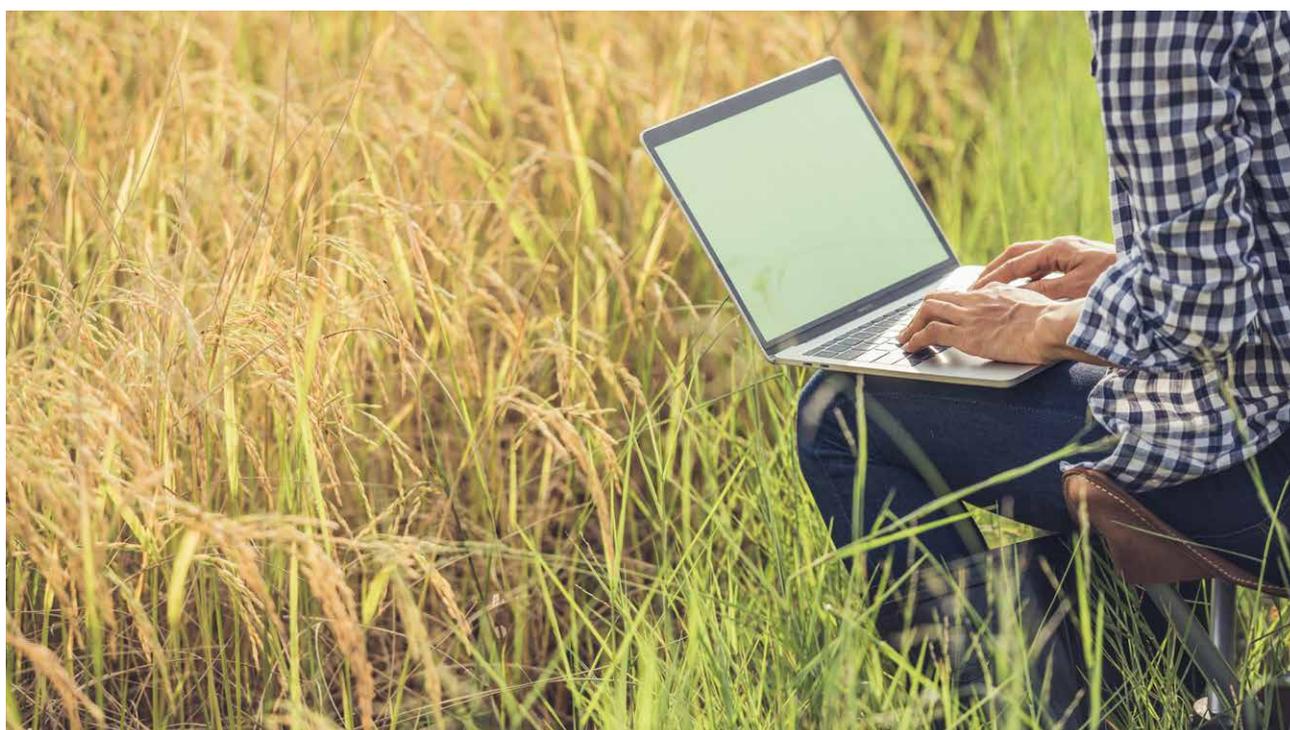
- building the skills, knowledge and ability to make all this happen.

Depending on the programming choices made by national or regional Managing Authorities, a wide range of rural development support may already be available (or could be programmed in the next CAP period). Such choices underpin the implementation of a sustainable, circular bioeconomy plan (for more on the most important support measures under EAFRD and other EU funds see text box on page 23 and table on page 24).

Achieving the shift to a more sustainable bioeconomy using rural development support is not just a case of selecting the right Measures and designing well-targeted interventions to meet identified local needs. It requires thoughtful and often imaginative combinations of different Measures at the point of delivery. For example, this could mean combining

support to facilitate group action and research the options with both financial aid and 'softer' support, such as accompanying in the form of capacity building and ongoing advice and feedback while businesses make significant changes or set up new enterprises.

When using Measures in new ways or combinations it is important to be able to check if the schemes are working well in practice and to adjust them if not – this requires a frequent internal monitoring/review process (different from formal CAP reporting) which can be supported if necessary by programme technical assistance (M20).



## KEY MEASURES FOR SUPPORTING A SUSTAINABLE BIOECONOMY PLAN<sup>(1)</sup>

Member States and regions can deploy various Measures from the EAFRD 'menu' for the 2014-2020 programming period and design these in a tailored and targeted way specifically to support a sustainable bioeconomy plan. One possibility would be to design an integrated package of Measures for this purpose. At each stage of planning and implementation of the plan there are several Measures which could be useful. For example:

### Innovation and pilot projects

The co-operation Measure can support the setting-up of EIP Operational Groups for sustainability (M16.1), and then pilot projects and the development of new products, practices, processes and technologies (M16.2) can be supported. Small, pilot environmental land management schemes can be used to test and refine innovative approaches to sustainable land management before these are rolled out as part of the main programme (M10.1 and M15.1). LEADER (M19) can support small-scale local initiatives addressing specific local needs or opportunities. This includes pilot projects and innovative approaches which may later be developed further or on a larger scale.

### Working together

There are several ways of supporting different actors to group together in putting their plans into practice. The cooperation Measure can support joint approaches to environmental projects and ongoing environmental practices (M16.5) and help small operators to work together, share facilities and to develop and market sustainable tourism (M16.3). There is support specifically for supply chain actors who wish to cooperate in establishing, developing and promoting short supply chains and local markets (M16.4) or providing biomass for food and energy production and industrial processes (M16.6). Collaborative approaches by local communities or businesses can also be developed with support from LEADER (M19). This can include cross sectoral cooperation within the territory or cooperation with another LEADER area.

### Investment and adding value

A wide range of investment support for rural businesses and rural communities is available not just under EAFRD but also other EU Funds. The EAFRD can support farmers and foresters investing in infrastructure and technology to develop, modernise and adapt existing businesses (M4.1, M4.3, M8.6). Farm or forest managers seeking to add value to their products can be helped to set up producer groups (M9), and to join quality schemes for agricultural and food products and improve promotion and marketing of recognised quality products (M3). In addition, the current Horizon 2020 Work Programme includes a new investment platform providing access to finance for innovative bioeconomy projects. It focuses primarily on circular approaches in the agriculture sector, using terrestrial or aquatic biomass for innovative bio-based products or processes, or for food, feed, fertilisers or soil improvers.

Bioeconomy services such as agri-tourism, nature tourism and forest-based recreation, which depend on the environmental management and attractiveness of rural landscapes, are an important part of the bioeconomy. There is business start-up aid and investment support for setting up non-agricultural activities in rural areas (M6.2, M6.4), for investing in small-scale tourist infrastructure (M7.5) and for maintaining, restoring and upgrading natural heritage, rural landscapes and high nature value areas (M7.6), which could be particularly relevant to opportunities for eco-tourism.

### Environmentally sustainable land management

The future of the bioeconomy depends on land management systems that protect the productive capacity of soils and maintain the biological systems that support our environment. This requires changes to or maintenance of more sustainable land management, which often implies additional costs or income foregone to businesses but can be supported by compensation payments and/or investment aids under EAFRD.

The most familiar are agri-environment-climate schemes and environmental investments (M10.1, M4.4). Similar environmental support for forests (M15.1, M8.5) is available but has not yet been used as widely. Farmers can access support for the costs of moving from conventional farming to more sustainable organic systems, and also for ongoing payments to maintain organic production (M11). A less well-known system of sustainable land management is agroforestry where trees for timber or fruit production are grown alongside crops or livestock at field scale. This has important benefits for the bioeconomy in terms of diversifying the supply of food and raw materials, strengthening the economic resilience of the business and improving soil management. Support is available both for maintaining existing agroforestry systems (some of which have been there for centuries but are now threatened) and setting up new ones (M8.2).

### Capacity building

A key part of any bioeconomy plan will be improving the capacity of the businesses and individuals to make the changes required. Vocational training and skills training, workshops and coaching, demonstration activities and farm and forest visits or short-term farm management exchanges can all be supported (M1). Advisors play a crucial role as a link between researchers and land managers, identifying needs coming from the farmers and foresters, assembling practical experiences, and applying knowledge from research to local situations. Provision of advice and training of advisors (M2) can be particularly effective if closely linked the needs of the targeted beneficiaries for a specific scheme, delivering tailored information about how to achieve sustainable objectives. LEADER Local Action Groups may also be able to support local people in capacity building or preparatory activities.

(1) For an overview of the sub-measures listed in this box see page 24. A full list of the Measures in use for the 2014-2020 is included in the EAFRD implementing regulation (EU) No 808/2014, <https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:32014R0808&from=en>

Table 1. List of relevant RDP Measures and sub-measures

Measure code	Name of measure	Sub-measure code	Sub-measure for programming purposes
1	Knowledge transfer and information actions	1.1	Support for vocational training and skills acquisition actions
		1.2	Support for demonstration activities and information actions
		1.3	Support for short-term farm and forest management exchange as well as farm and forest visits
2	Advisory services, farm management and farm relief services	2.1	Support to help benefiting from the use of advisory services
		2.2	Support for the setting up of farm management, farm relief and farm advisory services as well as forestry advisory services
		2.3	Support for training of advisors
3	Quality schemes for agricultural products and foodstuffs	3.1	Support for new participation in quality schemes
		3.2	Support for information and promotion activities implemented by groups of producers in the internal market
4	Investments in physical assets	4.1	Support for investments in agricultural holdings
		4.2	Support for investments in processing/marketing and/or development of agricultural products
		4.3	Support for investments in infrastructure related to development, modernisation or adaptation of agriculture and forestry
		4.4	Support for non-productive investments linked to the achievement of agri-environment-climate objectives
6	Farm and business development	6.3	Business start-up aid for the development of small farms
		6.4	Support for investments in creation and development of non-agricultural activities
7	Basic services and village renewal in rural areas	7.5	Support for investments for public use in recreational infrastructure, tourist information and small scale tourism infrastructure
		7.6	Support for studies/investments associated with the maintenance, restoration and upgrading of the cultural and natural heritage of villages, rural landscapes and high nature value sites including related socioeconomic aspects, as well as environmental awareness actions
8	Investments in forest area development and improvement of the viability of forests	8.2	Support for establishment and maintenance of agro-forestry systems
		8.5	Support for investments improving the resilience and environmental value of forest ecosystems
		8.6	Support for investments in forestry technologies and in processing, mobilising and marketing of forest products
9	Setting up of producer groups and organisations	9	Setting up of producer groups and organisations in the agriculture and forestry sectors
10	Agri-environment-climate	10.1	Payment for agri-environment-climate commitments
11	Organic farming	11.1	Payment to convert to organic farming practices and methods
		11.2	Payment to maintain organic farming practices and methods
15	Forest-environmental and climate services and forest conservation	15.1	Payment for forest-environmental and climate commitments
16	Cooperation	16.1	Support for the establishment and operation of operational groups of the EIP for agricultural productivity and sustainability
		16.2	Support for pilot projects and for the development of new products, practices, processes and technologies
19	Support for LEADER local development (CLLD)	19.1	Preparatory support
		19.2	Support for implementation of operations under the CLLD strategy
		19.3	Preparation and implementation of cooperation activities of the local action group
		19.4	Support for running costs and animation

## OPPORTUNITIES IN THE CAP STRATEGIC PLANS

The Commission's legislative proposal for CAP Strategic Plans, which will replace current Rural Development Programmes in the post 2020 programming period and which will bring together interventions under both Pillars of the CAP in a single programming approach, offers wider opportunities to support the bioeconomy. These are highlighted in the specific objectives for the whole CAP which include to, "promote employment, growth, social inclusion and local development in rural areas, including bio-economy and sustainable forestry," and to, "contribute to the protection of biodiversity, enhance ecosystem services and preserve habitats and landscapes."<sup>(5)</sup>

The new CAP proposal includes a range of rural development interventions similar to those in the 2014-2020 period, but with less detailed prescriptions at EU level and much more flexibility for Member States to tailor them to their particular needs.

There are of course potential risks to the development of the bioeconomy too, principally of 'status quo' implementation choices by Member States faced with the challenges of new programming and verification requirements. Overall the current proposals offer an important opportunity to use the new CAP to achieve a major shift in focus to deliver a circular, sustainable bioeconomy – but this means starting to plan for it now, by building a solid

analysis of bioeconomy aspects in the SWOT analysis<sup>(6)</sup> being prepared by Member State authorities for their new CAP Strategic Plans, and by bringing together the key players with the aim of jointly developing realistic and effective plans.



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### CIRCULAR BIOECONOMY BENEFITS FOR TOMATO GROWERS, THE NETHERLANDS

In Westland, an area of the Netherlands known for greenhouse horticulture, Solidus Solutions has developed a new packaging material based on tomato fibres. The leaves and stems of the tomato plants, which are leftovers from the harvest, are crushed and mixed with fibres of recycled paper, producing a type of cardboard for use as packaging. Together with waste paper, the crop residue can now be used to produce high grade, recyclable solid board. A unique cooperation, called Bio Base Westland, involving growers, green waste processors, board mills, research institutions, universities, consultants and councils, was responsible for bringing this new material to market. Growers can now buy the solid board packing, enriched by their own plant waste, and use it to pack their own tomatoes.

While RDP support was not used in this example, such an initiative could have benefited from a range of RDP Measures, such as M16.1 and M16.4 to bring individuals together, M6.2 and M6.4 developing farm businesses or non-farm businesses, or investment support through M4.2. The July 2019 EAFRD Projects Brochure<sup>(1)</sup> showcases twelve EAFRD-funded bioeconomy projects and many more great examples are available from the ENRD website's project database<sup>(2)</sup>.

Source: 'Supporting sustainable rural bioeconomy value chains', a briefing for the second meeting of the ENRD Thematic Group on 'Mainstreaming the Bioeconomy'<sup>(3)</sup>.

(1) [https://enrd.ec.europa.eu/publications/search\\_en](https://enrd.ec.europa.eu/publications/search_en)

(2) [https://enrd.ec.europa.eu/projects-practice/bioeconomy\\_en](https://enrd.ec.europa.eu/projects-practice/bioeconomy_en)

(3) [https://enrd.ec.europa.eu/sites/enrd/files/tg2\\_bioeconomy\\_draft-briefing.pdf](https://enrd.ec.europa.eu/sites/enrd/files/tg2_bioeconomy_draft-briefing.pdf)

(5) COM(2018) 392 final, Article 6(1).

(6) The analysis of the current situation in the Member State terms of strengths, weaknesses, opportunities and threats, which forms the evidence base for the Member State to identify the needs to be addressed for each of the nine specific objectives, <https://ec.europa.eu/info/food-farming-fisheries/key-policies/common-agricultural-policy/future-cap>



© Unsplash

## 4. Attracting new investment

Bioeconomy projects all need financing at some stage. From a farm shop looking to offer products online to a bioethanol refinery, the amounts required will vary substantially, as will the sources of finance. This article looks at the financing requirements of the bioeconomy and how rural entrepreneurs can find investors for their projects. In addition, several forms of public support are available. These are not all specifically focussed on the bioeconomy, but they can certainly include bioeconomy projects within their broader aims. A number of financing options for bio-based business projects in rural areas are profiled.

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**AN ARRAY OF FINANCING OPPORTUNITIES: FROM R&D TO PRODUCT LAUNCH**

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**DE-RISKING BIOECONOMY PROJECTS**

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**LEVERAGING PRIVATE INVESTMENT WITH THE EAFRD**

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**EMERGING INVESTMENT SOURCES**

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## AN ARRAY OF FINANCING OPPORTUNITIES: FROM R&D TO PRODUCT LAUNCH

Significant EU funding for the bioeconomy is driven by research and development (R&D) needs. This is often grant-based and focused on earlier stage innovations. R&D support includes sources such as Horizon 2020 – the biggest EU Research and Innovation programme ever with nearly €80 billion of funding available over seven years (2014 to 2020). This support is designed to attract additional private investment. Beyond the R&D and pre-market stages more support is needed for companies to commercialise new products from the bioeconomy sector.

One project supported by Horizon 2020 is ‘AGROinLOG’<sup>(1)</sup> which aims to demonstrate the technical, environmental and economic feasibility of integrated biomass treatment centres for food and non-food products. The project is based on fodder (Spain), olive oil production (Greece) and cereal processing (Sweden) enterprises looking to deploy new business lines and open new markets in bio-commodities and intermediate bio-products.

In addition to standard calls, the flagship initiative under Horizon 2020 is the Bio-based Industries Joint Undertaking (BBI JU). It is a Public-Private Partnership between the EU and the Bio-based Industries Consortium. The scale is significant. Some €975 million of EU funding from Horizon 2020 is expected to leverage at least €2.7 billion of additional private financing. Its goal is to support the development of bio-based

industries in the EU by awarding grants to research and innovation, coordination and support projects.

Although not specifically targeting the bioeconomy, funding is offered by national, regional and local development agencies. These include Tekes in Finland, Invitalia in Italy, Innovate UK and the Netherlands Enterprise Agency and much wider sets of public financial instruments in France, Spain and the UK, including equity and venture capital. These often reflect the maturity of projects, local raw resources and different public policies and development strategies.

Such support in France includes ‘Société des projets industriels’, a €425 million investment programme in projects for recycling and green materials, green chemistry, bio-fuels and safe, healthy and sustainable food. Also in France is the smaller, but more bioeconomy-focused, CapAgro Innovation programme. In Spain, the Innvierte programme<sup>(2)</sup> provides equity and venture capital.

In some Member States<sup>(3)</sup> the European Bank for Reconstruction and Development (EBRD) is another potential source for project and corporate financing, offering loans, equity, guarantees and hybrid structures which can be customised. The EBRD also offers technical, financial and policy support, as well as concessional or grant co-financing from donors.

For SMEs generally, grants under the Horizon 2020 SME instrument support

close-to-market activities and look to boost breakthrough innovation, especially in highly innovative SMEs with clear commercial ambition and a potential for high growth and internationalisation. Phased support involves business innovation grants of up to €50 000 for project assessment and up to €2.5 million for innovation development and demonstration. There is also access to a wide range of innovation support services and ‘innovation and business development’ coaching.

The European Investment Bank Group (EIB) also operates across all Member States giving project promoters options to access repayable finance (e.g. loans, guarantees and equity)<sup>(4)</sup> through several EU programmes which generally accept lower risk levels.

One of these targeting SMEs is the Competitiveness of Enterprises and Small and Medium-sized Enterprises (COSME) programme. Part of this initiative concerns improving access to finance through two financial instruments, the Loan Guarantee Facility and the Equity Facility for Growth, launched in 2014 and managed by the European Investment Fund (EIF). Their goal is to help financial intermediaries (e.g. banks) make more financing available to SMEs.

Bioeconomy projects that have benefitted under COSME include ‘Agricoool’<sup>(5)</sup> (France), which sought an equity investment from Daphni, a fund backed by the EIF under the EU’s Investment Plan for Europe

(1) <http://agroinlog-h2020.eu/en/home/>

(2) <https://www.cdti.es/index.asp?MP=100&MS=819&MN=2>

(3) Bulgaria, Croatia, Cyprus, Czech Republic, Estonia, Greece, Hungary, Latvia, Lithuania, Poland, Romania, Slovakia and Slovenia.

(4) <https://www.eib.org/en/products/index.htm>

(5) [http://www.eif.org/what\\_we\\_do/equity/Case\\_studies/efsi\\_innovfin\\_agricool\\_france.htm](http://www.eif.org/what_we_do/equity/Case_studies/efsi_innovfin_agricool_france.htm)

and Agrifarm<sup>(6)</sup> (Greece), a growing agricultural and agro-food company where the owner sought financing through Eurobank and received an EU-guaranteed loan.

Agri-food sector companies, other SMEs and self-employed people in rural areas can also benefit from EU support through guarantees partially backed by the European Fund for Strategic Investments (EFSI). In Spain for example, the EIB, EIF and ICO, the Spanish bank, wrote such guarantees for the leading light of the Spanish cooperative banking sector, Grupo Cooperativo Cajamar, which can now provide over €1 billion for new investment projects<sup>(7)</sup>.

Financing for individual bioeconomy projects is also available from the EIB through its Agriculture and Bioeconomy Programme Loans which can cover future capital expenditure and research. These are typically for companies planning to spend at least €15 million and up to €200 million, which allows the EIB to lend from €7.5 million to €50 million<sup>(8)</sup> per project.

More details of the different forms of EU support are on the EIC SME Instrument data hub, which also has a map to help find projects being financed<sup>(9)</sup>.

These types of finance do not always encourage, or require, additional private capital to co-invest in projects. But this catalytic effect of crowding-in private investment is becoming increasingly relevant in times of continued constraint on public spending.

## ACCESS TO FINANCE

To better understand the financing requirements of the bioeconomy, the European Commission commissioned a study on 'Access to Finance Conditions for Investments in Bio-Based Industries and the Blue Economy'<sup>(1)</sup>. The study found that individual projects face issues accessing private capital. Regulation and market demand both drive and restrict project promoters looking for finance as well as financial institutions providing it.

The study also reports that the bioeconomy faces funding gaps, especially for projects that are already set up, but which have not yet brought their products to market. These include when a project is scaling-up from pilot to demonstration and when moving from demonstration to flagship, first-of-a-kind, industrial-scale plants.

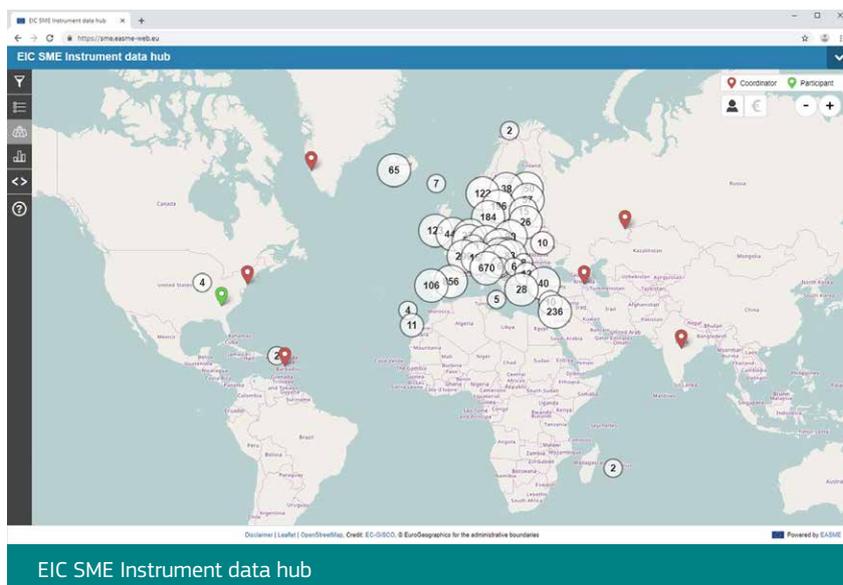
Public financial instruments are increasingly being used across Europe to reduce funding gaps and support businesses, including the bioeconomy, but their catalytic impact could be further enhanced. This means that these instruments should encourage (or 'crowd-in') private co-investment, rather than replace it.

In addition to policy actions, new or modified public financial instruments should de-risk bioeconomy investments and attract private capital. The study recommends an effective, stable and supportive EU level regulatory framework, as well as increasing awareness of EU Finance for Innovators (InnovFin) and the EFSI as additional sources of support.

The report also recommends developing a new EU risk-sharing financial instrument for the bioeconomy, possibly a thematic investment platform, to help mobilise private capital. An EU-wide contact and information exchange, knowledge sharing platform or other channels would also facilitate relationships between bioeconomy project promoters, industry experts, public authorities and financial market participants.

To respond to this recommendation, the Commission created the Circular Bioeconomy Investment Platform (CBIP, see page 31).

(1) [https://www.eib.org/attachments/pj/access\\_to\\_finance\\_study\\_on\\_bioeconomy\\_en.pdf](https://www.eib.org/attachments/pj/access_to_finance_study_on_bioeconomy_en.pdf)



(6) [http://www.eif.org/what\\_we\\_do/guarantees/case-studies/efsi-cosme-agrifarm-greece.htm](http://www.eif.org/what_we_do/guarantees/case-studies/efsi-cosme-agrifarm-greece.htm)

(7) <http://www.eib.org/en/infocentre/press/releases/all/2018/2018-365-eib-eif-and-ico-sign-an-agreement-with-grupo-cajamar-to-provide-over-eur-1bn-to-smes-and-the-self-employed.htm>

(8) [https://www.eib.org/attachments/thematic/agriculture\\_and\\_bioeconomy\\_factsheet\\_en.pdf](https://www.eib.org/attachments/thematic/agriculture_and_bioeconomy_factsheet_en.pdf)

(9) <https://sme.easme-web.eu>

## DE-RISKING BIOECONOMY PROJECTS

Public support can encourage investment from financial intermediaries by sharing the risk between public and private sectors. New and modified financial instruments that de-risk bioeconomy projects should complement grants and encourage leverage, so more funds are available for more projects.

Public support catalysed private co-investment to ensure sufficient funding for a bioeconomy project in Alsace, France. Agrivalor was founded by six farmers looking to recover organic waste and who required €8 million of investment. Their project was supported by the French Agency for the Environment and Energy Management (ADEME)<sup>(10)</sup>, the European Regional Development Fund and the French state for a total of €2.4 million. This support leveraged about twice that amount in private co-investment from banks and the farmers themselves, so 'Agrivalor' now has one methane production plant and six composting facilities<sup>(11)</sup>.

Financial intermediaries providing private capital also can reinforce financial discipline, by requiring a business plan detailing expected future revenue. This ensures better quality projects that are more likely to be profitable. In this way public support is more likely to be repaid and reinvested in more projects.

InnovFin, a joint initiative under Horizon 2020 with the EIB Group (EIB and EIF), is part of a new generation of EU financial instruments. InnovFin encourages financial intermediaries and advisory services to help



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### WITHOUT ANTIBIOTICS THANKS TO ALGAE, FRANCE

Amadéite Group is based in rural Brittany, France and is a pioneer in marine biotechnology. The company focuses on nutrition and the health of plants, animals and humans, seeking to minimise the use of synthetic pesticides, fertilisers and antibiotics by developing algae-based health and nutrition products. A loan of €30 million from the EIB supports an investment of €70 million in research and development for the company's project 'Without Antibiotics thanks to Algae'.

small and large innovative firms access finance more easily. For the 2014-2020 programming period it is making available €24 billion of financing (for innovative businesses that deal with complex products and technologies, unproven markets or intangible assets), via loans, loan guarantees and equity investments. This should support up to €48 billion of final research and innovation investments, though InnovFin only accepts low risk levels<sup>(12)</sup>.

Other forms of EU support through the EIB include the Natural Capital

Financing Facility<sup>(13)</sup> (NCF). This financial instrument backed by an EU guarantee can support bioeconomy projects delivering on biodiversity and climate adaptation through tailored loans and investments. Projects financed through the NCF need to generate revenues or demonstrate cost savings.

(10) <https://www.ademe.fr/lademe>

(11) <https://www.agrivalor.eu/notre-entreprise/>

(12) <http://www.eib.org/en/products/advising/innovfin-advisory/index.htm>

(13) <https://www.eib.org/en/products/blending/ncff/index.htm>

## LEVERAGING PRIVATE INVESTMENT WITH THE EAFRD

A familiar port of call for rural bioeconomy businesses looking for financing is the European Agricultural Fund for Rural Development (EAFRD). In fact, businesses can benefit from repayable and non-repayable support (financial instruments and grants) provided through the European Structural and Investment Funds (ESIF). The bioeconomy is particularly targeted by one of these funds, the EAFRD, and its various Rural Development Programmes (RDPs).

RDPs in individual Member States and regions provide grants for projects that meet programme criteria, which includes bioeconomy projects. These require a contribution from project promoters and the additional funding from a grant can also encourage further bank lending.

Financial instruments are increasingly being used as a way to leverage all ESI Funds to support programme objectives.

The advantages of financial instruments for Managing Authorities include:

- ✓ Greater access to a wider range of financial tools for policy delivery.
- ✓ Leveraging private sector funds to help boost RDP impacts.
- ✓ Improved targeting because ex-ante assessments for financial instruments confirm needs from target groups for loans, guarantees, equity, etc.
- ✓ Strong commitment to quality from final recipients as they need to repay the support.

At the moment, by mid-2019, 11 financial instruments supported by the EAFRD are operational and another 18 are in a process of being launched.

A (public) financial instrument that targets the bioeconomy more directly is the AGRI Guarantee facility, managed by the EIF<sup>(14)</sup>. This offers reduced interest rates and lower collateral requirements through financial intermediaries. The objective is to increase finance for agriculture, agri-food, forestry and rural businesses while supporting the creation and development of non-agricultural activities in rural areas.

This guarantee facility supports, for example, a fund of funds set up in cooperation with the French Region Occitanie<sup>(15)</sup>. One of the funds, FOSTER EAFRD is co-financed by the EAFRD and enables financial intermediaries in the region to offer greater access to finance for the agricultural, agri-business and forestry sectors<sup>(16)</sup>.

A typical target of financial instruments is the 'missing middle' where projects have progressed beyond initial R&D but still need help to access investment funds to grow and are not large enough for individual EU level support. In Germany, the Food and Agricultural Loan Fund was set up to specifically address a lack of bank finance for marketing innovative food and agricultural products<sup>(17)</sup>. This € 11.78 million fund offered loans of between € 80 000 and € 1 million to companies whose applications for

bank finance had been turned down.

Leveraging additional private sector investment is also highlighted in the ALTER'NA fund of funds<sup>(18)</sup> in the Nouvelle-Aquitaine region (France), which should multiply public support fivefold and indirectly support the bioeconomy by giving farmers access to finance. Financing for the fund of funds includes € 16 million from Regional Council funds and € 14 million from the European Union via the EAFRD<sup>(19)</sup>. Additional private co-investment should result in € 150 million being available to support some 1 500 final beneficiaries.



(14) [https://www.eif.org/what\\_we\\_do/guarantees/agri\\_guarantee\\_facility/index.htm](https://www.eif.org/what_we_do/guarantees/agri_guarantee_facility/index.htm)

(15) [https://www.eif.org/what\\_we\\_do/resources/foster/index.htm](https://www.eif.org/what_we_do/resources/foster/index.htm)

(16) <https://www.fi-compass.eu/video/eafrdfoster-tpe-pme-france>

(17) <https://www.fi-compass.eu/sites/default/files/publications/case-study-food-and-agricultural-loan-fund-2014-2020.pdf>

(18) [http://www.eif.europa.eu/what\\_we\\_do/resources/esif-eafrd/index.htm](http://www.eif.europa.eu/what_we_do/resources/esif-eafrd/index.htm)

(19) [http://www.eif.org/what\\_we\\_do/resources/news/2018/alterna-nouvelle-aquitaine.htm](http://www.eif.org/what_we_do/resources/news/2018/alterna-nouvelle-aquitaine.htm)

## EMERGING INVESTMENT SOURCES

### The Circular Bioeconomy Investment Platform (CBIP)

To mobilise private capital, the ‘Study on Access to Finance Conditions for Investments in Bio-Based Industries’ recommended, among others, developing a new EU risk-sharing financial instrument dedicated to the bioeconomy. Tendering is underway to provide EU-wide information exchange and knowledge sharing<sup>(20)</sup>.

Under the InnovFin Holding fund this platform should pool together financing from multiple investors to channel debt and equity into portfolios of bioeconomy projects. It should facilitate relationships between bioeconomy project promoters, industry experts, public authorities and financial market participants.

The Circular Bioeconomy Investment Platform (CBIP) will not cover renewable energy generation (fuels, heat or power) but such projects can still use the existing European Investment Project Portal<sup>(21)</sup>.

One project looking for funding on the EIPP is the bioLAND network, a replicable model of rural micro biorefineries which is looking to set up a pilot facility in the Serranía de Cuenca area of Spain. The project has secured financing of € 1.68 million through its own resources plus a similar amount from public aid. The remainder is being requested from banks and private investors<sup>(22)</sup>.

### Alternative sources of finance

In addition to financial intermediaries such as banks and venture capital, new forms of technical based finance (FinTech) including peer-to-peer lending and crowdfunding have been growing steadily.

Crowdfunding seems to be more likely when the business case or social impact of a project are obvious. Supporting smaller businesses, including bioeconomy projects, is the European Crowdfunding Network which has over 60 members<sup>(23)</sup> offering crowdfunding platforms and services. The platforms are primarily local, because of uncertainties in pan-European crowdfunding legislation.

Recent examples of SMEs seeking crowdfunding finance include one in Italy marketing a new tomato product<sup>(24)</sup> and a new biogas production facility in the Netherlands<sup>(25)</sup>. Other projects include agricultural robot development in France<sup>(26)</sup> and planting 10 000 trees in Portugal. The websites normally include details of each project, the finance requested and an analyst’s report.

### Overcoming limiting factors

The ‘Access-to-finance conditions for Investments in Bio-Based Industries’ report also highlights several issues cited by respondents that could limit new investment.

For private capital, a major financial risk is that bioeconomy projects

have low or volatile cash flow and profitability, especially at the earlier stages of a project, leading to potential liquidity issues. Another important risk is with large capital expenditure.

For project promoters, there seems to be a lack of awareness about available funding at EU level as well as a mismatch between their expectations and the scope and applicability of support. In addition, project promoters mention the small size of public funding relative to their needs and unfavourable terms along with complicated and lengthy application procedures. Some also felt that public funding could sometimes be more efficiently managed by national authorities.

However, attracting new investment is important to ensure continued development of the bioeconomy. Individual sources of finance will depend very much on a project’s location as there are different support programmes and different financial ecosystems between and even within Member States. The nature of the project, and the requirements and capacity of project promoters, will also determine the best sources of finance.

Increased use of public support to catalyse private investment will continue to give greater access to finance for projects of all sizes, from the selling of homemade jam online to the creation of an integrated biorefinery converting agricultural sidestreams into high-value bio-based chemicals.

(20) <https://etendering.ted.europa.eu/cft/cft-display.html?cftid=4096>

(21) <https://ec.europa.eu/eipp/desktop/en/index.html>

(22) <https://ec.europa.eu/eipp/desktop/en/projects/project-10701.html>

(23) <https://eurocrowd.org/directory-of-members/>

(24) <https://it.october.eu/progetto/italian-food-02/>

(25) <https://www.oneplanetcrowd.com/nl/project/200339/description>

(26) <https://www.wiseed.com/en/projet/17861417-naio-technologies>



## 5. Tailored regional and local approaches

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This article examines emerging trends in national, regional and local bioeconomy strategies, as well as some local initiatives that support the development of bio-based business models. Developing local bioeconomies across the EU will bring clear benefits for rural areas.

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NATIONAL AND REGIONAL APPROACHES

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REGIONAL BIOECONOMY CLUSTERS

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LOCAL INITIATIVES SUPPORTING THE BIOECONOMY

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## NATIONAL AND REGIONAL APPROACHES

Regional and local initiatives have an important role to play in optimising the European bioeconomy. The relaunched EU Bioeconomy Strategy<sup>(1)</sup> recognises this with one of its key priorities – to encourage the deployment of local bioeconomies across Europe. It foresees this through, for example, promoting a shift to sustainable food and farming systems, sustainable forestry and bio-based products.

Developing local bioeconomies across the EU will bring clear benefits for rural areas, as it implies increased investment in skills, knowledge, innovation and new business models. The growing participation of primary producers in bioeconomy value chains and the related diversification of economic activities are expected to create more jobs, particularly in rural areas. Plus, farmers and foresters could gain significant new sources of income from these diversified activities.

This article looks at emerging trends in national, regional and local bioeconomy strategies as well as some local initiatives which support the development of bio-based business models that valorise local resources in rural areas. A number of these are already successfully providing a supportive environment for bio-based businesses.

The EU Bioeconomy Strategy notes the importance of action at both European and national level, without setting specific requirements for Member States. As a result, there is no single model for a bioeconomy strategy. Some countries have adopted national

strategies focusing on the bioeconomy as a whole, such as Austria, Finland, France, Italy, Latvia, Germany and Spain. Others have taken a sectoral approach. For instance, Denmark has developed one plan for water, bio and environmental solutions and another for food, while Lithuania has a national development programme for industrial biotechnology.

Many bioeconomy strategies and plans are also being developed at regional level, for example in Flanders (Belgium), Bavaria and Baden-Württemberg (Germany) and Extremadura and Andalusia (Spain). These are particularly important given the rural nature of biomass production and regional differences in resources. In addition, some macro-regional strategies have emerged, such as for the Baltic Sea Region<sup>(2)</sup>, the Danube Region and West Nordic Countries.

The importance of regional strategies is underlined by the European Bioeconomy Stakeholder Manifesto<sup>(3)</sup>, signed by representatives of large and small companies, non-governmental organisations (NGOs), biomass producers, regions, and academia from all over Europe who, “believe that Europe can be a leader in the development of a sustainable bioeconomy.”

The Manifesto stresses that available biomass and agricultural land should be better utilised at regional level, while also ensuring sustainable management of natural resources. The bioeconomy can help revitalise rural areas, it says, offering a new perspective for traditional and novel,

high-value production in the regions, as well as creating new opportunities and jobs for farming and forestry.

Regional action on the bioeconomy is often politically driven, emerging from a coordinated policy approach. But there are also many grassroots initiatives. In order to succeed, both require the same key elements: active engagement of diverse stakeholders, actions that keep added value within the local economy, and a policy framework that favours collaboration and innovation. Successfully scaling-up local or regional dynamics in the bioeconomy benefits from, and even depends on, a conducive policy framework.

Regional bioeconomy initiatives can help facilitate access to funding, supporting more investment in and development of different bioeconomies in rural areas. France’s Grand Est region is a good example of this, having placed the bioeconomy as a central plank in its regional development strategy. It developed a strategy (“BioPacte”<sup>(4)</sup>) to optimise the use of biomass from agriculture, viticulture and aquaculture in regional markets through 12 specific value chains. A dynamic regional strategy ensures constant communication on relevant public policies and the optimal use of available funds.

One of Grand Est’s success stories is the development of the biogas sector (95 of the 382 biogas plants operating in France are based in the region). It secured European funding – from the European Agricultural Fund for Rural Development (EAFRD) and the

(1) <https://ec.europa.eu/research/bioeconomy/index.cfm?pg=policy&lib=strategy>

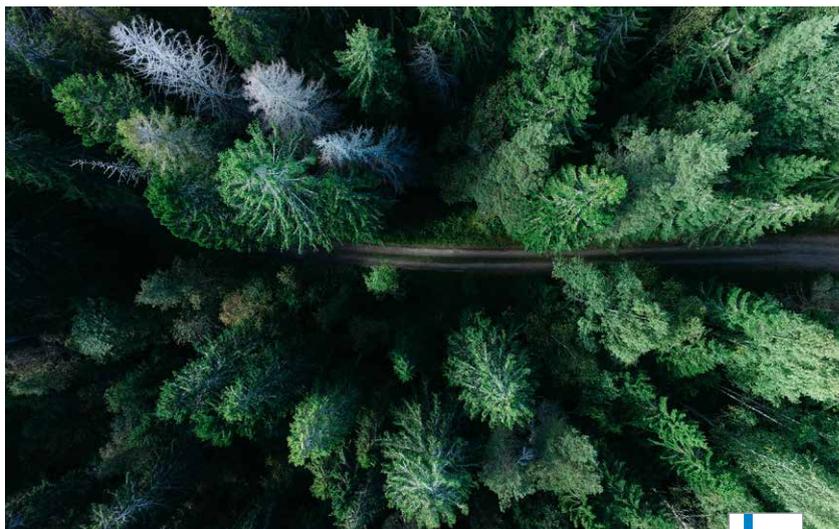
(2) A Bioeconomy for the Baltic Sea Region, [https://ec.europa.eu/knowledge4policy/publication/bioeconomy-baltic-sea-region\\_en](https://ec.europa.eu/knowledge4policy/publication/bioeconomy-baltic-sea-region_en)

(3) [https://ec.europa.eu/research/bioeconomy/pdf/european\\_bioeconomy\\_stakeholders\\_manifesto.pdf](https://ec.europa.eu/research/bioeconomy/pdf/european_bioeconomy_stakeholders_manifesto.pdf)

(4) For more about BioPacte see [https://enrd.ec.europa.eu/sites/enrd/files/tg2\\_bioeconomy\\_france\\_gaillot.pdf](https://enrd.ec.europa.eu/sites/enrd/files/tg2_bioeconomy_france_gaillot.pdf) and [https://enrd.ec.europa.eu/sites/enrd/files/tg2\\_bioeconomy\\_highlights.pdf](https://enrd.ec.europa.eu/sites/enrd/files/tg2_bioeconomy_highlights.pdf)

European Regional Development Fund (ERDF) – and national funding for this sector. Another example of the region's strategic approach involves the development of a hemp value chain. The activities of 400 farmers are being coordinated under the 'European Pole of Hemp', a hub for improving its valorisation and competitiveness. This initiative has also secured funding under the EAFRD.

The South Savo Region of southeast Finland is also benefiting from a policy-driven approach<sup>(5)</sup>. Its strategy focuses on forest management, food production and water management, integrating these activities under a regional coordination group. Rural SMEs involved in the bioeconomy are offered expert support to access the funding instruments most suited to their needs, such as via the EAFRD's Rural Development Programmes (RDPs), the ERDF or the European Social Fund (ESF). The goal is to combine support from the different funding instruments to best develop the region's bioeconomy (for more about South Savo see the box on this page).



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### DEVELOPING THE RURAL BIOECONOMY IN FINLAND USING A MIX OF FUNDS

The South Savo region in Finland supports bioeconomy development through the coordinated and complementary use of several EU funding programmes, including the EAFRD and national funding<sup>(1)</sup>. The programmes of the different funds are complementary, for example the RDP aim of improving competitiveness of rural SMEs is consistent with the ERDF priority to promote employment and labour mobility. The ESF objectives related to education and lifelong learning are in line with the spirit of the rural development strategy. In practice, complementary planning is achieved through cooperation and joint meetings between the people managing the different sources of support.

From the applicant's point of view the regional centre for EU funding and its advisers provide a one-stop shop for any kind of development or investment project on rural bioeconomy. The EU funds can support different parts of a project – typically the ERDF is used for a feasibility study or to invest in the product development, while the RDP helps rural SMEs to acquire new technology, processes and equipment and the European Social Fund (ESF) can contribute to rural workers' wellbeing, education, lifelong learning and social inclusion in the region.

Biohauki Ltd is a local company producing biofuel for transport and organic fertilisers, that was founded jointly by 13 farmers and the municipal energy producer. RDP investment support was not an option in this case under the Finnish RDP, given that it could only be used to support biogas production aimed at agricultural use, but national investment support was used for the biogas plant, while the EAFRD helped with related agricultural investments in renewable energy at the farm level and in livestock farming.

Despite the efforts to streamline the delivery of support to beneficiaries, the diversity of measures and rules of the different funds can make communicating with rural entrepreneurs and providing the right information to potential applicants quite challenging.

(1) See the document 'Example of a regional approach: combining structural funds to develop rural bioeconomy in South Savo region, Finland', [https://enrd.ec.europa.eu/sites/enrd/files/bioeconomy\\_case-study\\_southsavo-fi.pdf](https://enrd.ec.europa.eu/sites/enrd/files/bioeconomy_case-study_southsavo-fi.pdf)

(5) For more about South Savo's regional strategy, see [https://enrd.ec.europa.eu/sites/enrd/files/tg2\\_bioeconomy\\_finland\\_tuulinen.pdf](https://enrd.ec.europa.eu/sites/enrd/files/tg2_bioeconomy_finland_tuulinen.pdf)

## REGIONAL BIOECONOMY CLUSTERS

Across Europe, some regional bioeconomy clusters have sprung up which are having a positive impact on rural economies. Territorial bioeconomy clusters can emerge from a coordinated policy approach or as bottom-up grassroots initiatives, driven by local needs. They help forge links between businesses, services and innovators and can attract new investments to revitalise a rural economy, or create brand new economic activity in rural areas.

Bioeconomy clusters can also help the long-term viability of rural SMEs by bringing them together with other stakeholders to work on joint projects and collaborations. This creates supportive ecosystems that generate economies of scale and greater visibility for all stakeholders. To secure buy-in for these clusters, appropriate policy frameworks and economic models for their sustainability are vital to show local actors the advantages of collaboration over competition.

Andalusia in Spain is an interesting example of a top-down approach. The regional authorities there have launched a circular bioeconomy cluster alongside the regional bioeconomy strategy to support the development and competitiveness of Andalusia's bioeconomy (see case study on this page).

By contrast, the Cluster of Bioenergy and Environment of Western Macedonia (CluBE) in Greece is a bottom-up initiative supporting the region's transition away from coal to a low-carbon economy and contributing to its regeneration. Western Macedonia is being transformed into a post-coal region with the help of the EU's Just Transition Fund, which supports regions that are dependent



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**A CIRCULAR BIOECONOMY CLUSTER FOR ANDALUSIA**

The primary sector is an important source of employment and wealth in Andalusia, where over one-third of the population live in rural areas. Its biological resources come mainly from agrarian and agro-industry sources, in particular from the olive sector and horticulture, but there is a need for more value-added products. Traditionally, the region's biomass has been used for biogas, composting and animal feed as well as in thermal power stations. Now Andalusia's circular bioeconomy cluster is helping to foster innovation and generate new products in addition to these traditional applications.

The regional authorities launched the cluster to promote Andalusia's competitiveness and support the development of its bioeconomy. The goal is to facilitate cooperation on innovative projects and boost entrepreneurship, bringing a critical mass of companies to the sector. The cluster should also improve awareness of the bioeconomy and help attract investment for Andalusian circular bioeconomy initiatives.

Those involved in the cluster have access to a broad range of services aiding communication and knowledge transfer within the sector and promoting collaboration on innovative projects. Other benefits include access to mentoring and help with applying for European funds.

[www.bioeconomiaandalucia.es/cluster-de-bioeconomia](http://www.bioeconomiaandalucia.es/cluster-de-bioeconomia)

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on carbon-intensive industries during their move away from fossil fuels.

CluBE, a non-profit organisation, has members from the public sector, academia and business, across the regional bioenergy and environment sector. The cluster provides a platform

for cooperation between these three pillars of the regional economy, with the goal of stimulating the economic growth of Western Macedonia's producers and SMEs. It seeks to develop synergies between local and regional players and businesses in the bioenergy and environment sector, to

support innovation and increase the sector's added value. The cluster's development of R&D and business activities in various parts of the bioenergy and environment sector will help reinforce a smart, bio, green and circular economy in the region and nearby.

## LOCAL INITIATIVES SUPPORTING THE BIOECONOMY

The development of local strategies on the bioeconomy is also essential to allow rural areas to stimulate and support the rise of bio-based business models that make the most of local resources. Successful approaches build on local resources and needs, avoid capital outflow from the local area and add value to its economy.

Knowledge is a vital part of developing different bioeconomies at the local level in rural areas. For the bioeconomy as a whole to create economic, social and environmental value that stays in the local rural community, knowledge must be combined with long-term commitment and a local network, thus empowering local communities to innovate.

Local actors can identify opportunities in the bioeconomy if they have access to relevant knowledge and information about its impacts on rural development (e.g. by using good examples and local 'champions'). This knowledge can also help inform the choices of local policy-makers, creating a better enabling environment for bio-based businesses.

Often, local approaches stem from grassroots initiatives. A number have already grown up that are promoting and providing a supportive environment for developing the bioeconomy in rural areas. For instance, some LEADER Local Action

Groups (LAGs) – bodies made up of public and private organisations from rural villages – are involving local communities in initiatives that use the bioeconomy to face local challenges.

LAG Bornholm in Denmark is one such group. Bornholm, an island in the Baltic Sea off the south coast of Sweden, has 40 000 inhabitants and its economy is primarily based on food, tourism and small-scale industry. The LAG considered how the bioeconomy could enhance the island's economy and help on its path towards self-sufficiency in food, animal feed and renewable energy production.

The LAG has been instrumental in strengthening the local community and accelerating development in rural areas, working together with local residents, the business community, public authorities and others. Its achievements so far illustrate the different benefits and dimensions a local approach can have, such as on increasing employment and local revenues, while also reducing the carbon footprint of local industries and businesses. LAG Bornholm promotes the bioeconomy by focusing on added value, in areas ranging from food to biomass and small-scale products with a local origin.

In less than 10 years, the island has moved from having a high dependency on imported fossil fuels to having its electricity and heat coming from

almost 100% renewable – and local – sources. Bornholm's agriculture sector is also shifting from the use of imported genetically-modified soya for animal feed to more locally grown protein, such as broad beans, and thus is becoming more self-sufficient.

Bornholm has a reputation worldwide for its food sector, attracting numerous tourists to the island. LAG-Bornholm is keen to support an improvement in the island's self-sufficiency in food (currently low), which would also be positive for its bioeconomy – adding value to local products, creating new jobs and increasing local revenues while also reducing emissions linked to transportation.



## 6. Building momentum

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This article profiles the different approaches rural areas are taking when seeking to raise awareness, create engagement and develop the new skills needed to power the bioeconomy. Local buy-in, capacity building and communication skills lie at the heart of the successful bioeconomy initiatives underway around Europe.

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THE IMPORTANCE OF LOCAL BUY-IN

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DEVELOPING NEW AND EXISTING SKILLS

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RAISING AWARENESS OF THE RURAL BIOECONOMY

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## THE IMPORTANCE OF LOCAL BUY-IN

Bioeconomy stakeholders operate across different sectors and scales, encompassing a variety of skills, users/consumers, resources and policies. Some stakeholders are mainly local entrepreneurs and primary producers or users of bio-resources. Others straddle regional and even national boundaries establishing wide networks with other national and transnational stakeholders and multinational companies.

However, in a rural context, stakeholder inclusion and local embeddedness (i.e. building on local institutions and local resources) are drivers of momentum and skills-development needed for a sustainable bioeconomy transition. Local actors' initiatives are key to

this transition because they hold important, first-hand knowledge of the available resources and how to use them sustainably – for instance

in a circular model. Moreover, local communities can have a genuine interest in maintaining and improving local conditions, including



© Wikipedia, Hajothu

### VOX VALLEY DEVELOPMENT ASSOCIATION, HUNGARY

The Koppány valley in western Hungary is a hilly area where large-scale crop production is the predominant land use and the small villages are suffering from depopulation and poverty.

Severe soil degradation, erosion and unsustainable biomass production are major problems, and the ageing population has little interest in innovation. Another challenge is the loss of wetland habitats. The region has also seen the massive emigration of rural population to urban areas.

The community-based 'Vox Valley Development Association' was founded in 2004. The main goal of the association is to tackle social-ecological losses in the region via cultural heritage conservation and income-generating activities. In terms of innovation and circular bioeconomy action, the association is implementing a system that mixes diverse technologies, such as aquaponics, hydroponics, renewable energy production and insect breeding.

For example, the association is working with the Koppány valley LAG and a recently established Natural Park to introduce bioeconomy pilot initiatives to address certain problems. One of the first projects aims to add value to the ecological buffer strips necessary on the sloping arable land to protect water courses and prevent soil erosion, by sowing them with the protein fodder crop *Galega* and a high-volume energy crop (*Silphium perfoliatum*). These crops, after fulfilling their environmental function, can be cut and can be used to replace maize as a feedstock

for bio-gas production. The project estimates that this secondary effect from the yearly biomass production of these buffer strips' crops could help more than 100 local families to heat their households and support complementary livestock activities.

Additionally, several innovative concepts for the sustainable use of local biomass are planned, including the 'Aquatecomponics' project and the Koppány Programme. The 'Aquatecomponics' project will use solar panels to provide electricity to a heat pump that warms up: 1) a greenhouse; 2) a facility where food waste is turned into compost; 3) an insect house that generates protein for an aquarium; and 4) an aquarium, whose waste is used as manure for the greenhouse plants. Building is due to commence in late 2019. An EIP-AGRI Operational Group is refining the technology around this project.

The Koppány Programme has yet to commence but it plans to merge two technologies (biogas production and plant protein extraction) in an innovative processing unit. The biogas plant will be used to generate electricity and heat. The heat will be deployed for grass protein extraction. The plant will process locally-grown green biomass. The anaerobic digestion residues will be used as manure, thus improving the soil quality. The leaf protein extracted will be used as feed in a local poultry-breeding system encouraging households to produce free-range chicken, as an alternative to using imported soybean based feed.

a thriving local economy as well as sustainably-managed natural resources and ecosystems.

Therefore, bottom-up processes and channelling local stakeholders' ideas up to regional and national decision-makers is fundamental to make the sustainable transition happen. Inclusive processes can help bridge and reinforce synergies between otherwise disparate stakeholders (from foresters and farmers to local entrepreneurs, academic organisations, public authorities and civil society), thus also facilitating knowledge exchange.

Inclusion of local actors helps embed sustainable bioeconomy innovation. Once aware of its potential, local entrepreneurs will seek to seize the specific opportunities the bioeconomy affords them. This dynamic helps drive forward new ways of doing things and leads industries to adapt and transform to be part of a profitable and sustainable bioeconomy sector.

Local stakeholders have developed different approaches and business models to foster inclusion and embeddedness. Some may be informal and local initiatives, as for instance local inhabitants or public representatives who demand more participatory and inclusive processes in local planning for bioeconomy activities (e.g. community-led bioenergy production projects).

An example of this is the process started by some Italian municipalities in the Province of Bologna ('Unione dei Comuni di Savena-Idice') to establish participatory land planning rules in relation to bioenergy production<sup>(1)</sup>. Other cases are rather successful in establishing wider and more inclusive platforms. For example,

## BOOSTING THE RURAL BIOECONOMY

The opportunities to build momentum via new approaches and models that bring actors together and foster knowledge generation and exchange were explored in the ENRD Thematic Group on 'Mainstreaming the Bioeconomy'<sup>(1)</sup>. Some of the key findings included:

- Farmers and rural SMEs should feel ownership of bioeconomy projects and be able to share their experiences with others through peer-to-peer exchanges, complementing the collection and sharing of good practices.
- Synergies between RDPs and other funding opportunities should be enhanced; multi-fund approaches are important and should be further exploited. Packages of RDP Measures could be offered to support rural actors' integration in new bioeconomy value chains. This should feed into the future national CAP Strategic Plans.
- Support – be it funding, technical or business guidance – is necessary at all stages of business development, not just for the set-up phase.
- To enable coherence between sectors, policies and legislation national bioeconomy strategies must build on local and regional dynamics, strengths and needs.
- The sustainability of the bioeconomy is not automatic so relevant strategies should aim for – and monitor – ecosystem preservation and the respect of natural resources.

These findings fed into the TG recommendations, published on the ENRD website<sup>(2)</sup>.

(1) [https://enrd.ec.europa.eu/enrd-thematic-work/greening-rural-economy/bioeconomy\\_en](https://enrd.ec.europa.eu/enrd-thematic-work/greening-rural-economy/bioeconomy_en)

(2) [https://enrd.ec.europa.eu/publications/recommendations-use-rdps-mainstream-bioeconomy\\_en](https://enrd.ec.europa.eu/publications/recommendations-use-rdps-mainstream-bioeconomy_en)

the Bioenergy Villages project<sup>(2)</sup> in Göttingen (Germany), supported by the European Agricultural Fund for Rural Development (EAFRD) through LEADER, utilises a 'Smart Village' approach to deliver energy services to local residents (see case study on page 42 for more details).

Other ways to build engagement are initiatives such as 'innovation hubs' or 'knowledge transfer platforms', clusters and Local Action Groups (LAGs) supported via a combination of European funds with specific goals related to, among others, bio-resources use, bioproducts, sustainability and cooperation measures. An example of this category is the Vox Valley Association and Koppany Valley LAG<sup>(3)</sup> project in Hungary created to boost local sustainable development

via tackling soil degradation and unsustainable biomass use (see page 38).

Inclusion and local embeddedness are cross-cutting dimensions that can be supported, whether directly or not, via other EU funds, including via Community-led Local Development (CLLD). However, the EAFRD remains key to helping build momentum for the bioeconomy.

(1) <https://lsvsi.it/paes/il-progetto/>

(2) See <http://www.bioenergieidorf.de/en/home.html> and [https://enrd.ec.europa.eu/sites/enrd/files/s7\\_smart-villages\\_bioenergy-village\\_de.pdf](https://enrd.ec.europa.eu/sites/enrd/files/s7_smart-villages_bioenergy-village_de.pdf)

(3) [https://enrd.ec.europa.eu/sites/enrd/files/tq2\\_bioeconomy\\_hungary\\_gelencser.pdf](https://enrd.ec.europa.eu/sites/enrd/files/tq2_bioeconomy_hungary_gelencser.pdf)

## DEVELOPING NEW AND EXISTING SKILLS

Available case study evidence suggests that, to develop bio-based activities and optimise synergies, the creation of small-scale networks or platforms that include at least primary producers, public sector, academic institutes and entrepreneurs is important to facilitate the adoption and adaptation of the bioeconomy value chains in rural regions.

Some of these case studies drew on existing skills and have often been successful, others aimed to develop new ones. The latter is more challenging because the projects may not fit within the existing local or regional knowledge base and/or industrial specialisations. ‘Del Monte de Tabuyo’<sup>(4)</sup> is a showcase of the latter type of project. Despite the lack of existing local knowledge and skills, five women succeeded in establishing a successful rural bio-based business, in two distinct steps. First, they relied on the results of a research project on mycology and, second, they collaborated with a regional consultancy company that helped them access the most suitable funding opportunities (see case study on this page).

Many European and national funding schemes can support existing or new skills development and knowledge transfer by just fostering cooperation and inclusion. The success stories show that the key to build the bioeconomy momentum in rural areas seems to be linking primary producers and primary sector advisory groups (e.g. national forest or agricultural advisory groups) to innovative entrepreneurs or researchers. Inclusion of different sets of stakeholders also



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### DEL MONTE DE TABUYO, SPAIN<sup>(1)</sup>

In the late 2000s, in the rural area of Tabuyo in Spain, five friends and neighbours decided to get together and leverage forest resources to build a bio-based rural business. At the time, the EU policy landscape was not yet using the term ‘bioeconomy’, but this case already represented a good example of rural diversification and sustainable business initiated by individuals and supported through both EU and regional funding. In fact, the five women leading the project first acquired a loan from a national bank and the Centre for the Development of Industrial Technology, and then their project was also supported via ERDF funding for regional R&D activities.

In Monte del Tabuyo, the forests are a public utility for communal use. While the forests could not be used for economic gain, the abundance of mushrooms triggered the interest of the five women behind the project. Since there was no local tradition to use and consume mushrooms, they started a restaurant business based on their own cultivated and collected products and other raw materials bought from other Spanish regions.

The five women created a cooperative called Silvestres del Teleno, which marketed the mushroom products they produced and the Del Monte de Tabuyo company, that ran a restaurant that featured their mushrooms. A third stakeholder joined, IRMA S.L., as a regional development consultancy to advise on the most suitable sources of funding. IRMA S.L had been involved in the StarTree project<sup>(2)</sup>, funded by EU’s FP7 Cooperation Work Programme, which generated case study information later used by the Del Monte del Tabuyo company.

A crucial source of knowledge-base and networking opportunities was the project ‘Mycology of Castilla y Leon’. It was a regionally financed project that provided knowledge and promoted mycology as a resource with great potential that, until then, had not been valued economically.

(1) <http://biobus.swst.org/index.php/bpbj/article/view/17/8>

(2) <https://star-tree.eu/>

(4) <http://www.delmontedetabuyo.com>



## BIOREFINERY GLAS, IRELAND

The 'Biorefinery Glas' (the Gaelic word for green) is a pilot project financed by the EAFRD (Measure 16) and the Irish Department of Agriculture, Food and the Marine within the Irish RDP in February 2019. It is based on a previous H2020 project 'Agriforvalor' that built the knowledge base and network for this new initiative.

The project is just at the start and brings together two Irish academic institutes, two farmers cooperatives and a Dutch tech company. The ambition is to foster the farmers' income, promote diversification, and close the production cycle by using not just grass protein but also residues from grass protein extraction process to produce less refined products such as biogas and organic fertiliser, thus reducing the impact of farming on the environment.

The goals of the project are multiple. The project will demonstrate how to adapt small-scale grass biorefinery technology on farms in southern Ireland. The Irish Institute of Technology in Tralee and farmers will test the production of multiple products, including protein concentrate feed for cattle, press-cake fibre for cattle, prebiotic sugars (for food and feed) and recover nutrients from residues to turn them into fertilisers. From a 'new skills' perspective, farmers will not only learn to use biotechnologies, but also to close the productive cycle by using residues to produce less refined products, i.e. fertilisers. Farmers will also be involved in farm-to-farm symbiosis and implementation of new business models, thus improving their business management skills. Lastly, the plan is to give the farmers coops the ownership of the biorefinery thus giving farmers the possibility to expand their business management and innovation capacity.

The project is a good example of inclusiveness and local embeddedness. It builds on the local natural, human, social and financial resources and includes a diverse set of stakeholders in knowledge production, transfer and implementation. Moreover, it boosts the synergies between climate and production measures.

The project's funding is based on M16 Cooperation and through an EIP-AGRI Operational Group i.e. as a pilot project linking different stakeholders into a network and where ideas are tested on the ground. The Biorefinery Glas got the funding from M16 of the Irish RDP, that supports projects targeting natural resources efficiency and the transition to a low-carbon and climate resilient economy in agriculture, food and forestry sectors. The project idea was developed and brought forward by an Irish researcher (Institute of Technology, Tralee).



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rely on a participatory approach to develop and implement their strategy to improve their economic, social and/or environmental conditions, in particular by mobilising solutions offered by digital technologies. Smart Villages that work on bioeconomy-related projects go beyond the primary producers to reach local inhabitants, the public sector and local entrepreneurs altogether. The inclusion and involvement of the public representatives usually fosters the local inhabitants' confidence in the project and the willingness to share the responsibility and costs. The cooperation between different stakeholders strengthens trust within the local network and facilitates learning via easy knowledge exchange also creating a window of opportunity for new bio-products development. Alongside Smart Village type approaches, thematic networks supported under the EU's Horizon 2020 programme such as 'Agriforvalor'<sup>(8)</sup> (with pilot networks in Andalusia, South-East Hungary

brings forward challenges among which difficulty in coordination, communication and financial issues. Pilot projects where primary producers are the main stakeholders are critical to overcome their risk and fear of financial failure, and develop new skills. Recently, in Galway, Western Ireland, a pilot project of this kind was funded through EIP-AGRI (see box on this page)<sup>(5)</sup>.

Other examples that can lead to new skills development are the Smart Village-type approaches that are built around bioeconomy value chains such as bioenergy production (e.g. Bioenergy Villages in Göttingen, Germany<sup>(6)</sup>, see box on page 42). Smart Villages<sup>(7)</sup> are communities in rural areas that use innovative solutions to improve their resilience, building on local strengths and opportunities. They

(5) <https://biorefineria.blogspot.com/2018/12/profile-biorefinery-glas-small-scale-farmer-led-green-biorefineries.html>; <https://ec.europa.eu/eip/agriculture/en/find-connect/projects/biorefinery-glas-small-scale-farmer-led-green>

(6) [https://enrd.ec.europa.eu/sites/enrd/files/s7\\_smart-villages\\_bioenergy-village\\_de.pdf](https://enrd.ec.europa.eu/sites/enrd/files/s7_smart-villages_bioenergy-village_de.pdf)

(7) For more about Smart Villages visit the ENRD's Smart Villages Portal, [https://enrd.ec.europa.eu/smart-and-competitive-rural-areas/smart-villages/smart-villages-portal\\_en](https://enrd.ec.europa.eu/smart-and-competitive-rural-areas/smart-villages/smart-villages-portal_en)

(8) <http://www.agriforvalor.eu>

and Ireland) and ‘Panacea-h2020’<sup>(9)</sup> (ten Member States involved) or labs such as the i-Danha Food Lab Accelerator<sup>(10)</sup> in Portugal are aimed at boosting knowledge transfer and skills development in the Bioeconomy.



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### BIOENERGY VILLAGE, JÜHNDE, GERMANY<sup>(1)</sup>

This Bioenergy Village was the first one established in Germany. It resulted from an idea of the University of Göttingen to foster the implementation of a biomass strategy to start the transition to an energy self-sufficient society through the use of agriculture biomass. The initial goals were to boost local economic development and environmental sustainability via biodiversity preservation and reduction of mineral fertilisers use. The project later benefited social sustainability through more local participation and shared responsibility. Jühnde was selected out of 54 other villages because of the very positive and engaged feedback by the actors and inhabitants.

Between 2000 and 2004, with the strong support of the local mayor and engineering companies, the project partners applied for permission, acquired investment subsidies, and planned the bioenergy system as well as the district heating grid. The village inhabitants (ca. 800) decided to found an operating cooperative in 2004 and invested their own financial resources into the bioenergy project. Voting rights and share of proceeds depend on the specific amount of invested money. The project was also financed via EU funding, such as LEADER + (15 % of the total budget) and the Ministry of Food and Agriculture (75 %) – the remaining 10 % is local shares. The project was also possible thanks to the national feed-in tariff scheme for renewable electricity.

The Jühnde case became a regional pilot project and with the support of the University, knowledge was transferred to other villages in and outside of the region. Currently, there are five bioenergy villages in the region. Between 2000-2006, a LAG was also founded with the support of LEADER+, called LAG Göttinger Land<sup>(2)</sup> which serves as an umbrella organisation for all the bioenergy villages in the Göttingen region.

(1) <http://www.bioenergie-dorf.de/en/home.html>

(2) [https://enrd.ec.europa.eu/sites/enrd/files/s7\\_smart-villages\\_bioenergy-village\\_de.pdf](https://enrd.ec.europa.eu/sites/enrd/files/s7_smart-villages_bioenergy-village_de.pdf)

## RAISING AWARENESS OF THE RURAL BIOECONOMY

In European rural areas different approaches are being used to attract stakeholders and form bioeconomy platforms and clusters. Some are bottom-up participatory projects led by local entrepreneurs or innovators, others are more top-down, such as when led by researchers or innovation hubs, but seek to include local actors such as primary producers, local businesses and public authorities. See, for instance, the case of CISA in the Bologna Apennines in Emilia Romagna, Italy (see box on page 43). What is

interesting is that most of these models are connected to the use and/or development of knowledge transfer tools and primary producers’ resources.

The case of CISA (now AESS)<sup>(11)</sup> in Emilia Romagna is a good example of this latter case and demonstrates how it is possible to build bioeconomy momentum even where there is not strong incipient demand. The key driver in this case was the Province of Bologna, particularly the Department of the Environment, which was keen to

use EU regional development funding to start environmentally-friendly projects in the underdeveloped area of the Apennines.

Considering the approaches taken at different levels throughout the rural bioeconomy and around Europe, newcomers are attracted by multiple factors. These include: shared risk, cost and revenue responsibility (e.g. cooperatives); inclusion of civil society actors, private and public stakeholders (this is also a feature

(9) <http://www.panacea-h2020.eu/about/panacea/panacea-network/#1515775944093-ba228efd-46cb>

(10) [https://enrd.ec.europa.eu/sites/enrd/files/w30\\_rural-innovation\\_3a-amorin.pdf](https://enrd.ec.europa.eu/sites/enrd/files/w30_rural-innovation_3a-amorin.pdf)

(11) <https://www.aess-modena.it/en/>

of the 'Bio-step project'<sup>(12)</sup>; building on existing skills to develop new ones (i.e. local embeddedness); using knowledge-transfer tools to raise awareness among stakeholders beyond early adopters; and an adaptive and enabling policy framework.

In particular, shared risks, costs and revenue responsibility are crucial drivers for local stakeholders to stick together and move beyond any challenges they experience thanks to a shared vision that binds them together. The 'GreenLab Skive'<sup>(13)</sup> project in Denmark (see box on page 44) shows how shared responsibility and inclusion can raise stakeholder awareness in the rural bioeconomy and face down potential fears, frustration and concerns<sup>(14)</sup>.

Most importantly, it is the combination of these factors that can attract an increasing amount of stakeholders into the rural bioeconomy. The recently-established Slovakian Bioeconomy Cluster<sup>(15)</sup> demonstrates the perseverance needed to raise awareness where a clear vision and common understanding of the bioeconomy pathway has yet to be developed (see box on page 44). However, it also shows how local key stakeholders such as universities and SMEs can leverage policy changes and attract other stakeholders into enabling the bioeconomy transition.



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### CISA, EMILIA ROMAGNA APENNINES, ITALY

In 2004, the Province of Bologna, the local development bank CA.RI.SBO, and the Italian Institute for Sustainable Development constituted the local Centre for Environmental Innovation (CISA) funded with EU regional and rural development funding. CISA was a consortium that gathered 11 municipalities in the Apennine mountains area of the Province of Bologna.

The area is rich in forest resources but the forestry sector was almost non-existent. Therefore, CISA's goal was to create a local renewable energy district that could become a pivotal example of locally-embedded and inclusive rural development, and environmentally friendly practices.

CISA launched three pilot projects, one on small-scale and forest-based bioenergy production, alongside a small-scale hydropower generation plant and a power station for solar-powered cars. These pilot projects triggered the local forest owners and forest businesses to form a Forest Cooperative called EPAV (30 associates) to more efficiently extract and supply local biomass.

Over time, CISA grew to cover 17 municipalities and became a local centre of competence that provided advisory and technical services to forest owners and businesses, and also to local bioenergy plants. Moreover, CISA catalysed the interest of other national and international organisations thus providing opportunities to be part of international projects and networks building on knowledge exchange and local assets.

Recently, CISA has merged with another local competence centre (i.e. 'Energy and Sustainable Development Agency of Modena' – AESS<sup>(1)</sup>) to constitute an inter-municipal Energy Agency that includes the municipalities of Modena and Bologna provinces. AESS expanded the portfolio of CISA actions to more public and private stakeholders and territories but it carries on the same goal to foster rural development via environmentally friendly projects.

(1) <https://www.aess-modena.it/en/>

(12) [http://www.bio-step.eu/fileadmin/BioSTEP/Bio\\_documents/BioSTEP\\_D4.2\\_Lessons\\_learned\\_from\\_BioSTEP.pdf](http://www.bio-step.eu/fileadmin/BioSTEP/Bio_documents/BioSTEP_D4.2_Lessons_learned_from_BioSTEP.pdf)

(13) <http://www.greenlabskive.com/?qa=2.72555027.1693405810.1553862662-1529062281.1553862662>

(14) <https://www.tandfonline.com/doi/full/10.1080/2157930X.2017.1281343>

(15) <http://bioeconomy.sk>



### BIOECONOMY CLUSTER, SLOVAKIA

In 2018, the Union of Slovak Clusters<sup>(1)</sup>, the University of Agriculture and other research centres decided to try to invest resources in building a bioeconomy cluster. In the absence of a clear, national bioeconomy strategy, private and academic stakeholders came together to start building momentum behind the Slovak bioeconomy. The recently established cluster wants to develop a varied portfolio of bioeconomy value chains, from eco-constructions, to biocosmetics and biopharmaceuticals. However, first they need to enhance the knowledge base and attract new stakeholders to develop a shared bioeconomy vision to build more concrete activities upon.

The goal is to involve regional SMEs and farmers – mostly large-scale due to the agriculture sector structure – to develop the knowledge base for: 1) building a common understanding of the bioeconomy and show some partners or SMEs are already doing bioeconomy-related activities; 2) teaching and persuading partners to collaborate; 3) helping the partners to find collaborators; 4) mapping innovation needs of the companies; 5) proving to farmers that bioeconomy is not only about primary production but also about using waste for more sophisticated products; and 6) investing in bioeconomy value chains such as biocosmetics and pharmaceuticals.

Future plans will depend on the response of SMEs and farmers but the cluster hopes to conduct on-farm pilot projects and expand to other sectors such as eco-construction and biopharmaceuticals.

(1) <https://www.clustercollaboration.eu/cluster-networks/union-slovak-clusters>



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### GREENLAB SKIVE, DENMARK

GreenLab Skive is a rural park for businesses working actively with integrated renewable energy, energy storage and resource efficiency. It is located in a rural area with development problems and involves multiple local stakeholders such as a farmers cooperative and association, local companies and two multinationals and the municipal council. The park is currently being built and it will include a biogas plant, a biorefinery for starfish protein extraction that will be used as feed by the local farmers, thus replacing import of organic soybean from China, and a high voltage power plant with wind turbines. The project has mostly been financed through public funding (municipal) and EU Interreg.

The idea of GreenLab was initiated in February 2015 by five members of the municipal council of Skive, in Denmark. The municipality team's name is 'Energibyen Skive'. The idea of Energibyen Skive arose from their awareness of the need to tackle the economic and social crisis of the rural area.

The first step of the project was to contact the local energy companies and two multinational enterprises (via their Danish office), namely, E.ON and Praxair, to test whether they would be interested in the idea of setting up a business park with a combination of different renewable energy and biorefinery technologies.

At the same time, they started to have meetings and hearings with the local inhabitants and farmers to raise awareness

on the urgency to foster local economic development. Particularly, the municipal council held public hearings to decide on change of farmland use and to respond to the concerns of the farmers. Around 60 farmers decided to form a cooperative that owns 50% of the biogas plant (with E.ON owning the other 50%). The farmers thus benefit from the revenues of heat supply and provision of biomass and the use of the organic fertiliser produced in the anaerobic digestion. The local fishermen proposed to invest in a biorefinery for starfish protein extraction. Starfish is an invasive species in the fjord, therefore its use for protein extraction has also a positive environmental effect. The extracted proteins are then used as animal feed by the local farmers.

Energibyen Skive has invested a lot of efforts in dialogue and communication with local stakeholders. It explained how despite losses (e.g. some farmers had to sell their land to install the plant facilities), the benefits are multiple and long-term (e.g. new jobs, lower unemployment, reduced emissions, attraction of new and young people to the area, new schools and so on). In 2015, Aalborg University made a Life Cycle Assessment study on the GreenLab environmental sustainability potential and evaluated the project to be able to reduce 35 000 t CO<sub>2</sub> per year. Communication between different stakeholders, facilitated through the active role of the municipality, was essential to link the multinationals' with the locals' concerns and to create a common vision.

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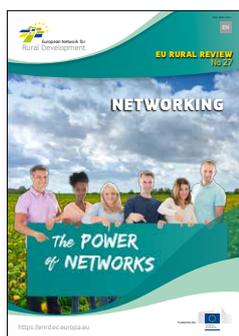
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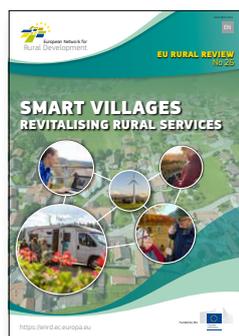
### EU RURAL REVIEW

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#### No.27 – Networking



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#### No.25 – Resource Efficiency



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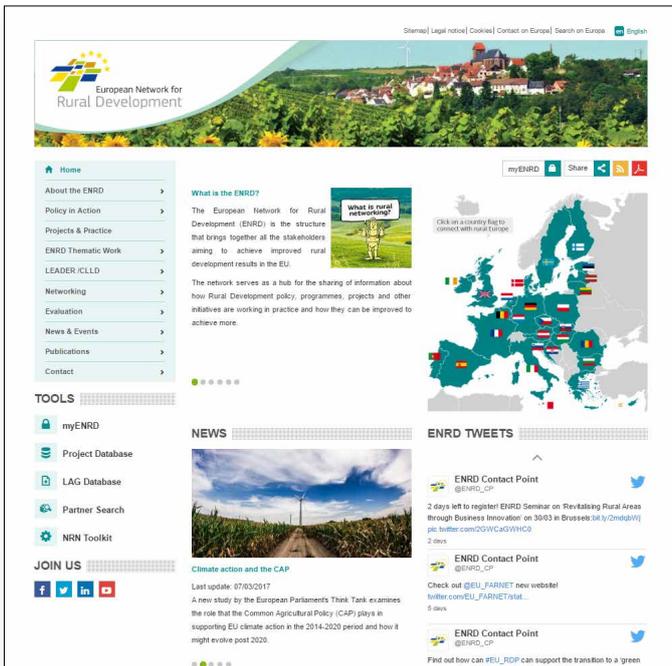
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