

Recommendations for a circular economy in European agriculture

April 2019

Every year, Europe produces one million tonnes of mushrooms, with each tonne requiring three tonnes of mushroom compost, which can only be reused up to three times before it needs to be disposed of. The **BIOrescue project** has demonstrated that this used mushroom compost, with other underutilised agricultural residues, can be turned into new bio-based products. The products developed within the project, such as bio-based pesticides, as well as biodegradable polymer capsules for targeted drug delivery, are designed for agricultural uses, providing alternative solutions to fossil-based products currently used in the agro-food industry. In addition to used mushroom compost, the BIOrescue approach has also explored the use of other agricultural residues including straw, prunings, sugar beet pulp and apple pomace, potentially creating a market for agricultural residues and wastes.

Making products from renewable, local bio-resources instead of fossil fuels will stimulate economic growth and the creation of new jobs in Europe, particularly in rural areas, whilst also reducing carbon emissions and fossil fuel imports. The construction of new biorefineries will support job creation in agriculture (cultivation, collection and delivery of biomass), as well as at the refinery itself (construction, operation, maintenance, management and research and development).

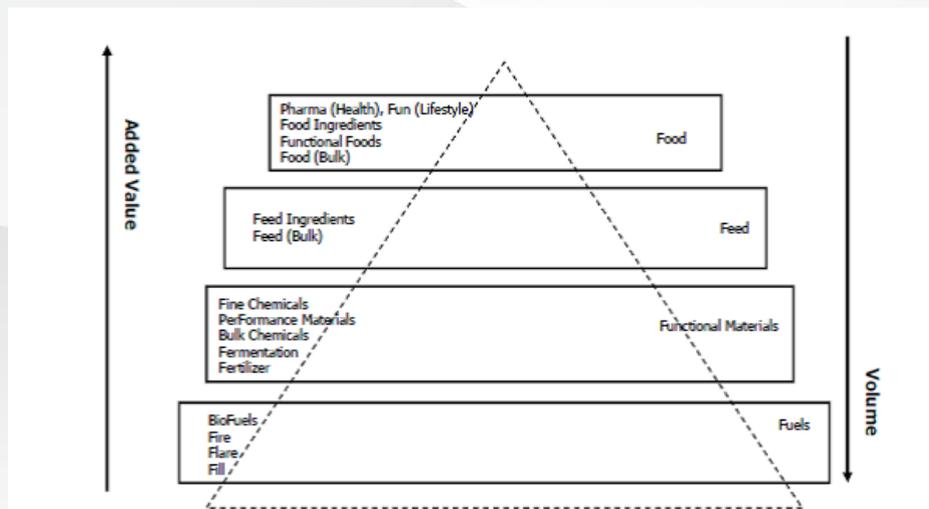
In comparison to other biomass resources, such as energy crops, residual biomass from agriculture and other industries have fewer sustainability concerns, and there are numerous benefits to be had from keeping resources in the loop, and building synergies between agriculture and bio-refineries. Indeed, such synergies create win-win scenarios. For mushroom farmers, disposing of compost is a burden as it must be either spread on the soil (where pre-treatment is needed to sterilise the material), or landfilled, with most EU countries having landfill taxes and many also having bans or limits on biodegradable waste. Using this 'waste' as a resource can have numerous positive benefits for the European economy, but barriers remains and need to be overcome with political support.

European Framework

The development of the bioeconomy and the use of agricultural residues can be encouraged with a supportive European framework, including a robust biomass sustainability policy and a cohesive approach that avoids conflicting goals between energy and bioeconomy policies. The EU's Bioeconomy Strategy aims to develop a more resource efficient, sustainable and competitive European economy that can contribute to challenges including food security, natural resource scarcity, fossil fuel dependence and climate change. The bioeconomy has significant potential in Europe, not just in the agri-food and bio-energy sectors, but also in bio-based products.

- Whilst the Bioeconomy Strategy is a good start, it has so far not been fully enacted. Europe must remain on track and implement the strategy fully, without delay;

- Europe needs to develop a more cohesive framework for supporting the bioeconomy, with stronger integration of policy objectives across the board. This includes ensuring that agriculture and energy policy are not pulling in opposite directions to bioeconomy development;
- The policy framework for supporting bioenergy is well developed, but distorts market prices for non-energy related bio-industry, even though the added value of biomaterials and bio-based products can be higher than energy applications (see image, *cascading use of biomass*). Biomass prices have risen as a result of bioenergy targets, distorting the market for higher value applications;
- EU Climate and Energy Policy should include bio-based industries as contributing towards targets, where bio-industry projects can demonstrate contributions to greenhouse gas emissions reduction;
- Political will towards bio-based products and bio-materials is slow; better integration is needed between policy and action to promote the cascading approach and enhance the economic viability of feedstocks.



Above: Cascading use of biomass, which promotes higher grade applications with higher value. Volume indicates available biomass suitable for application (Image source: AGRIFORVALOR project)

Feedstock production and logistics

For the bioeconomy to thrive, Europe needs to be able to supply cost-effective feedstocks, for year-round production. Feedstocks in Europe can be expensive as a result of competition from the (subsidised) fossil fuel and bioenergy industry, and higher labour and operating costs. In particular, there are challenges related to underdeveloped infrastructure for harvesting, storing and transporting feedstocks. Using residual feedstocks (such as mushroom compost) entails variations in feedstock quality. Technological improvements for bio-refineries and for assessing feedstock quality need to be advanced.

Biorefineries require a consistent supply of sustainable feedstock to produce bio-based products. These require either dedicated crop cultivation, or access to by-products and residues from other processes. In comparison to

other biomass resources, such as energy crops, residual biomass from agriculture and other industries have fewer sustainability concerns. These resources are often treated as a waste to be disposed of, rather than a resource to be used. Indeed, for mushroom farmers, disposing of compost is a burden as it must be either spread on the soil (where pre-treatment is needed to sterilise the material), or landfilled, with most EU countries having landfill taxes and many also having bans or limits on biodegradable waste.

- Agricultural policy needs to be updated to recognise agricultural wastes as a resource, and to incentivise their use, rather than their disposal (being aware not to disrupt existing uses or the nutrient cycle);
- The European Waste Framework Directive provides definitions for different types of waste, secondary raw materials, and by-products, associating each type of waste with different objectives and priorities. However, non-hazardous agricultural residues, such as mushroom compost, are not in the scope of the directive. This results in non-uniform classification of agricultural residues across member states (waste, residue or by-product), increasing logistic costs for their conversion into bio-based products, and making it difficult to trade residues cross-border, thus resulting in sub-optimal usage and, in many cases, landfilling;
- Public authorities (national or regional) need to take account of the potential of the bioeconomy, mapping their resources and economic potentials. This includes looking for, and fostering, industrial symbiosis, where wastes and residues from one company can be a resource for others;
- Grants should be available for the establishment of biomass value chains to overcome local fragmentation. This can include the establishment of farmers' co-operative organisations to pool and make efficient use of resources;
- Existing biomass certification schemes focus on cultivation for bioenergy purposes, but greater clarity is needed for certification regarding feedstocks for bio-based products.

Bioconversion and processing

Development of new biorefineries is essential for the creation of new, high-value bio-based products. Bioconversion is the process by which bio-based products are produced from biological and chemical substances, through fermentation or by using enzymes. These processes need to be improved to increase yields and reduce costs. BIOrescue has created and tested biorefinery processes that could be replicated for broader, Europe-wide impact, and has also created a process for testing the quality of biomass feedstock which is much cheaper and faster than existing solutions. These solutions are ready for replication, but require an enabling framework for technology uptake.

- The development of the bioeconomy will be stimulated through integration of biorefineries into existing value chains, particularly in the agro-food, forestry, biofuels and chemicals industries. Policy will need to play a role in this, incentivising existing industries to convert their processes;
- Access to private funding for scaling-up projects remains challenging, with investors uncertain about the potential returns on investment. Financial instruments can be established that can help to de-risk investments, using public funds in co-operation with financial institutions for loans, loan guarantees, and equity and quasi-equity agreements;
- Similarly, knowledge-sharing and networking platforms need to be established to raise awareness of the potential of the bioeconomy, linking project developers and financiers. It is expected that the European

Investment Banks's €100 million Circular Bioeconomy Investment Platform (to launch in 2019) will help to de-risk investments and contribute to connecting investors with projects;

- Increase public funding for demonstration projects and stimulate demonstration via public and private partnerships;
- European Structural and Investment Funds (ESIFs) should be used to support the development of bio-based industries. The bioeconomy can be supported under the European Regional Development Fund for investments in innovation-drivers, infrastructures, logistics and take-up. The European Social Fund can support skills, capacity building and entrepreneurship. The Bio-Based Industries Consortium has already produced a document on combining Horizon 2020 funding with the ESIFs. Regions should now be considering their options for the Operational Programmes for 2021-2027.

End-products and market uptake

The market for bio-based products needs to be further developed to help products compete against fossil-fuel equivalents, which can be mass produced, but are unsustainable (externalised costs). The costs of feedstocks and processes pass on to the cost of the final bio-based product, which cannot compete with fossil fuel-based products which externalise their environmental costs. Without political support, bio-based products will face difficulties in overcoming existing market barriers.

- Overcoming the competitive advantage of fossil fuel-based products will require that they reflect the environmental costs and impacts in the actual cost of the product, and that subsidies are removed to enable bio-based products to compete more fairly;
- Public procurement should support the development of the bioeconomy, being a very powerful tool for encouraging market development. Public authorities can give preference to bio-based products in their procurement contracts;
- Public authorities can set targets for uptake of bio-based products. This can be challenging due to the sheer number of product categories in the bio-economy, but indicative or binding targets can be set for specific sectors (e.g., mandates for bio-chemicals);
- Eco-design and product labelling requirements can stimulate market development of bio-based products, enabling consumers to make informed decisions. Schemes can be mandatory or voluntary;
- Awareness raising and communications efforts are needed for end-users, taking account of concerns regarding the food v. fuel argument and GMOs.

Contact – Greenovate! Europe

Bénédicte Julliard – Project Manager

b.julliard@greenovate-europe.eu

Simon Hunkin – Policy & Knowledge Manager

s.hunkin@greenovate-europe.eu