



Sustainability Transition Assessment and Research of Bio-based Products

Newsletter Issue 4



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Welcome to the fourth newsletter of our project on the sustainability assessment of bio-based products, [STAR-ProBio](#), in which you can read, among others, how our main outputs are starting to take shape. For any questions or feedback please contact us at communication@STAR-ProBio.eu

Foreword by the project coordinator

STAR-ProBio has just entered its “last mile” and it is time to start taking stock of the work done so far.



**Prof. Piergiuseppe
Morone**
**(Unitelma Sapienza -
University of Rome)**

Firstly, I would like to mention that the review meeting held in Rome in January 2019 was very successful! We received positive, constructive and encouraging feedback from two external reviewers, appointed by the Commission, who assessed independently our deliverables and all the work done by the consortium over the first 18 months of the project. The review meeting was also a great opportunity to present our key achievements to the project officer and the policy officer, who shared the



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Work Programme BB-01-2016: Sustainability schemes for the bio-based economy



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general positive view on STAR-ProBio progresses and achievements.

This meeting brought a wave of optimism among all partners and strengthened our commitment to deliver valuable outputs to the Commission and, more generally, to all stakeholders interested in our work. As mentioned in my previous foreword, the key outputs of STAR-ProBio, and in a way its legacy, will be the SAT-ProBio and the SyD-ProBio – two ‘Smart Tools’ which will allow users to perform a sustainability assessment on bio-based products and compare the alternative policy scenarios for the uptake of the European bioeconomy.

The soundness of the work done so far is also reflected in the high number of scientific publications (often on high impact factor journals) that stem in the last two years from our research and innovation action. Altogether, there have been 11 peer reviewed publications and 50 presentations at conferences and meetings since the beginning of the project.

Finally, the growing interest in the project was well reflected in the successful accomplishment of the last two meetings held in April and June in Santiago de Compostela and Rome, respectively. The Santiago meeting provided an opportunity to all partners to jointly reflect upon the development of the two ‘Smart Tools’ mentioned above. Great progress was made in Santiago both in the SyD-ProBio model construction as well as in the definition of the SAT-ProBio structure as a useful, friendly and applicable tool to perform sustainability assessments. The Rome meeting, organised as a parallel event of the EURAS annual conference, provided the floor to present to a broad audience our project. Also, the roundtable on ‘Standards as policy tools’, that saw the participation of eight highly knowledgeable panellists, provided a unique opportunity to discuss how to use standards to reach sustainability.



A general feeling of satisfaction is circulating among STAR-ProBio partners, and this makes me happy and optimistic for the future. Although we are all very well aware that so much still needs to be done to accelerate the transition towards a sustainable world, the feeling that we, as an EU-funded research project, are doing our share is the highest reward we can get!

Rome, 25/06/2019
Piergiuseppe Morone

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STAR-ProBio in brief:

- Aims to **formulate guidelines for a common framework** promoting the development of regulations and standards that support the adoption of business innovation models and market uptake in the bio-based products sector.
- Will develop a **blueprint for a sustainability scheme** and a **sustainability assessment tool** applicable to a large spectrum of bio-products.
- Will make **recommendations** for a more efficient and harmonized policy regulation framework for the market-pull of bio-products.

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- Outputs will be **new and revised assessment methodologies, criteria and indicators** developed by integrating scientific and engineering approaches with social sciences and humanities.
- Application to **selected case studies** to illustrate benefits and impacts for bio-based products.
- Case studies cover **extensive value chains** with several intermediate and final bio-based products.

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STAR-ProBio Recent News

STAR-ProBio project features in Italian Bioeconomy Strategy

In the updated Italian Bioeconomy Strategy (just published in May 2019) sustainability standards, certification schemes and (eco)labels have been identified as a key supportive measures to unlock the innovation potential of the Italian bioeconomy, contributing to the creation of a 'level playing field' between bio-based products and conventional products, and prompting the market uptake of bio-based products.

In this regard a direct mention to the work carried out in our STAR-ProBio project was made in the Strategy:

"[...] the European project STAR-ProBio (Horizon 2020 Research and Innovation Action) is performing a multidisciplinary study, aiming at the development of: (i) a comprehensive blue-print for sustainability



assessment (SAT-ProBio); and (ii) a novel system dynamic model (SyD-ProBio) that would serve as a valuable tool for supporting evidence-informed policy interventions and for creating a level playing field."

This is acknowledgment that makes us proud of the work done so far and further motivates in accomplishing our goals over the next year!

STAR-ProBio second annual meeting



On the 2nd and 3rd of April 2019 the STAR-ProBio consortium met for a series of intensive and fruitful meetings and workshops in Galicia, Spain for the 2nd annual meeting. The event was hosted by project partner Universidade de Santiago de Compostela (USC). The overall focus was streamlining the substantial body of research already developed over the first two years into the project's main outputs: the sustainability assessment tool for bio-based products SAT-ProBio and the system dynamics model for analysing various combinations of bio-economy policy options Syd-ProBio.

The first day plenary sessions were held on the results of the various work packages and their impact on the overall project. The second day focused on the "smart tools" of STAR-ProBio. To this end two workshops were held. The SAT-ProBio workshop further detailed the framework of sustainability assessment for bio-based products, whereas the SyD-ProBio workshop explored policy options, indicators and variables that can feed into the system dynamics model. The SyD-ProBio model is meant as a tool for policy scenario analysis, testing extreme scenarios, best-case scenarios, and optimal scenarios for bio-based products with a multi-stakeholder perspective in mind.



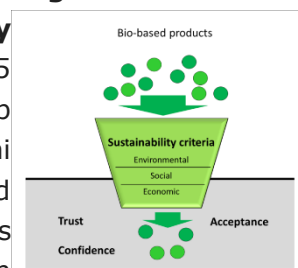
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Read More about STAR-ProBio Research

Recently completed Deliverables

In the last 6 months STAR-ProBio has completed several interesting reports:

- [Public report](#): Deliverable D5.1 **Acceptance factors among consumers and businesses for bio-based sustainability schemes**. This report covers a large chunk of the WP5 market assessment work. It reports on expert focus group activities and the first 2 of the 3 rounds of the large Delphi exercise on what kinds of sustainability messages and information are important for the market. Some highlights of the results include that information on what to do with with a bio-based product after its useful life and reduced greenhouse gas emissions but also health are important to the vast majority of both professional and individual consumer respondents. It worth noting that even for the lowest scoring of the 29 sustainability criteria, there was still a significant portion of the respondents deeming it important, which signals that proving sustainability cannot just focus on a few most important criteria but must cover all bases. Another important finding is that both within professionals and individuals, different people have very different understandings of what percentage of greenhouse gas reductions and percentage of bio-based content can be expected. This means that a certain percentage is considered sufficient or good by some people, while others consider the same percentage misleadingly low and not enough to call a product “bio-based” or “sustainable”. This is an important point for public awareness and calls for careful expectation management.
- Internal report: Deliverable D3.1 **Expanding environmental sustainability criteria to address the manufacturing and other downstream processes for bio-based products**. This internal report describes the creation of a set of sustainability criteria for the production processes (“downstream processes”) of bio-based products, in compliance with standard life cycle assessment accounting (i.e.: ISO 14040 and EN 16760) as a coherent set of environmental and techno-economic indicators, to be included in sustainability certification scheme. For this purpose, thresholds to these indicators are proposed and tested via case studies and data collection. In addition, these indicators’ compliance to the EN 16751 framework is assessed. The new indicators are successfully tested on the case studies. The set of sustainability indicators is well aligned with the EN 16751 framework so far and the STAR-ProBio goals are fully aligned with those of this European Standard.
- Internal report: Deliverable D6.2 **Stakeholders’ map and validated list of ‘value items’**. This report focuses on the social aspects of sustainability, and was developed with the aims of identifying and mapping stakeholders according to their power and interest assessed against bio-based products and of validating a bundle of “standardized social indicators” by engaging the identified stakeholders through four context-related interactive workshops.



This allows defining a social impact framework tailored to bio-based products. Specifically, the validation exercise serves the purpose of narrowing down the number of social indicators. In turn this process creates a basis for reducing the amount of data needed for carrying out the assessment and decreasing, thus, associated costs.

- [Public report:](#) Deliverable D6.3: **Criteria and indicators developed for conducting S-LCA social impact assessment.** This report summarizes the work performed regarding the selection of the most important impact subcategories for the social analysis of these products and the development of a specific methodology to measure them. In order to select the relevant impact subcategories to be included in the analysis, an extensive literature review was conducted, different workshops were organized and questionnaires were distributed to stakeholders. Considering the final list of subcategories, a simple, flexible and practical methodology was developed and adapted to analyse the social performance of bio-based products. As reflected in this report, the methodology considers the five categories of stakeholders: workers, consumers, local community, general society and value chain actors and uses quantitative, semi-quantitative and qualitative indicators. Finally, it provides a final score that embodies the overall social performance of the production of a specific bio-based product.
- [Public report:](#) Deliverable 6.4: **Report on end-of-life social and socio-economic assessment.** End of Life (EoL) management represents a great challenge to develop new opportunities towards sustainability. Indeed, international institutions, organizations, academics, researchers and practitioners highlighted the importance of EoL management, since it is associated with relevant environmental, social and economic impacts. Yet, the appraisal of EoL alternatives represents a particularly complex task to address due to the difficulties arising from the assessment of social and economic key-criteria. In this regard, several gaps related to bio-based products have been stressed by the literature, especially with reference to socio-economic indicators. This report focuses on the existing EoL options with the aim of identifying key community priorities for sustainable EoL management of bio-based products. This is achieved by developing a win-win asset-based model that has been tested on a selected case study, i.e. Poly Lactic Acid (PLA)-based packaging film. The results show that recycling (both mechanical and chemical) is the best EoL option for the considered product.
- [Public report:](#) Deliverable D10.4 **Second year report on communication, dissemination and publication activities.** Communication, dissemination and publication activities play a vital role within STAR-ProBio. The second year report lists all such activities during the period May 2018 – April 2019 and provides an outlook for the third and final year of the





project. These activities include the various forms of online and social media communication, 14 scientific and 5 non-scientific publications, 6 outreach events for the general public and over 50 speaking engagements, posters and other presentational communication.

Publications

E. Imbert, L. Ladu, A. Tani & P. Morone, **The transition towards a biobased economy: A comparative study based on social network analysis**, *J. Environ. Manage.*, 2019, 230, 255-265; <https://star-probio.us17.list-manage.com/track/click?u=6e180c4592b89daaf686e0345&id=f6360d9322&e=f3c4522597>; written by TUB and Unitelma relevant to the work of WP5.

S. González-García, B. Gullón, G. Feijoo & M. T. Moreira, **Environmental concerns on the production of value-added bioproducts from residual renewable sources**. In M. Hosseini (Ed), *Advances in Feedstock Conversion Technologies for Alternative Fuels and Bioproducts*, 2019, Chapter 18, 339-353, <https://star-probio.us17.list-manage.com/track/click?u=6e180c4592b89daaf686e0345&id=e9734e40c8&e=f3c4522597>; written by Universidade de Santiago de Compostela, relevant to the work of WP2.

D. Briassoulis, A. Pkiasi & M. Hiskakis, **End-of-waste life: Inventory of alternative end-of-use recirculation routes of bio-based plastics in the European Union context**, *Critical Reviews in Environmental Science and Technology*, 27 Mar 2019, <https://star-probio.us17.list-manage.com/track/click?u=6e180c4592b89daaf686e0345&id=a05d64e391&e=f3c4522597>; written by Agricultural University of Athens, relevant to the work of WP4.

A. Cortés, M. T. Moreira & G. Feijoo, **Integrated evaluation of wine lees valorization to produce value-added products**. *Journal of Waste Management*, 2019, 95, 70-77; <https://star-probio.us17.list-manage.com/track/click?u=6e180c4592b89daaf686e0345&id=ac0ad99cc0&e=f3c4522597>; written by Universidade de Santiago de Compostela, relevant to the work of WP2.

I. Salim, S. González-García, G. Feijoo & M.T. Moreira, **Assessing the environmental sustainability of glucose from wheat as a fermentation feedstock**. *Journal of Environmental Management*, 2019 247, 323-332; <https://star-probio.us17.list-manage.com/track/click?u=6e180c4592b89daaf686e0345&id=7e09627717&e=f3c4522597>; written by Universidade de Santiago de Compostela, relevant to the work of WP2.



A. Cortés, G. Feijoo, A. Chica, J.F. Da Costa-Serra & M.T. Moreira, **Environmental implications of biohydrogen based energy production from steam reforming of alcoholic waste**. *Industrial Crops and Products*, 2019 138, 111465; <https://star-probio.us17.list-manage.com/track/click?u=6e180c4592b89daaf686e0345&id=100fadb9f0&e=f3c4522597>; written by Universidade de Santiago de Compostela, relevant to the work of WP2.

P.M. Falcone, S. González-García, E. Imbert, L. Lijó, M.T. Moreira, A. Tani, V.E. Tartiu & P. Morone, **Transitioning towards the bio-economy: Assessing the social dimension through a stakeholder lens**. *Corp Soc Resp Env Ma*, 2019, 1-19; <https://star-probio.us17.list-manage.com/track/click?u=6e180c4592b89daaf686e0345&id=14dbcdb0f3&e=f3c4522597>; written by USC and Unitelma relevant to the work of WP6.

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STAR-ProBio Dissemination & Communication

2nd annual STAR-ProBio workshop @ EURAS 2019

14 June 2019 at the LUISS Guido Carli University, Rome

The second annual STAR-ProBio workshop was co-organised with the 24th EURAS (European Academy for Standardisation) conference, themed 'Standards for a Bio-Based Economy', which took place from 13 to 15 June 2019 at the LUISS Guido Carli University of Rome. The STAR-ProBio workshop, hosted together with the LIFECAB project, was a plenary session covering the afternoon of the main conference day.



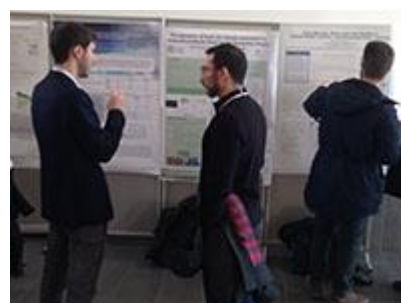
The successful 3.75 hour workshop, attended by 65 participants from 16 countries, combined presentations on the STAR-ProBio project from Sofia Maina (Agricultural University of Athens) and Maite Moreira (University of Santiago de Compostela) and the LIFECAB project from Michalis Koutinas (Cyprus University of Technology) and Elio Padoan (University of Turin – DISAFA) with a Roundtable Discussion to explore 'Standards as policy tools'. Panel members consisted of a complementary blend of industry (including SME), academia, policy maker and NGOs: Knut Blind, TU Berlin & FhG FOKUS; Mauro Cordella, JRC; Mathilde Crepy, ECOS – European Environmental Citizens' Organisation for Standardisation; Monica Delsignore, Università degli Studi di Milano – Bicocca; Uwe Fritsche, Director of IINAS; Liliana Gamba, WWF; Davide Mainero, Acea Pinerolese; and Elena Mocchio, UNI - Ente Italiano di Normazione. The panel discussed topics such as the key challenges that natural and social sciences face for designing adequate standards for bioeconomy, the trade-off between environmental and socio-economic sustainability and the role of standards in policy and regulation to achieve major sustainability in bioeconomy activities.

The workshop was well received by an engaged audience and led to increased stakeholder interest in the project's final deliverables, as well as additional insights of market needs and desires for bio-based product sustainability assessment.

Conferences and Events

STAR-ProBio researchers have been out and about in recent months promoting our work at a range of different conferences and events including the following:

Luana Ladu and **Simone Wurster** of the Technical University of Berlin represented the Star-ProBio project at **BIO Deutschland - Sitzung der AG "Industrielle Bioökonomie"** and gave a presentation to representatives from businesses across Europe. The meeting was held on 12 November 2018 in Berlin, Germany.



Also in Berlin, **Mathilde Crepy** of ECOS gave an oral presentation at the **13th European Bioplastics Conference**, held on 4 and 5 December 2018, entitled '*Standards for bio-based evaluation bio-based content and sustainability criteria for bio-based plastics*'. Industry representatives, researchers and policy makers from across Europe were among the 420 delegates at the event.



Diego Marazza, **Enrico Balugani** and **Roberto Porcelli** of the University of Bologna all attended the **Italian Association of Environmental and Resource Economists (IAERE) 7th Annual Conference** on 7 and 8 February 2019 in Udine, Italy. They presented a poster entitled '*The dynamics of land use change associated to biobased products: focus on the economic effects*'. The conference was attended by ca. 100 scientists and students from around the world.



The STAR-ProBio project was represented by **Piergiuseppe Morone** and **Francesca Govoni** of Unitelma Sapienza at **Closing the Loop "Promuovere l'economia circolare nella Regione Marche"** on 8 March 2019 in Ancona,

Italy. Piergiuseppe chaired a session titled '*CIRCULAR AGRIFOOD (Spreco alimentare, economia circolare e bioeconomia: dal problema alla soluzione)*'. Within this session, Francesca briefly presented the STAR-ProBio project to the audience. The event took place as part of EU Industry Week and was attended by scientists, researchers, policy makers and the general public from across Europe.



Janusz Gołaszewski of University of Warmia and Mazury in Olsztyn presented a poster '*Sustainability aspects of renewable resource use in techno-economic assessment of bio-based products*' at the **12th International Conference on Bio-based Materials**. The event was held on 15 and 16 May 2019 in Cologne, Germany and was attended by ca. 280 directors and researchers from around the world.



Kadambari Lokesh of the University of York gave a platform presentation on '*Sustainability transition assessment and research of bio-based products*' at the **WRUN and Climate Change Network Meeting: Exploring the environmental impacts of supply chains**. The meeting was held in York on 23 May 2019 and around 30 scientists, policy makers, students, conservationists and ecologists were in attendance.

Kadambari Lokesh of the University of York and **Diego Marazza** of the University of Bologna both gave oral presentations at the **SETAC Europe 29th Annual Meeting**, held from 26 to 30 May 2019 in Helsinki, Finland. In addition, Diego chaired the session "Bio-based industries: sustainability benefits of technological innovation and closed loop approaches across supply chains". The audience gave useful feedback about the STAR-ProBio project and for future research directions.

Sergio Ugarte of SQ Consult B.V. and **Stefan Majer** of DBFZ both participated in the **27th European Biomass Conference and Exhibition** in Lisbon, Portugal. Sergio gave an oral presentation on '*Strengths and gaps of the current EU bioeconomy framework for the sustainability assessment of bio-based products*'; Stefan on '*Identification and certification of low indirect land use impact biomass for the EU bioeconomy*'. The conference was held from 27 to 30 May 2019 and had 1,766 participants from 81 countries,



The Bioeconomy Explained to Young Students

In March, the University of York organised two outreach events (on behalf of the STAR-ProBio project) involving school children. The first was run as part of the University of York's annual Science Trail inviting regional schools to participate in activities and learn more about the research carried out in the university. The second was run as part of the York Cares' Inspiring Minds programme which aims at inspiring disadvantaged children by linking real life and learning. The focus of the events was to provide the children with hands-on experience whilst learning about conventional versus bio-based plastics and the importance of the bioeconomy. A total of 55 primary school and 110 secondary school children were involved over the two days.

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STAR-ProBio Work Package Updates

The STAR-ProBio Work Package leaders provide updates on what has been achieved since the last newsletter.

WP2: Upstream environmental assessment

A set of procedures was established throughout the development of the life cycle assessment (LCA) of the upstream processing stages (agricultural activities and pre-processing) to support strategic and policy decision-making for bio-based products. The

first two years of the project were dedicated to determining the best environmental indicators for bio-based products, goal and scope definition, system boundaries and the selection of suitable feedstocks to be converted into fermentation sugars for the production of bio-products. The selection of raw materials takes into account not only first-generation feedstocks (edible crops) but also residues from agricultural and industrial operations.

Ongoing work is being carried out on the life cycle inventory of feedstocks production and pre-processing phase. The results of the inventory data will be used to compare the environmental sustainability of upstream processes for bio-based products, as well as to combine them with other work packages.

WP3: Downstream environmental assessment

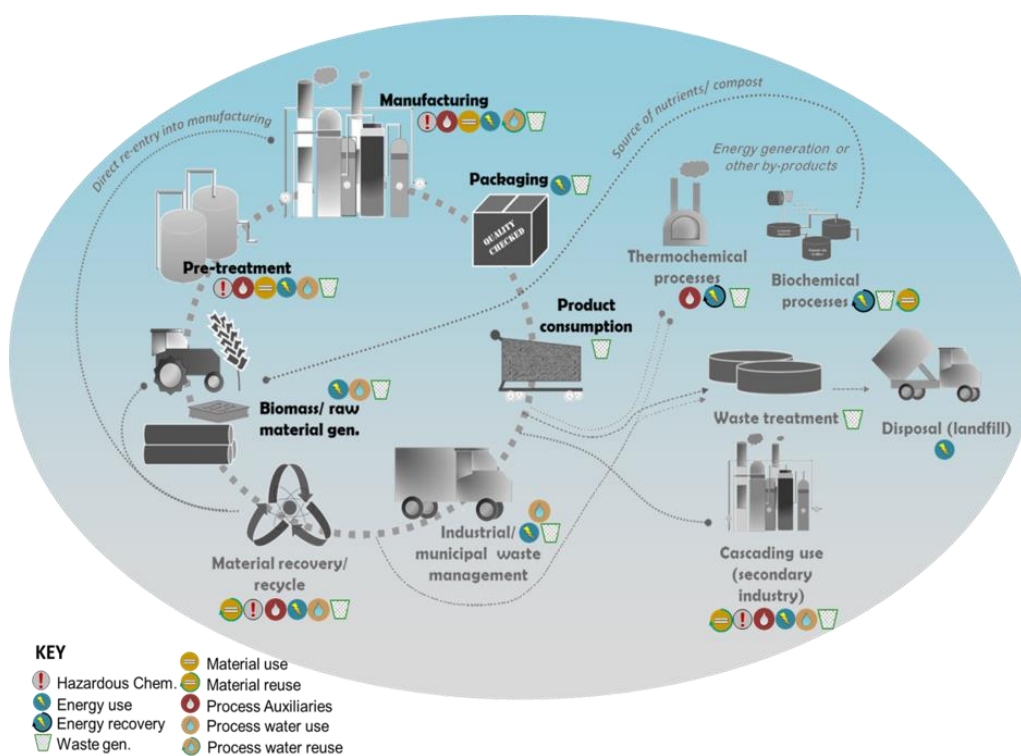
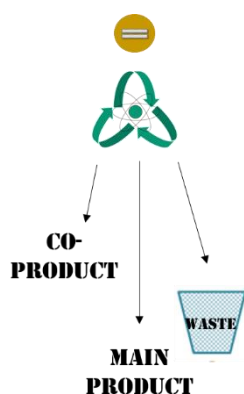


Figure 1: An overview of resource utilisation and circularity within a typical bio-based value chain.

Great progress has been made in the development of an environmental assessment methodology for the bio-based products, within WP3. Given the importance of systems thinking in evaluating the sustainability of a bio-based products, a life cycle assessment (LCA) was chosen and its methodologies developed. A selection of LCA indicators, recommended by the Product Environment Footprint (PEF) guidance by the European Commission for the industrial sector, were adopted. A selection of non-LCA indicators were adopted and exclusively developed for STAR-ProBio by combining the existing approaches in resource efficiency with the green chemistry metrics and the circular economy principles. These “hybridised indicators” quantitatively or qualitatively highlight

the material/energy efficiency and circularity characteristics that have been embedded into the process design by the economic operators from stages including manufacturing, refining, logistics and the end-of-life (EoL) management of these bio-based products. For example, the material efficiency evaluation not only accounts for the feedstock intensity of the product, but also measures how effectively a process utilises its process auxiliaries (solvents, freshwater, catalysts, columns etc), in addition to measuring how well these materials are being recovered (reactivated, if needed) and reused within the same process. As proposed, new thresholds were developed for each of the LCA- and the hybridised indicators using the climatic planetary boundaries as guidance. The proposed methods and thresholds were tested for effectiveness and accuracy by applying them to a comparative LCA evaluation of the bio-based and fossil-based case studies. The methods, thresholds and the outcomes of this evaluation have been published in the deliverable D3.1. Preparations are also being made to publish the research outcomes in a high-impact factor journal with AUA, Quantis and UNITELMA.

In the next 6 months, we will be delving into developing a coherent set of environmental assessment methodology to address the managed end-of-life (EoL) management of bio-based products, from a closed-loop viewpoint. We are currently in the process of developing appropriate sustainability criteria and appropriate thresholds appropriate for the environmental impact assessment of the EoL processes.



WP4: Techno-economic assessment members recently participated in international conferences presenting their work carried out in the framework of WP4. Demetres Briassoulis gave two presentations on the work carried out in the framework of WP4 and WP8: one in the International conference Biopol-2019, in Stockholm 17-19 June 2019 entitled "*Techno-Economic sustainability criteria for post-consumer bio-based plastics' material recovery*", and another one in the 7th International Conference on Sustainable Solid Waste Management on Crete Island, Greece, 26-29 June 2019 entitled "*Techno-economic*

sustainability criteria and indicators for End-of-Life options of bio-based plastics". Dimitrios Ladakis and Apostolis Koutinas presented two oral presentations in the 8th International Forum on Industrial Biotechnology (IFIbiop2019, 1-5 May 2019, Miri, Malaysia) entitled "*Techno-economic sustainability analysis of succinic acid production from glucose syrup and spent sulphite liquor*" and "*Exploitation of industrial side streams for the production of bio-based chemicals and polymers - Techno-economic sustainability potential*". Apostolis Koutinas presented WP4 results on techno-economic sustainability methodology development at the Lignocost COST action meeting that was held in Wageningen on 13th March 2019. Techno-economic assessment work has made significant progress at both levels of methodology including relevant principles, criteria



and indicators and the case studies analysis. The TESA of the case studies of the processing and EoL have also been progressed and the common environmental and techno-economic data have been communicated to WP3 and WP8.

WP5: Market Assessment completed the second round of its Delphi survey on the market acceptance of sustainability assessment factors for bio-based products with 180 respondents, including 80 end-consumers and 100 professionals. Key topics included: the relevance of sustainability in buying bio-based products and main drivers to buy bio- or fossil-based; different influences on the willingness to buy bio-based products (in general and per type of bio-based products); relevance of 29 specific criteria (split in environmental, social, economic and additional criteria); indication of the origin of bio-based products as well as the impact of nine categories of regulatory options (asked only to professionals). The survey led to important results for STAR-ProBio's further work. Of the 29 environmental, social, economic and additional criteria included in the questions, almost all were considered essential for calling a product sustainable by a majority of respondents; environmental criteria were considered essential by a larger majority of respondents. In addition to direct sustainability requirements, criteria with a more indirect impact on sustainability such as quality and life cycle cost are given great importance by the majority of respondents.

When queried about minimum, typical and misleading percentage of bio-based content and percentage of GHG emissions reduction, all respondent groups gave a wide range of answers. This means that a certain percentage of bio-based content or GHG reduction is above the minimum or typical percentage for some people, while others consider the same percentage misleadingly low and not enough to call a product "bio-based" or "sustainable". This is an important point for public awareness and calls for careful expectation management. These and other results and recommendations are explained in detail in [Deliverable D5.1](#): Acceptance factors among consumers and businesses for bio-based sustainability schemes.

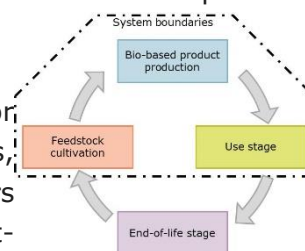
In addition, an experiment eliciting consumers' willingness to pay (WTP) to assess the market potential of bio-based products was conducted in April 2019 at the Ikea store of Bari, Italy. In particular, STAR-ProBio aimed to understand whether consumers are willing to pay more for bio-based products than for fossil-based products and whether certifications/ labels on bio-based products affect the consumers' willingness to pay. STAR-ProBio gathered data from 360 respondents. Each consumer was asked to express his/her WTP on a conventional (fossil-based) product, a non-certified bio-based product and a certified bio-based product. On this basis, STAR-ProBio obtained a total of 1,080 observations. Selected products included: (1) bio-based colored pens (2) conventional colored pens (3) disposable bio-based food storage bags (4) conventional bio-based food

storage bags (5) bio-based hand soap (6) conventional hand soap. The results are currently being analysed.

WP6: Social assessment

Earlier workshops with stakeholders identified 15 important impact subcategories for social assessment. In order to gain a deeper understanding about the relevance of such social impact categories, an ad hoc questionnaire administered to different stakeholders categories (i.e. workers, consumers, value chain actors, general society and local community) was used in to ascertain relevant impact subcategories to be included in social life cycle analysis (*S-LCA*). Based on the final list of subcategories, a simple, flexible and practical methodology was developed and adapted to analyze the social performance of bio-products. The next step would be to make the "proof-of-concept". The aim would be to collect all the information from the performance indicators of some examples of bio-based products in order to analyze possible difficulties in the practical application of the proposed methodology.

Work has been done to identify key community priorities for sustainable End of Life (EoL) management of bio-based products, by firstly deepening the earlier work done on criteria and indicators pertaining to EoL stage, followed by developing a win-win asset-based model focused on EoL treatment of bio-based products. A four step process (i.e. getting started, coming together, action planning and implementation) was implemented. To maximize its effectiveness and generalizability, the model was tested by different categories of stakeholders (i.e. Academicians, Trade Associations, Policy Makers and Waste Management Companies) from geographically and culturally distant European regions. The final result of this model is represented by the development of a new indicator, called socio-economic indicator for EoL strategy (SEI-EoL), which includes several perspectives of analysis. The model was tested on a selected case study, i.e. PLA-based packaging film, which was chosen from among STAR-ProBio's case studies due to the product's potential applicability to all EoL options. The main result shows that mechanical and chemical recycling obtain the highest values of SEI-EoL, while landfill use is the least preferred option.



WP7: ILUC risk assessment for bio-based products

The Indirect Land Use Change (ILUC) of biobased products is a complex and sensitive topic that the European Commission has been addressing over the last 10 years. STAR-ProBio researchers are developing a risk-based approach to assess the ILUC risk of the biobased products and to define low indirect impact of biomass (LIIB) for certification schemes. This is well in line with recent EC actions.



In detail, STAR-ProBio researchers are working to assess the effectiveness of the causal-descriptive model based on a system dynamics methodology (SyDILUC) for selected case studies that represent real examples of biobased products at global level. The researchers are coping with the dynamics of the so called “yield gaps”, these would be the distance between actual and maximum yield potential of the target crop of the model. Obtaining this information is vital since it is one of the most sensitive factors in the definition of the ILUC.

As final results, the model would enable the producers to have assessed the ILUC risk level of their own biobased products, through a user-friendly interface (ILUC Risk Tool). Using the model, we are defining some mitigation practices to reduce the ILUC risk and to contribute to satisfy additional demand for biomass without increasing land demands. The achievement of a biobased product with an associated low ILUC risk may allow the definition of criteria and requirements for certification schemes by which the producers could certify their own products. The risk factors identified in the ILUC assessment as well as the low ILUC risk mitigation practices will be turned in *ad hoc* policy recommendations for mitigating ILUC risks related to the production of biobased products in Europe.

In the next few months efforts will be directed towards finalizing the ILUC Risk Tool, analysing the trade-offs and risks that can be associated with the implementation of the low ILUC practices, and elaborating policy recommendations.

WP8: Sustainability scheme blueprint for bio-based products

Building on the results of other WPs, various activities have been performed towards the SAT-ProBio sustainability assessment tool, including SWOT/PESTEL analysis in relation to seven gaps identified in WP1, the concepts for communication of LCIA results, benchmarking, thresholds and overall model of certification scheme and the ecosystem-based Drivers-Pressures-States-Impacts Response (DPSIR) framework was applied to study interactions between society and the environment regarding sustainability assessment of bio-based products. In parallel, work has commenced on the CEN Workshop Agreement (CWA), contracting NEN as CWA Secretariat and preparing the agenda for the first meeting of stakeholders.

Further development of the SAT-ProBio tool includes the scoping paper with the anticipated content of the blueprint as well as a matrix with the inventory of the SAT-ProBio principles, criteria and indicators is being finalised, as well as work on recommendations to the current certification schemes. Work will continue on completing the SAT-ProBio blueprint, the CWA, the context of our work against the Sustainable Development Goals as well as research on a well-balanced set of rules governing the certification scheme.



WP9: Analysis of regulations, (eco)labelling and policy initiatives

As an important additional element to the development of sound and meaningful assessment tools for biobased products, STAR-ProBio WP9 is analysing options for the implementation of the manifold STAR-ProBio products into the existing EU bioeconomy framework.

As a first step, the WP9 team conducted a comprehensive review of the existing policy framework for the EU bioeconomy. Based on this analysis, potential gaps as well as connections and links between policy goals and targets for the future development of the Bioeconomy and sustainability assessment tools and instruments have been described (selected results have been presented at the EUBCE conference 2019 in Lisbon). Based on this work and the existing results from other STAR-ProBio work packages, WP9 tasks analyse both the applicability of the STAR-ProBio products as well as options for their implementation and connection to the EU policy framework for the Bioeconomy. Recent activities in WP9 include:

- Testing the applicability of existing (eco)labels to biobased products - selected results were presented at the 24th EURAS Annual Standardisation Conference in Rome.
- The development of a co-regulation framework for the STAR-ProBio blueprint
- The analysis of synergies and connections between sustainability certification and Bioeconomy monitoring
- An ongoing participatory group modelling process, tackling the complex and cross-cutting nature of the policy arena for bio-based products, that will lead to the development of a comprehensive System Dynamics model (SyD-ProBio) to test the impact of different policies on the EU bioeconomy.

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STAR-ProBio Researcher Interviews

Dr Kadambari Lokesh, University of York



What is your role in the project and how does your work help to reach STAR-ProBio's desired impact?

I am a post-doctoral research associate based at the University of York. My responsibilities include carrying out technical evaluations and communicating outcomes to experts and non-specialists, particularly within the "environmental sustainability" sphere. The conclusions of my work directly add value to STAR-ProBio's ultimate aim of creating and proposing a sustainability assessment framework which will not only bridge the gaps in the existing international standards for bio-based products, but by also stressing the significance and the need to transcend to a resilient circular economy from our currently unsustainable linear economy. This is particularly relevant not only to the global climate emergency but also with the looming global resources supply and trade crisis.

"The conclusions of my work directly add value to STAR-ProBio's ultimate aim of creating and proposing a sustainability assessment framework which will not only bridge the gaps in the existing international standards for bio-based products, but by also stressing the significance and the need to transcend to a resilient circular economy from our currently

What is the most interesting part of your job?

Just how multi-disciplinary this research is. We have a consortium made of sustainability experts, environmental groups, social scientists, policy and certification analysts, process engineers, green chemists and most importantly, industrial partners. My research enables me to interact with these partners and pick their brains. My learning curve is a real roller-coaster.

Tell us a bit about your background/career path

**unsustainable
economy."****linear**

Kadambari Lokesh

My background was in biology and biotechnology, completing my bachelor's degree with distinction at the University of Madras, India. I acquired a PhD in Aerospace at Cranfield University, UK, for my work on the Techno-economic Environmental Risk Analysis (TERA) for the biojet fuels assessing their performance in a commercial jet engine. This involved the use of dedicated in-house developed tools in addition to using the rather holistic approach to sustainability evaluation, life cycle assessment and life cycle costing. This experience helped me secure my first post-doctoral position at the Stockholm Environment Institute (SEI), University of York on an EPSRC funded research project entitled "Sustainable Chemical Feedstocks", in collaboration with the Green Chemistry Centre of Excellence (GCCE), where I was involved in evaluating the sustainability characteristics of a novel approach to acquiring high-value chemicals from an agricultural waste, wheat straw, and developing appropriate methods. On its completion, I was able to secure my current role for the STAR-ProBio research.

What is your view of the bio-based products sector/market?

There is a greater demand for bio-based products than ever before, from consumers more than any other sources. We also have a number of innovative businesses that are developing ethically sourced bio-based products. However, we can see that this bio-based market is still struggling to keep up with the quantitative and quality-based demands of the current trends of consumerism. Their responsible sense of buying sustainably sourced goods and products is also often impacted by how expensive it gets. Availability of financial mechanisms, such as subsidy systems, catalyse the promotion of bio-based products. But there is a need for this industry to become an autonomous system. There is also a need for better transparency among the stakeholders, communicating the importance of



capturing the best practices that are being implemented by each other in their processes, which can then be communicated to the consumers to create awareness of the responsible operations that have been invested in creating a product they favour the most. Some enterprises have successfully implemented this. This approach must, however, widen to SMEs that make up a majority of the bio-based sector.

In your opinion, what would success look like for the project?

I have had the pleasure of tasting success at a preliminary level, disseminating the outcomes of this research and discussing further upon it. There have been words of welcome, there have been highlighting of potential concerns and suggestions of what more could be done. This feedback has helped shape this project to where it is right now and to me, the success would at least be to be able to pitch and seek ways to help some of the notable work from STAR-ProBio be recognised or be adopted by policy makers and industry experts.

Andrzej Juszczyk, ChemProf POLAND

What is your role in the project and how does your work help to reach STAR-ProBio's desired impact?

I am a technologist from the ChemProf company, working on the production and implementation of natural products for animal nutrition. Close cooperation with manufacturing gives me the opportunity to participate in every stage of production and face with problems that are associated with the manufacturing of bio-based

products. Basic processes such as extraction and stabilisation of active substances from plants, or increasing their bioavailability are the main points of my work. I operate on various available industrial technologies such as percolation, microfiltration, reverse osmosis, vacuum drying and spray drying. As a result, the assessment of economic viability and the feasibility of new products is easier and comparable to their synthetic alternatives.

What is the most interesting part of your job?

The implementation of new products based only on natural ingredients is what has always seemed the most difficult to me, and also the most interesting part of my work. Bio-products that we produce are used on farms around the world to support animal health, especially when the use of synthetic agents is not possible. The preparation of such a bio-product with the desired content of an active substance, stable and convenient to use, is a kind of challenge that gives me power every day.

Tell us a bit about your background/career path

I graduated with an MSc from the University of Warmia and Mazury in Olsztyn, where I dealt with research on the possibilities of bioethanol production from rapeseed straw and biodiesel from algae oils. The possibilities offered by natural resources have led me to postgraduate studies at the Medical University of Poznan, where I improved my knowledge of the treatment and medicinal plants processing. For last five years I have been associated with the ChemProf company, where I use my acquired knowledge in the production of natural products.

What is your view of the bio-products sector/market?



"Close cooperation with manufacturing gives me the opportunity to participate in every stage of production and face with problems that are associated with the manufacturing of bio-based products."

Andrzej Juszczyk



Demand for bio-based products is currently huge and will rise. This is related on the one hand with the real need to introduce such products, and on the other hand, with the global trend. Bio-based products are "cool", but we should not forget that they are made from limited sources, which will run out in the future. However, it doesn't change the fact that today we should develop as many methods of production and processing of such bio-products as possible, to face the problems that will occur in the future.

In your opinion, what would success look like for the project?

The success of the STAR-ProBio project will be the encouragement of policy-makers (through a scheme/blueprint for improving bio-based products) to create a favourable environment for companies which want to deal with bio-based products. When European companies see real benefits of the production or use of bio-based products, all of these benefits will also be passed on from consumers to society.

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Related European Projects

STAR-ProBio has cultivated synergistic co-operations with many related European projects. We'd like to introduce a couple of them here:

ReSolve (H2020-BBI-JTI-2016 – RIA 745450)

The [ReSolve](#) project's overall aim is to find safer bio-based alternatives to two hazardous fossil-based solvents. The 3 year project, running until May 2020, brings together 11 European partners including producers, research organisations, SMEs and end-



users. It is developing the replacement solvents, demonstrating their performance in relevant applications and evaluating their sustainability and health impact.

Solvents are used widely throughout a number of different industries. The two solvents that ReSolve aims to find replacements for are toluene and NMP. Despite these solvents being subject to restriction conditions under the European REACH regulation, they are still used in very large volumes in Europe. Substitution of the solvents by high-performing, safer, bio-based alternatives would have a significant impact on the health of European workers routinely exposed to these solvents.

Key outcomes from the project will be presented at the project's stakeholder workshop that will be held as a pre-conference event at EFIB 2019. Registration is now open and further details are available from the [EFIB 2019 conference website](#).

STAR4BBI (H2020-BBI-PPP-2015-2-1 – RIA 720685)

[STAR4BBI](#) is an EU funded project focusing on Standards and Regulations for the Bio-based Industry. The project has started on September 2016 with the duration of 36 months. It is led by the Netherlands Standardisation Institute NEN and comprises the consortium members nova-Institute, TU Berlin and Wageningen Food & Biobased Research.

Over the last three years the STAR4BBI project has studied policy and standardisation hurdles that bio-based industries face. During the recent stakeholders' workshop in Cologne, a set of seven measures to achieve better policies and standards for bio-based industries had been concluded. These will be shared with the EC and industry associations via a soon to be produced report. These proposals can



be found here: <http://news.bio-based.eu/necessary-measures-to-achieve-a-level-playing-field-for-bio-based-products/>

Additional information about the project and reports published by now can be found here: <http://www.star4bbi.eu/>



These projects have received funding from the Bio Based Industries Joint Undertaking under the European Union's Horizon 2020 research and innovation programme under grant agreement Nos 720685 and 745450.

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Forthcoming Events



Sustainability Metrics: Tracking, Measuring and Reporting Responsible Innovation

11th September 2019, University of York

The University of York is organising a second sustainability metrics workshop following the success of the first event in 2018. This event will demonstrate the current trends and practices in applying qualitative and quantitative sustainability evaluation practices, through use of LCA and other industrial best procedures, in the context of circular economy. All the progress from WP3 will also be showcased at this event.

Confirmed speakers include:



- Laura Craggs, Drax Power limited
- Lasse Six, AGRIMAX - OWS Limited
- Professor Peter Styring, University of Sheffield
- Dr Julia Creasey, Croda
- Dr Francesco Razza, Novamont S.p.A

Register your place for free by 30 August 2019 at:

<https://star-probio.us17.list-manage.com/track/click?u=6e180c4592b89daaf686e0345&id=3e3b6a04b9&e=f3c4522597>

6th International Environmental Best Practices Conference

22-26 September 2019, Olsztyn, Poland

With support from STAR-ProBio, consortium partner University of Warmia and Mazury (UWM) is organising the 6th International Environmental Best Practices Conference from 22-26 September 2019 in Olsztyn, Poland. The theme this year will be "Sustainability schemes for bio-based products in the framework of the circular bioeconomy".

The Conference will focus on a sustainable transition of the economy from fossil-based products to biomass-based alternatives; it is the biggest research challenge for the next decades. Firstly, the development of bio-based economy requires an interdisciplinary research approach as it is only through convergence of achievements at the crossroads of many sciences, including chemistry, biotechnology, technical, agricultural, environmental, social and economic sciences, that synergistic outcomes will be created. And secondly, applied research on economic system with bio-based value chains that assume material flows towards zero waste and pollution will integrate three fundamental areas of sustainable development: economy, environment, and society. The implementation of circularity within bioeconomy requires that the value chains be examined in the context of life cycle analysis that includes end-of-life options of bio-based products and restitution of the environment with the use of green chemistry. The other important issue is that the bioeconomy sectors are progressing more quickly than regulations associated with bio-based products entering the market. The gaps in the standards, certification schemes and labelling of bio-based products provide unregulated areas which cannot fulfil the requirements of sustainability.

The 3 day conference, open to all registered participants and starting on the 24 September, will be preceded by a bi-annual project meeting of all STAR-ProBio consortium members.

[Registration is open!](http://ebp6.eu) Visit ebp6.eu

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The 6th International Environmental Best Practices Conference
Sustainability schemes for bio-based products in the
framework of the circular bioeconomy

22-26 September 2019, Olsztyn, Poland

Panels of session presentations and posters

- PS1. Sustainable value chains for biomass-based products**
- PS2. Multi-product processing – requirements on sustainability**
- PS3. Green chemistry and biotechnology – new technologies and markets**
- PS4. Standardisation process for natural pharmaceutical products**
- PS5. Socio-economic dimensions of regulations on circular bioeconomy**



Summer School, end of summer 2019

STAR-ProBio will provide several contributions to the 2-week [Forestry and construction Catapult summer school](#) in Helsinki, Finland and Gothenburg, Sweden. This Summer School is aimed at PhD students, Post Docs and professional students and is led by EIT Climate-KIC. The central question that the Summer



Climate-KIC is supported by the
EIT, a body of the European Union





School aims at answering is 'How can we fully harness the climate change mitigation potential of wood construction?', while at the same time researchers will experience working in multi-disciplinary teams on real life practical problems. The course will provide an overview of how the inherent properties of wood can be used to good effect to create a more sustainable built environment, through the development of real-life solutions, co-created in multidisciplinary teams. One of the key components of this summer school will be a real-life challenge given by an invited stakeholder from a sector like the construction industry, forest industry, real estate owners, investors or public authorities.

STAR-ProBio project final event

Around April 2020 STAR-ProBio will host an important event, marking the completion of the project. We will keep you posted!!!!

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STAR-ProBio in brief:

- Aims to **formulate guidelines for a common framework** promoting the development of regulations and standards that support the adoption of business innovation models and market uptake in the bio-based products sector.
- Will develop a **blueprint for a sustainability scheme** and a **sustainability assessment tool** applicable to a large spectrum of bio-products.

STAR-ProBio Partners:

- [Unitelma Sapienza University of Rome](#)
- [University of York](#)
- [Technische Universitaet Berlin](#)
- [Agricultural University of Athens](#)
- [Deutsches Biomasseforschungszentrum](#)
- [SQ Consult](#)
- [University of Bologna – Alma Mater Studiorum](#)
- [Uniwersytet Warminsko Mazurski W Olsztynie](#)
- [ChemProf](#)
- [Quantis](#)
- [NOVAMONT](#)
- [Swedish Environmental Protection Agency – Naturvardsverket](#)
- [Universidade de Santiago de Compostela](#)
- [agroVet GmbH](#)

- Will make **recommendations** for a more efficient and harmonized policy regulation framework for the market-pull of bio-products.
- Outputs will be **new and revised assessment methodologies, criteria and indicators** developed by integrating scientific and engineering approaches with social sciences and humanities.
- Application to **selected case studies** to illustrate benefits and impacts for bio-based products.
- Case studies cover **extensive value chains** with several intermediate and final bio-based products.

- [European Environmental Citizens Organisation For Standardisation](#)



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STAR-ProBio geographical distribution of partners

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Our newsletter and other news:

www.star-probio.eu/news/



**Sustainability Transition Assessment
and Research of Bio-based Products**



This project is funded by the European Union's Horizon 2020 Research and innovation action under grant agreement No 727740 with the Research Executive Agency (REA) - European Commission. Duration: 36 months (May 2017 – April 2020).

Work Programme BB-01-2016: Sustainability schemes for the bio-based economy

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