D5.4 Report on Policy Lessons

June 2017 (M28)

T5.4 – Final Policy Dinner Debate Event at European Parliament

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Professional support to the uptake of bioeconomy RD results towards market, further research and policy for a more competitive European bioeconomy.

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement N° 652683.

Technical References

Project Acronym	ProBIO
Project Title	**Professional support to the uptake of bioeconomy RD results towards market, further research and policy for a more competitive European bioeconomy**
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Project Duration	March 2015 – August 2017 (30 months)

Deliverable No.	D5.4
Dissemination level [1]	Public
Work Package	WP5 – Enabling networking and knowledge exchange
Task	T5.4 – Final Policy Dinner Debate Event at European Parliament
Lead beneficiary	Greenovate! Europe
Contributing beneficiary(ies)	Technofi, i.con innovation
Due date of deliverable	30 June 2017
Actual submission date	14 July 2017

[1] PU = Public
PP = Restricted to other programme participants (including the Commission Services)
RE = Restricted to a group specified by the consortium (including the Commission Services)
CO = Confidential, only for members of the consortium (including the Commission Services)

Document history

V	Date	Beneficiary	Author
1	28 June	G!E	Simon Hunkin
2	10 July	G!E	Katharina Krell
3	14 July	G!E	Simon Hunkin

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement N° 652683.

Summary

ProBIO is a Co-ordination and Support Action funded by the European Union's Horizon 2020 Programme, which aims to increase the impact of bioeconomy research results from the 7th Framework Programme's Knowledge-Based Bioeconomy (KBBE) Programme. ProBIO has screened 411 FP7 KBBE projects, looking for research results with the potential to have an impact on European society through commercial application, contribution to policy-design, or use as a building block for further research.

Eighteen projects were found to have a total of nineteen research results with implications for policy-making in Europe, spread over the sectors of Agriculture, Fisheries, and Food and Nutrition. ProBIO has examined these projects, and made a number of recommendations for how results can be used to improve policy. Drawing from lessons learned during the project duration, ProBIO has also made a number of recommendations on how to improve European Framework Programmes, which have been presented in the European Parliament.

Key Messages

Agriculture

- Whilst the Common Agricultural Policy has become increasingly focused on environmental performance and sustainability, new **tools and indicators** could help to improve this even further. The FLINT project's handbook and farm management software should be considered for harmonising the collection of sustainability data, while the FADNTOOL project results, created at the request of the Farm Accountancy Data Network (FADN), should already be under consideration there;
- **Pesticides and Fertilisers** are widely used in the European Union in order to support crop growth. However, both can lead to the build-up of chemical pollutants and have unintended consequences on the environment:
    - The TEAMPEST project has made valuable recommendations on reducing pesticide use, through new policy instruments. These instruments should be considered primarily by national and regional policy-makers at this point, but the findings should also be considered by DG Agriculture and DG Environment for considering future pesticide regulation and management;
    - Both BIOFECTOR and REFERTIL have contributed to the debate on fertilisers, with the former providing evidence of the effectiveness of bio-effectors in replacing fertilisers. The database of bio-effectors and guidelines should be considered by DG Agriculture to inform future regulation, but should at a minimum be taken up by Farm Advisory Services who can provide input to farmers. REFERTIL recommendations on improving use of organic fertilisers are directly applicable to the revision of the Fertiliser Regulation, which is already more focused on organic fertilisers, being framed within the Circular Economy Package;

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- The REFERTIL project highlights the importance of policy-frameworks that can support a circular economy approach, and in particular, greater effort is needed to support the use of **agricultural 'wastes'** as a resource. As well as REFERTIL, NEMO highlights that EU support-policies are not doing enough to ensure that these available resources are being used optimally. Upcoming revision of the biofuels policy should be accompanied by revisions to the CAP that encourage farmers to make use of 'waste' resources, which are often burnt or composted, with no net environmental benefit.

Fisheries

- The EcoFishMan Responsive **Fisheries Management** System should be considered as a future model for the Common Fisheries Policy, which has so far struggled with combating fish discards, primarily through failures in monitoring and enforcement. The new system, shifting responsibility to the fishermen, could help to tackle these problems, if the political will can be found;
- The PARASITE project has developed two new technologies for improving **food safety** for fish consumers. Both technologies have been proven viable, and should be considered by food regulatory bodies that may wish to upgrade their current frameworks.

Food and Nutrition

- TeRiFiQ, PROMETHEUS and SATIN have considered how to improve **food processing and production** systems for ensuring healthier food products:
    - The TeRiFiQ and SATIN projects show that improvements in food nutrition can be achieved without detriment to taste. This should open a discussion regarding the role of labelling in encouraging food producers to develop healthier foods;
    - PROMETHEUS has actively sought to answer a challenge set by policy-makers, and its results should be considered by the European Commission, and raised by them with the World Health Organisation.
- With increasing awareness of the impact of plastics on the environment, interest in **sustainable packaging** is growing, but it is important to understand the health impacts of using new materials. SusFoFlex has examined some of these materials, and highlights the challenges that policy-makers will need to overcome;
- Consumers are becoming increasingly aware that the products they buy can have an environmental cost. The **sustainability labelling** developed by the SENSE project can form the basis of political discussions surrounding food labelling, and should be explored by food businesses looking to make inroads with socially conscious consumers;
- There is an increasing need for **encouraging healthy eating** in Europe, to overcome current health problems which are driven by diet. HabEat recommendations, as well as the results from TeRiFiQ, PROMETHEUS and SATIN can inform this discussion.

Programme Level

In order to overcome barriers to impact, the ProBIO consortium makes the following recommendations for the follow-up programme to Horizon 2020:

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- **Foster more market driven R&I through substantially increased industry and SME participation** – for example, through the joint technology initiatives and similar approaches;

- **Base calls for proposals for applied research projects more on strategic R&I-roadmaps, which are developed jointly with industrial companies including SMEs** both in a top-down and bottom-up fashion. An example for bottom-up project definition could be through cluster-facilitated R&I projects that are based on strategic R&I roadmaps which have been developed jointly by groups of SMEs and research teams collaborating in regional or national SME driven clusters;

- **More support for collaboration and demonstration** by ensuring the participation of industrial technology developers and end users in the development phase of a project;

- **Provide staged funding programmes for research and innovation actions with a longer-term implementation perspective –** A new programme design with 'staged grants' could address TRL 4-6 in a first project stage and TRL 7-9 (piloting and demonstration) in a second project stage. Both stages would need to be included in one Grant Agreement, but the grant for Stage 2 would be conditional upon achieving well-defined exploitable results in Stage 1;

- **Follow-up on the impact of project results after the end of the grant agreements** – Make access to funding for further projects conditional upon successful use of previous project results. For basic research, this could involve the publication of results, intellectual property and evidence of follow-up research. For applied research, this would require evidence of commercialisation efforts.

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1 Introduction

ProBIO is a Co-ordination and Support Action funded by the European Union's Horizon 2020 Programme, which aims to increase the impact of bioeconomy research results from the 7th Framework Programme's Knowledge-Based Bioeconomy (KBBE) Programme.

Over the 30 months of the project, ProBIO has screened more than 400 FP7 KBBE projects, looking for research results with the potential to have an impact on European society. ProBIO defines impact as the use of research results in a commercial application, their contribution to policy-design, and their use as a building block for further research.

From the initial 411 KBBE projects screened, seventy-six were recognised as having significant potential for exploitation. Looking further, eighteen of these were found to have 'policy-relevant results' – results with the potential to improve policy frameworks. These eighteen projects put forward nineteen research results which could be used to inform policy in three areas: Agriculture, Fisheries, and Food and Nutrition. The next chapter of this report briefly presents the challenges in each of these areas, then outlines how each project can support the EU to overcome these challenges. Key messages for policy-makers and other stakeholders are drawn out at the end of each section. The lessons identified throughout the ProBIO project that have a relevance for policy-makers at both European and National levels.

After this, the report presents the programme level recommendations of the ProBIO project. It is often assumed that Europe generates excellent research results, but that researchers lack the skills to commercialise these results to generate impact. ProBIO has found instead that the structure of EU research programmes means that the results generated by projects are often far from commercialisation (being at a low TRL), or have limited market potential. The project has therefore made recommendations on how to improve the Horizon 2020 follow-up programme, to maximise impact.

This report ends with a report from the policy event which was held in the European Parliament to promote ProBIO's results and recommendations, with the Agenda and Press Release from the event presented as Annexes.

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2 Policy Relevant Results

The European Union has the long-term goal of boosting investment, employment and growth in Europe's bioeconomy, which is already worth more than €2 trillion in annual turnover, and supports more than 22 million jobs. To achieve this, policy-makers must ensure that the correct enabling frameworks are in place. The EU already has many support policies for the bioeconomy, and has adapted long-standing instruments to tackle modern challenges, but there is still much room for improvement. Through its screening of KBBE projects, ProBIO has identified project results with relevance for improving this European framework, which are presented below for Agriculture, Fisheries, and Food and Nutrition.

Agriculture

Challenges

Agriculture forms the bedrock of Europe's bioeconomy, ensuring food security and providing the resources needed for the economy to grow. However, the sector needs to become more efficient and answer numerous emerging challenges. The Food and Agriculture Organisation of the United Nations has estimated that a 60% increase in global agricultural production (from a 2005 base level) will be required to answer the demands for food from an estimated 2050 population of 9 billion people. This dramatic requirement is not just because the global population will increase, but also because agriculture will need to provide more than just food resources, answering also the requirements of competing sectors. All of this is within the context of adaptation to, and mitigation of, climate change, combating environmental risks, and ensuring the safety of flora and fauna. Setting the right framework conditions is also essential for rural development, supporting the generation of new economic activities and opportunities.

Existing Policy Framework

The main tool for the EU to influence agricultural practices is the Common Agricultural Policy (CAP), which provides agricultural subsidies and funds other programmes for improving environmental performance and supporting rural development. CAP Cross Compliance measures, particularly the Good Agricultural and Environmental Conditions (GAEC), place requirements on farmers to maintain the environment in a good condition, and provide guidance on agricultural practices. The Regional Development Pillar of the CAP, and the European Agricultural Fund for Rural Development (EAFRD), fund knowledge transfer, training and skills acquisition, and support non-agricultural activities for farm and business development. These practices are further supported by the European Commission's Farm Advisory Services and the European Innovation Partnership on Agriculture (EIP-Agri).

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Policy Relevant Results

Nine FP7 KBBE projects were identified as having results which could contribute to improving the existing policy framework, either by modifying existing policies and instruments, or by introducing new knowledge and ideas for additional support measures.

- **BIOFECTOR – Fostering bio-stimulants to decrease the use of mineral fertilisers**

Type of result: Database
Project website: http://www.biofector.info/

The BIOFECTOR project explored bio-effectors, micro-organisms and active natural compounds which can enhance plant performance, reducing the need for fertilisers and pesticides. The project has put together a database of bio-effectors, which can be consulted by farmers to identify solutions for their needs. In suitable fields of horticulture and agriculture, bio-effectors support lower fertiliser use, and reductions in greenhouse gas emissions, energy use and production costs. The screening approach used within the project makes it possible for recommendations to be made on bio-effector use, including what crops and plants would be suitable, and the optimal conditions for use. The knowledge gathered by the project would be of great use for policy-makers looking at the harmonisation and registration of bio-effectors, and would be useful also for Farm Advisory Services, farm associations and regulatory authorities.

- **CLAIM – Supporting the role of the CAP in landscape valorisation**

Type of result: Database, Knowledge Platform
Project website: http://www.claimproject.eu/

The CLAIM project aimed to provide a knowledge base to support improved landscape management within the CAP, so that landscapes can provide added-value for rural areas. The main output of the project is a Knowledge Platform (CLAI-KP), providing evidence of the positive impacts of landscape management. This knowledge could feed into the CAP in both the first pillar (for example, through greening) and the second pillar (through sustainable management of agricultural ecosystems). Beyond use for policy-makers, the platform would be interesting for advisory services, and could also be used by regions to improve their Regional Development Programmes.

- **FADNTOOL – Decision making tool supporting the CAP**

Type of result: Decision-support tool
Project website: http://193.218.36.90/

FADNTOOL has developed a new tool using the Farm Accountancy Data Network (FADN) database, to support decision making in the CAP. The project aimed to make it possible to monitor the impacts of CAP reforms and market changes. FADNTOOL has constructed a complete methodological framework comprised of innovative and state-of-the-art economic models,

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custom-built for the FADN database that allows an overall analysis of the effects of agricultural policy changes and market developments on the agricultural sector and the whole economy. The project has also developed an interface for the use of the modelling tools by the EU and national FADN offices, which can contribute to more efficient decision-making at the EU level.

- **FLINT – Farm Level Indicators for New Topics in policy evaluation**

Type of result: Data system, Handbook
Project website: http://www.flint-fp7.eu/

FLINT has collected data relevant to political analysis of the performance of the CAP, and has provided a handbook on how to adapt accounting and farm management software to gather data on sustainability. The FLINT system would allow for the collection of harmonised data, enabling governments and businesses to compare farm systems from different countries. The revised data system could provide policy-makers and researchers with a better overview of the performance of farms, thus allowing for new analysis that could create new policy initiatives that can incentivise sustainable agriculture. The system would also be useful for retailers and companies in the food chain who could verify the sustainability of products that they deal with.

- **ICON – Optimisation of ICON plants oil value chain with regards to GMOs regulations**

Type of result: Recommendations for existing regulations
Project website: http://cordis.europa.eu/project/rcn/88255_en.html

ICON aimed to develop high-yield sustainable oil crops that could produce the right oils for lubricants and for the chemicals industry by genetically modifying two plant species. The new crops could have environmental benefits, and will contribute to energy savings, and economic returns for farmers. However, the project faces numerous regulatory barriers regarding GMOs. ICON believe that their results show that large positive benefits are possible through developing innovative oil crops, and the project has also controlled, monitored and optimised the oilseed crops value chain to demonstrate benefits. The project's recommendations can be used to improved regulation of GMOs in Europe.

- **LEGATO – EU policies on grain legumes**

Type of result: Recommendations
Project website: http://www.legato-fp7.eu/

LEGATO is an ongoing project which identifies the main issues which are limiting grain legume cultivation, and is coming up with solutions for novel varietal development, culture practices, and food uses. The project devises tools and resources to enable state-of-the-art breeding methodology and to fully exploit available genetic resources. To this end, the project explores characteristics not previously explored, including disease and pest resistance. Additionally, the project is trying to increase the consumption of legumes, which are nutritionally valuable and rich in protein, being more ecological as a protein resource than meat. LEGATO can help achieve these benefits by providing innovative genetic material for low-input agriculture, as well as providing

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input for locally-adapted cropping systems built around grain legumes. LEGATO experiences will provide recommendations which would be useful for businesses on adapting legume incorporation in human food products.

- **NEMO – The Impact of the EU biofuel policy on NEMO**

Type of result: Recommendations
Project website: http://nemo.vtt.fi/

The NEMO project explored second generation biofuels, using lignocellulose-based agriculture and forestry residues to produce ethanol. Lignocellulose is composed of sugars but in a form that makes them difficult to be used by microbes in the production of ethanol. The project developed enzymes that can be used to hydrolyse ligno-cellulose into sugars suitable for microbial fermentation. Whilst the EU has targets for biofuel use, the necessary long-term conditions for investments in the production of biofuels from residues and waste are still lacking. The NEMO project recommends that EU biofuel policy be amended in order to include agricultural and forestry waste sub-targets for "advanced" biofuels, beyond 2020. The discovery, exploitation and commercialization of novel high performance enzymes and micro-organisms for conversion of lignocellulosic biomass to bioethanol will strengthen the competitiveness of European agricultural and forestry industries as well as increase competition in research and innovation.

- **REFERTIL – Policy recommendations for the revision of Fertilizer Regulation**

Type of result: Recommendations
Project website: http://www.refertil.info/

REFERTIL investigated innovative fertilisers based on recovered and recycled nutrients from bio-waste, animal wastes, and other agricultural by-products. Whilst there are different national regulations on organic fertilisers, at the EU level, regulations only exist regarding inorganic fertilisers. This results in barriers to the trade of organic fertilisers across borders. The project provided recommendations for improving regulations, including the revision of the Fertiliser Regulation. These results are directly applicable to revision of the Fertiliser Regulation, in the Committee stage of co-decision as of the time of writing.

- **TEAMPEST – A revised EU pesticide legislation through optimal tax schemes**

Type of result: Methodology and recommendations
Project website: http://www.eng.auth.gr/mattas/teampest/

TEAMPEST looked into pesticide regulation in the EU and proposed new tax schemes for optimal pesticide use, which has a number of costs on the environment, consumers and wildlife. The project started out by assessing the impacts of pesticide use and looking into the willingness of producers to adopt low pesticide methods, before calculating the optimal level of pesticide use at farm level, and proposing policy and tax levy schemes for reducing societal costs. The methodological framework is available for redesigning pesticide regulations to ensure their

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sustainable use. As well as a new taxation framework, the project also recommends education and training on the best use of pesticides to ensure farmers can adapt to the new system.

Key Messages

- Whilst the Common Agricultural Policy has become increasingly focused on environmental performance and sustainability, new **tools and indicators** could help to improve this even further. The FLINT project's handbook and farm management software should be considered for harmonising the collection of sustainability data, while the FADNTOOL project results, created at the request of the Farm Accountancy Data Network (FADN), should already be under consideration there;
- **Pesticides and Fertilisers** are widely used in the European Union in order to support crop growth. However, both can lead to the build-up of chemical pollutants and have unintended consequences on the environment:
    - The TEAMPEST project has made valuable recommendations on reducing pesticide use, through new policy instruments. These instruments should be considered primarily by national and regional policy-makers at this point, but the findings should also be considered by DG Agriculture and DG Environment for considering future pesticide regulation and management;
    - Both BIOFECTOR and REFERTIL have contributed to the debate on fertilisers, with the former providing evidence of the effectiveness of bio-effectors in replacing fertilisers. The database of bio-effectors and guidelines should be considered by DG Agriculture to inform future regulation, but should at a minimum be taken up by Farm Advisory Services who can provide input to farmers. REFERTIL recommendations on improving use of organic fertilisers are directly applicable to the revision of the Fertiliser Regulation, which is already more focused on organic fertilisers, being framed within the Circular Economy Package;
- The REFERTIL project highlights the importance of policy-frameworks that can support a circular economy approach, and in particular, greater effort is needed to support the use of **agricultural 'wastes'** as a resource. As well as REFERTIL, NEMO highlights that EU support-policies are not doing enough to ensure that these available resources are being used optimally. Upcoming revision of the biofuels policy should be accompanied by revisions to the CAP that encourage farmers to make use of 'waste' resources, which are often burnt or composted, with no net environmental benefit.

Fisheries

Challenges

Fisheries and the exploitation of maritime resources present many upcoming challenges. Whilst fish stocks are renewable, they are not finite, and sustainable management of fish populations is essential for ensuring the continuation and growth of the European fishing industry. Additional risks come from the chemicals and wastes that enter the seas and have an impact of the health of fish. Fish parasites and diseases are also a serious hazard for human health, where the parasite

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itself can cause harm, or where parasite antigens cause allergic reactions. Alongside fisheries, Europe's oceans provide additional income through tourism, leisure and trade. New opportunities for Blue Growth are also emerging from new maritime technologies, products and services, which will need to be managed to ensure the sustainability of aquatic resources.

Existing Policy Framework

Fisheries in the EU are covered by the Common Fisheries Policy (CFP), which sets rules for managing fishing fleets and for maintaining fish stocks. The CFP was introduced in the 1970s and has been continually updated to enhance environmental protections and improve efficiency, with sustainable fishing and the maintenance of fish stocks now being main goals of the policy. The main areas of the policy are fisheries management, international policy, and market and trade policy. This sets limits on how much can be caught by fleets from each country, and requires clear labelling of catches with details for traders and consumers. Additionally, the European Maritime and Fisheries Fund (2014-2020) helps fisherman transition towards sustainable fishing practices, supports coastal communities to diversify their economies and finances projects that create new jobs, particularly for developing the Blue Economy.

Policy Relevant Results

Three project results were identified that could improve current frameworks.

- **EcoFishMan – Responsive Fisheries Management System**

Type of result: Management System
Project website: http://ecofishman.eu/

EcoFishMan has developed a Responsive Fisheries Management System (RFMS) for improving the Common Fisheries Policy. The RFMS aims to improve the current decision-making system, which the project felt encourages a short-term focus and does not give enough responsibility to industry. The RFMS aims to tackle the challenges in the CFP with the development of multi-annual plans governed by an ecosystem approach with simplified rules and decentralised management. The burden of proof that the fishery is ecologically sustainable would be shifted towards the resource users, improving data exchange and local management. The RFMS has the potential to contribute to the CFP, particularly in relation to the discard policy. The new framework would introduce a system based on specifying maximum allowable negative impacts.

- **PARASITE – Anisakis detection method for enforcement of fish product quality controls in the industry**

Type of result: Technology and methodology
Project website: http://parasite-project.eu/

The PARASITE project has developed the SCANISAKIS technology, which can identify anisakis parasite infections in fish. Parasites in fish are a major health hazard, and the technology hopes to

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reduce the number of anisakis infections in human. The technology can also help industry to avoid waste through early identification of infection, before processing and packaging. SCANISAKIS technology could minimise current losses and costs and contribute to a more efficient and safe food industry and to savings in national health systems. The technology has implications for food safety standards and food safety agencies.

- **PARASITE – Technology to prevent the discarding of viable parasites at sea aimed at eliminating the environmental hazard caused by fish borne parasites**

Type of result: Technology and methodology
Project website: http://parasite-project.eu/

The PARASITE project has also developed the TEDEPAD technology, which uses controlled pulses of electromagnetic radiation to inactivate larvae in fish wastes. Often, when at sea, fishermen gut caught fish and discard the viscera into the sea. If a fish has parasites, then these are simply reintroduced into the ocean. The TEDEPAD technology can be used by fisherman on the viscera, in order to kill parasitic larvae, and since on-board gutting and disposal of viscera is a widespread practice in Europe, the technology has potential for widespread use. The TEDEPAD technology is relevant for policy makers since it could be used to update several existing regulations in place related to fishery activities, fishing fleets and environmental health authorities.

Key Messages

- The EcoFishMan Responsive **Fisheries Management** System should be considered as a future model for the Common Fisheries Policy, which has so far struggled with combating fish discards, primarily through failures in monitoring and enforcement. The new system, shifting responsibility to the fishermen, could help to tackle these problems, if the political will can be found;
- The PARASITE project has developed two new technologies for improving **food safety** for fish consumers. Both technologies have been proven viable, and should be considered by food regulatory bodies that may wish to upgrade their current frameworks.

Food and Nutrition

Challenges

Agriculture and fisheries are the primary sectors in food production, but the food industry as a whole will also be required to adapt to answer challenges in nutrition, health, water and energy efficiency, zero waste and environmental sustainability. The food industry is the largest industry in the EU, meaning that it is able to lead the way and have substantial impact from introducing changes. The sustainability of our food systems requires a holistic approach to the design of processes within agro-food chains, taking account also of food safety concerns, as well as packaging and process waste. New materials for packaging, and novel foodstuffs, present many opportunities for the future, but also create new regulatory challenges. Ensuring good nutrition is

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also a key challenge, with the industry, guided by policy-makers, expected to play a role in tackling Europe's increasing obesity problems.

Existing Policy Framework

EU policy for food aims to guarantee safe, nutritious food and animal feed, support high levels of animal health and welfare, and provide clear information on the origin and content of food. This involves legislation on food safety and food hygiene, as well as regulations on the use of pesticides, food additives and supplements, substances in contact with foods (such as packaging) and labelling. Many health issues remain sole competences of EU national governments, however, the EU does have a role in supporting and complimenting these efforts. The EU Health Strategy works alongside food safety policy to promote healthier lifestyles, including eating and exercise strategies.

Policy Relevant Results

Seven project results were identified that could help to improve current frameworks.

- **HabEat – Nutritional recommendations for infants and young children**

Type of result: Recommendations
Project website: https://www.habeat.eu/

The HabEat project aimed to better understand the situational factors that influence the effectiveness of healthy eating strategies on children, and propose strategies that can break unhealthy eating habits, taking differences in child eating behaviours, and parental feeding strategies into account. The project prepared a booklet of recommendations that can be used by parents to change eating habits, focusing in particular on increasing consumption of fruit and vegetables. The recommendations and booklet would also be useful for European Commission DG Health and Food Safety, and also for national authorities aiming to support healthy eating strategies.

- **NAMASTE – New and sustainable food from agro-food waste streams in Europe and India**

Type of result: Recommendations, data sets
Project website: http://cordis.europa.eu/project/rcn/94083_en.html

NAMASTE explored how to turn wastes from the fruit and cereal processing industries into new food ingredients and products via novel and sustainable processing routes. The project looked into wastes in both the EU and in India, where currently most such wastes are landfilled. The project developed protocols for the selection of citrus and wheat processing by-products, assessed protocols and technologies for exploiting these by-products. Procedures were then developed for assessing the quality and safety of the developed foodstuffs, and an assessment was made of environmental and economic sustainability. So far, public policy has done little to support the development and acceptance of such foodstuffs, and NAMASTE can provide evidence that such products can be safe, nutritious and ecological. Greater efforts must be made to engage industry and the general public if widespread acceptance of these foods is to follow.

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- **PROMETHEUS – Rigorous control of the nutritional quality and safety of food products with regards to NEOFORMED compounds**

Type of result: Data for policy-makers
Project website: http://processing-contaminants-prometheus.com/

The PROMETHEUS project has sought to standardise methods for determining chemical process contaminants in food, including neoformed contaminants that could have a negative impact on human health. When food is processed, or cooked, changes in the chemical composition of the food can result in decreased nutritional value and also lead to the build-up of hazardous and toxic compounds that, in the long-term, can impact upon health. As more is being learnt about neoformed compounds, greater control and monitoring is being required, and the World Health Organisation and European Commission are both looking into the matter.

- **SATIN – Studies and recommendations on new approaches to tackle obesity**

Type of result: Recommendations
Project website: http://www.satin-satiety.eu/

The SATIN project explored issues of appetite control and satiety, looking to develop foods that can reduce hunger, accelerate within-meal satiety, and also enhance between-meal satiety. The aim, ultimately, was to use advanced technologies, novel food structures and processing techniques to refine and processes food to increase satiety, thus aiding weight management. The partners of the SATIN project examined the effects of the developed foods in studies of appetite control and weight management. These studies substantiate individual product health claims, but also identify and characterise consumer benefits of satiety beyond weight management. The project also explored food safety issues for all of its developed products, and the results can feed into the EU Platform on Diet, Physical Activity and Health.

- **TERIFIQ – Policy recommendations addressing healthy products**

Type of result: Recommendations
Project website: http://www.terifiq.fr/

The TeRiFiQ project aimed to reduce the levels of sodium, sugar and fats in selected cheeses, meats, cakes and ready-made food products, whilst maintaining, or even enhancing, nutritional and sensory qualities of these foods. The project has shown that the technological solutions exist, but food manufacturers will need to be encouraged to improve the healthiness of their products, and retailers will also need to see the appeal. The project addresses two policy issues; the setting of minimum food standards for salt, sugar and fat content, and the potential of labelling to encourage healthy food development by food manufacturers. Project results could contribute to improving Health 2020 policies and the design of new regulations to promote healthy food products.

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- **SENSE – A contribution to a harmonisation and establishment of standards for sustainability measurements of the food chain**

Type of result: Tool
Project website: http://www.senseproject.eu

The SENSE project tool provides the food and drink industry with information about its environmental and social sustainability. Whilst more and more policies are emerging to support sustainability in the food and drink value chains, at present, there is no EU-wide regulatory framework for examining the sustainability and environmental impact of products. The SENSE tool could be used as a basis for defining a harmonised set of standards for the food and drink industry, and the information compiled for assessment could be used for a new eco-labelling system for the food and drink industry.

- **SusFoFlex – Impact of the EU Food Packaging policy on SusFoFlex**

Type of result: Recommendations
Project website: http://www.susfoflex.com/

SusFoFlex explored novel food packaging solutions, and developed an ethanol sensor for use in food packaging. The project aimed to understand how sustainable packaging materials can have an impact of food safety and quality. As new packaging options will need to be sustainable, improve shelf-life of products, and also reduce food loses through the use of nanomaterials and sensors (intelligent packaging), there will also be a strong need for introducing sustainability criteria and requirements for the packaging sector. The project recommended that safety studies need to be performed on the usage of biodegradable materials sourced from organic agro-food by-products or traditional packaging materials such as polypropylene (PP) polyethylene (PE), similar materials for food packages. SusFoFlex results could feed into new food packaging strategies at the EU level.

Key Messages

- TeRiFiQ, PROMETHEUS and SATIN have considered how to improve **food processing and production** systems for ensuring healthier food products:
  - The TeRiFiQ and SATIN projects show that improvements in food nutrition can be achieved without detriment to taste. This should open a discussion regarding the role of labelling in encouraging food producers to develop healthier foods;
  - PROMETHEUS has actively sought to answer a challenge set by policy-makers, and its results should be considered by the European Commission, and raised by them with the World Health Organisation.
- With increasing awareness of the impact of plastics on the environment, interest in **sustainable packaging** is growing, but it is important to understand the health impacts of using new materials. SusFoFlex has examined some of these materials, and highlights the challenges that policy-makers will need to overcome;
- Consumers are becoming increasingly aware that the products they buy can have an environmental cost. The **sustainability labelling** developed by the SENSE project can form

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the basis of political discussions surrounding food labelling, and should be explored by food businesses looking to make inroads with socially conscious consumers;

- There is an increasing need for **encouraging healthy eating** in Europe, to overcome current health problems which are driven by diet. HabEat recommendations, as well as the results from TeRiFiQ, PROMETHEUS and SATIN can inform this discussion.

3 Programme level recommendations

Throughout the ProBIO project, partners have encountered numerous barriers in European research programmes that hamper the societal and commercial impact of European research. This chapter outlines these barriers, and then proposes five recommendations to overcome them. **These identified barriers and recommendations aim to support greater impact, and thus are focused on future programmes to fund applied research (TRLs 5-9) rather than basic research (TRLs 1-4), unless otherwise noted.**

These barriers, and corresponding recommendations, are amongst the key messages learned by the ProBIO project, though they are also informed by our further experiences. For the past ten years, Greenovate! Europe and its members in the ProBIO consortium have recommended that funding programmes must properly address and support all stages in the innovation value chain, involving a dedicated partner for exploitation who can assess the exploitation value of research results and advise on their use.[1] **The need for dedicated expertise is supported by the findings of the present ProBIO project, but ProBIO has revealed that such support alone is insufficient, as the assumption behind the so called 'exploitation gap' of European research is wrong.** This assumption states that although the EU has excellent research, it is not turned into market success due to a lack of entrepreneurial capacity and a 'knowhow gap' concerning the needs and issues of commercial exploitation. While this has been the starting point of the ProBIO project, our finding is that there are **more complex, structural barriers** behind the low exploitation performance of European RTD programmes.[2]

Identified barriers

1) Too few projects generate exploitable results

Many KBBE research project results lack the innovation potential needed for commercial exploitation. The main reason is that, although the programme aimed for *breakthrough innovation*, the projects as such did not generate enough exploitable results. This is rooted in how EU R&I programmes are defined and implemented, which too often focus on projects driven by the research community, following a technology-push strategy to address societal needs,

[1] ProNano – Promoting Technology Transfer of Nanosciences, Nanotechnologies, Materials and new Production Technologies, NMP4-SA-2010-248219, 2010 – 2012; ProRETT – Promotion of Renewable Energy Technology Transfer, TREN/05/FP6EN/S07.55804/020152, 2006 – 2008.

[2] Based on the Call definition and the references cited therein such as the Communication of the EC 'Innovating for Sustainable Growth: A Bioeconomy for Europe'

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excluding market considerations from programme definition. Consequently, there is a lack of business vision and potential for commercial application as a core basis of technological development. Indeed, markets for the KBBE results often do not exist at the time of project completion, as project objectives are based on answering societal, not market, needs.

2) Lack of motivation for exploitation

The majority of research result owners are research institutions, universities and similar organisations, whose prime objective is result generation and not result exploitation. In other words, the objective behind participating in EU funded projects is to receive research funding as a way of creating new knowledge. When a project (and accordingly the related funding) expires, the focus turns to receiving new research funding. To get exploitation funding from, for example, private investors (private equity) would divert the focus from the institutions' prime research objective.

3) Lack of business and commercial partners that can drive innovation

Another important issue is related to the composition of many consortia, which may lack a dedicated commercial partner who is committed to exploitation of the results, or may place said partner in too weak a position or role in the consortium. This is caused by call definitions that often discourage industry participation. Relevant issues are:

- Policy driven, and over-ambitious calls, which focus on societal rather than market needs;
- A requirement for wide European outreach with many different partners and little synergy;
- A focus on generic societal needs which does not foster commercially relevant results, since societal needs are often not (yet) market needs;
- Unrealistic requirements of impact on societal goals, environment, growth, jobs, coherence and more, all in the same project.

Although a lack of entrepreneurship is often cited as a key issue inhibiting research exploitation, Europe does in fact have a strong entrepreneurial streak, including many companies, and especially SMEs, which should be ready to exploit RTD results because of their need for innovation and competitive advantage. Yet, neither EU policy nor the research community are yet setting up research projects that support them and meet their needs, giving them access to the research results that they need to grow.

4) Complexity of innovation process not well considered in programme set-up

The complexity of the innovation process chain in generating breakthrough innovations and reaching the market is often not sufficiently considered in programme and project set-up in a way that can achieve the EU's political priorities. The key issue is that typically more than one R&I project is required to generate results that are ready for successful commercial exploitation. The innovation process chain from basic research to demonstration and finally to market exploitation is not seamlessly covered in European R&I funding. Too many gaps are persisting between the different steps of technological development required to reach the market. **Moreover, a significant lack of funding is still observed especially for TRL 7-9 development; substantially more funding is required, especially for piloting & demonstration phases.**

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5) Need to reshape evaluation and project implementation procedures

There is a substantial need to reshape the ways and procedures by which the EC evaluates the impact side of submitted EU proposals, and assists impact generation of EU funded projects. The expected impact from a project is not always clearly defined in the call text, and is often overly ambitious, causing difficulties for both applicants and evaluators. Evaluators usually do not have sufficient knowledge of market expectations, and are thus unable to judge exactly what the potential socio-economic impact of a project could be.

Recommendations

In order to overcome these barriers, the ProBIO consortium makes the following recommendations for the follow-up programme to Horizon 2020:

- **Foster more market driven R&I through substantially increased industry and SME participation** – for example, through the joint technology initiatives and similar approaches;

- **Base calls for proposals for applied research projects more on strategic R&I-roadmaps, which are developed jointly with industrial companies including SMEs** both in a top-down and bottom-up fashion. An example for bottom-up project definition could be through cluster-facilitated R&I projects that are based on strategic R&I roadmaps which have been developed jointly by groups of SMEs and research teams collaborating in regional or national SME driven clusters;

- **More support for collaboration and demonstration** by ensuring the participation of industrial technology developers and end users in the development phase of a project;

- **Provide staged funding programmes for research and innovation actions with a longer-term implementation perspective –** A new programme design with 'staged grants' could address TRL 4-6 in a first project stage and TRL 7-9 (piloting and demonstration) in a second project stage. Both stages would need to be included in one Grant Agreement, but the grant for Stage 2 would be conditional upon achieving well-defined exploitable results in Stage 1;

- **Follow-up on the impact of project results after the end of the grant agreements** – Make access to funding for further projects conditional upon successful use of previous project results. For basic research, this could involve the publication of results, intellectual property and evidence of follow-up research. For applied research, this would require evidence of commercialisation efforts.

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4 Report from the Dinner Debate

To promote the policy lessons of the ProBIO project, and its recommendations for improving future framework programmes, a Dinner Debate was held in the European Parliament on 28 June, involving 60 participants from the policy-making, research and industry communities.

The event, '*Increasing impact from publicly funded research: Lessons from the bioeconomy*', was organised with Lieve Wierinck, a Member of the European Parliament from the Open Flemish Liberals and Democrats (Open Vld, Belgium), and a member of the Industry, Research and Energy Committee. Ms. Wierinck MEP was one of the shadow rapporteurs on the Parliament's own-initiative report, 'Assessment of Horizon 2020 implementation in view of its interim evaluation and the Framework Programme 9 proposal'.

Figure 1 - Lieve Wierinck MEP opens the debate

Following an introduction by the moderator, Astrid Severin (Greenovate! Europe), Ms. Wierinck gave the opening speech, setting out the European Parliament's opinion of Horizon 2020's performance, and its view on the next framework programme. The European Parliament recognises that Europe produces excellent research, but has emphasised that much more needs to be done to promote commercialisation of results and secure societal impact.

Katharina Krell (Greenovate! Europe) gave the overall introduction to the ProBIO project, outlining the logic behind ProBIO interventions, and the assumptions and rationale that led to the project formation. The ProBIO consortium, in filtering the results of 411 KBBE projects, found that whilst there are excellent research results, result owners are generally unmotivated to commercialise, and the projects lack innovators, being instead too research driven.

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The following two presentations presented success stories from the ProBIO project. Selim Stahl from the Research Institutes of Sweden (RISE) presented case studies from amongst the 41 projects which received ProBIO coaching to identify research results that require further development (TRL lower than 7), and link them with available research funds. Louise Pierrel Mikkelsen then presented the ProBIO business coaching for closer-to-market research results (TRL 7 or higher). In total, 28 projects received coaching for commercialisation.

Ernst-Udo Sievers (i.con innovation) presented the project's policy recommendations (see Chapter 3), for increasing impact from research results, highlighting that of the 411 screened results, only around 5% were actually ready to be supported towards market exploitation. Feedback to the ProBIO recommendations were very positive.

Figure 2 - Bernd Reichert, European Commission DG RTD

Having covered FP7 through the ProBIO project presentations, the following session of the Dinner Debate focused on stakeholder statements on Horizon 2020. The first statement came from Paula Hafner of Zabala Innovation Consulting, reporting on how the programme was performing from the point of view of a frequent participant.

The next intervention was from Jyrki Suominen, Deputy Head of Unit for Strategy in the Bioeconomy Directorate of the European Commission's Directorate-General for Research and Innovation, which oversees the Biobased Industries Joint Undertaking (BBI-JU). Mr. Suominen presented the BBI-JU, highlighting that increased industry involvement meant that research was more likely to be commercialised, as topics are jointly defined with industry. He then presented a few case studies of successful market applications of BBI-JU funded project results.

The last intervention came from Bernd Reichert, Head of Unit for Horizon 2020 SME at the European Commission Executive Agency for Small and Medium Enterprises, responsible for the Horizon 2020 SME Instrument. Mr. Reichert presented the novelties of the SME instrument, such

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as single company participation, and highlight how successful it had been in getting research to market and creating new patents.

The final presentation of the evening was from Liviu Stirbat, Deputy Head of Unit for Better Regulation (formerly Evaluation) in the Policy Development and Coordination Directorate of the European Commission's Directorate-General for Research and Innovation, which was responsible for the midterm evaluation of Horizon 2020. Mr. Stirbat showed that there has been considerable consensus around the need for greater support for commercialisation and innovation, with more focus also on monitoring outcomes.

Figure 3 - Liviu Stirbat, European Commission DG RTD

The event ended with a moderated debate amongst participants, on the topic of increasing impact. The feedback received from the debate participants was very positive. A survey collected from attendees showed that 95% of respondents felt the event met their expectations, and the same percentage said it had provided them with knowledge relevant to their work. All participants agreed that the agenda, speakers and presentations were all either 'Very Good' or 'Quite Good'. A couple of respondents also gave comments:

> *"Good event which provided a good insight into the challenges to bring innovations to market. The recommendations will be extremely helpful and help inform our own valorisation and end markets work."*

> *"Good and very nice event. Good demonstration of what ProBio has brought, its value as a project and as sort of activity (coaching on valorisation for research teams of e.g. universities). Interesting presentations of RTD."*

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5 Conclusion

By examining the results of 411 KBBE projects, ProBIO has identified a number of projects can that provide valuable input into policy-making at the European and national levels. Some of these projects provide an initial evidence base for the introduction of new regulations and support tools, whilst others seek to improve existing frameworks. All, however, provide information that can help to tackle identified challenges and contribute to Europe's long-term socio-economic goals.

In the field of Agriculture, ProBIO has identified projects that can provide tools, methodologies and frameworks for improving sustainability in the Common Agricultural Policy, through monitoring performance and harmonising data collection. New research has highlighted the possibility to improve frameworks on pesticide and fertiliser use, and has also provided evidence to support the circular use of agricultural wastes.

In the fisheries sector, ProBIO has found an ambitious new management system for fisheries that could overcome problems of discards and support sustainability of fisheries, whilst also finding technologies that, if supported through policy, could greatly improve food safety for fish products. In the area of food and nutrition, the project has found results that can support the development of healthier and more sustainable foodstuffs, support safe and sustainable packaging, and encourage healthy eating.

ProBIO has also made a number of recommendations on improving the overall performance of future EU framework programmes in terms of their generated impact. These propose that Framework Programme 9 truly aim to secure Europe-wide impact by ensuring that it is structured to deliver more market-ready results.

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Annex I – Dinner Debate Agenda

Increasing impact from publicly funded research
Lessons from the bioeconomy
28 June 2017, 18:30-21:30
Member's Salon, European Parliament
Dinner Debate hosted by Lieve Wierinck MEP

18:30	Registration and Welcome Cocktail
18:45	The view of Horizon 2020 from the European Parliament Lieve Wierinck MEP – *European Parliament*
19:00	The ProBIO Approach to Increasing Impact from Bioeconomy Research Katharina Krell – *Greenovate! Europe EEIG*
19:10	ProBIO Added Value: Success Stories from ProBIO Interventions Selim Stahl – *RISE Research Institutes of Sweden* Louise Pierrel Mikkelsen – *InvestorNet-Gate2Growth*
19:30	First course
19:45	Barriers to Impact in FP7 and Recommendations for Future Programmes Ernst-Udo Sievers – *i.con innovation*
20:00	Stakeholder Statements on Impact – Experiences from Horizon 2020 Paula Hafner – *Zabala Innovation Consulting* (Discussing Horizon 2020) Jyrki Suominen – *European Commission, DG Research and Innovation* (Discussing the Bio-Based Industries Joint Undertaking) Bernd Reichert – *Executive Agency for Small and Medium Enterprises* (Discussing the SME Instrument)
20:15	Main Course
20:30	First Results from the Horizon 2020 Midterm Evaluation Liviu Stirbat – *European Commission, DG Research and Innovation*
20:45	Dessert
21:00	Debate – How *do* we maximise the impact of publicly funded research? Moderator: Astrid Severin – *Greenovate! Europe EEIG*
21:30	End of Event

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Annex II – Debate Press Release

Less than 5% of FP7 bioeconomy projects are ready to enter the market and trigger socio-economic impacts

Brussels, 29 June 2017 – An analysis by the Horizon 2020 ProBIO project has found that less than 5% of bioeconomy projects funded by the EU's 7th Framework Programme for Research and Innovation (FP7) have results with the potential to be introduced to market. ProBIO has screened more than 400 projects funded by FP7's Knowledge-Based Bioeconomy (KBBE) Programme and found that whilst projects have supported the generation of new knowledge, few are close to being ready to cause widespread socio-economic impact through commercialisation.

"The ultimate aim of European research funding is to support economic growth and answer societal challenges, but this can only be achieved through the commercial application of research results. The low level of exploitable results is a result of how programmes are currently oriented, and the next European Framework Programme needs to be more forward-looking and better include commercialisation if we want to see these impacts," said Udo Sievers, from i.con innovation, a partner of the ProBIO project, during a Dinner Debate held on 28 June in the European Parliament.

The Debate, which was hosted by Lieve Wierinck MEP, Shadow Rapporteur on the European Parliament's mid-term assessment of Horizon 2020, gathered 60 representatives from the policy-making, research and industry communities to present ProBIO results and discuss how to increase impact from publicly funded research.

The common assumption is that the EU has excellent research, but it is not turned into market success only because Europe lacks entrepreneurial capacity and there is a 'knowhow gap' concerning the needs of commercial exploitation. However, ProBIO found that there are more complex, structural barriers behind the low commercial performance of European research programmes. These have taken a technology-push approach, thus ignoring market conditions, have not included enough commercially active partners, and have not provided full innovation process support.

Although both the Commission's interim review and the experiences of ProBIO partners have shown that Horizon 2020 is doing better than FP7 in supporting exploitation, there remains scope for improvement. The ProBIO project makes the following recommendations for the next European research framework programme:

- Foster more market driven research and innovation through substantially increased industry and SME participation;
- Base calls for proposals for applied research projects more on strategic research and innovation roadmaps, developed with SMEs and industry;
- Give more support for collaboration and demonstration;
- Provide staged funding programmes with a longer-term implementation perspective;
- Follow-up upon the impact of project results after the end of the grant agreement.

ENDS

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