Legume Futures

Legume-supported cropping systems for Europe

Legume Futures response to the European Commission consultation on the

Bio-based economy for Europe: state of play and future potential

Summary

This response comes from the Legume Futures research consortium. Legume Futures is an EU FP7 research project that examines how European agricultural systems can be improved using legume crops. It comprises 19 research partners from across Europe. More details can be found on the Legume Futures website (www.legumefutures.eu).

The bio-based economy is not defined in the consultation papers and the consultation uses rather closed questions, some structured in a way that invites positive responses to the (undefined) bio-based economy. Because the 'bio-based' economy is not defined, we can only comment on various interpretations of it.

We want to emphasise that the bio-based economy does not or will not operate parallel to what we all understand as agriculture, food, fisheries and forestry (AFFF). Success in addressing the 'bio-economic' challenges will depend on what happens on European farms, forests, and in the related supply systems. The farm and food business environment is dynamic, changing constantly in response to market and policy signals and in response to technical developments and opportunities. From the documents we have seen[1][2], we suspect that the proponents of a new 'bio-based economy' may overlook this and the role of public policy in shaping farming, the rationale for which is farming's great influence on public goods, including food security.

Assuming that the bio-based economy is an expansion of agriculture, fisheries and forestry into non-traditional uses (i.e. non-food – or the 'new bio-economy') as described by Nowicki et al.[3] to contribute increase resource use efficiency in the economy[4], we see opportunities but also risks for Europe. Optimum development of this type of bio-economy beyond current food supply activities will depend on increased exploitation of bio-based resources that do not compete with food production. New opportunities may arise if food consumption changes to less resource intensive products (e.g. less meat and dairy), releasing agricultural capacity for non-traditional uses. In such circumstances, substantial land resources might be available for non-traditional uses or for food production for export. Land use change to high carbon stock land cover (e.g. perennial biomass crops and forestry) offers opportunities for the bio-based economy with minimal risks to the environment.

[1] The German Bioeconomy Council. http://www.biooekonomierat.de
[2] http://www.plantetp.org/index.php?option=com_content&view=article&id=57&Itemid=67
[3] Nowicki, P., Banse, M., Bolck, C., Bos, H., and Scott E. (2008) Biobased economy; State-of-the-art assessment LEI, The Hague. Report 6.08.01; ISBN/EAN: 978-90-8615-199-8. http://edepot.wur.nl/120739
[4] http://www.absolut-bio.de/bio-based-economy-conference-auf-der-biotechnica-2009/

SEVENTH FRAMEWORK PROGRAMME

Legume-supported cropping systems for Europe
(Legume Futures)
is a collaborative research project funded by the European Union through the 7th Framework Programme under grant number 245216 CP-FP
www.legumefutures.de

However, there are risks. We must recognise the risks associated with the opportunity costs of using agricultural resources, particularly arable crop resources, for non-food purposes. As we see now from the case of crop-based biogas in Germany, there are significant economic, environmental and social risks if new non-traditional subsidised uses compete with food production. There is a general risk that a strategy for the bio-based economy might suggest to some not so familiar with AFFF that there is a universe parallel to agriculture food and forestry called 'The Bio-economy' which has wealth creating potential untapped by AFFF. This risks a fruitless debate about refocusing policy, including research policy, away from real-world questions relating to agriculture, food and forestry to the 'bio-economy' with a new model for driving 'innovation'.

So our main points are:

- The 'bio-economy' is nothing new. It is what we call agriculture, fisheries, food and forestry (AFFF).
- Agriculture, fisheries, food and forestry are intertwined with public goods and policies. It would be a mistake to assume that research and innovation paradigms that operate in for example pharmaceuticals can applied to a 'bio-economy' to deliver wealth that remains untapped wealth by agriculture and forestry.
- There are opportunity costs – particularly with bio-based non-food products from arable land.
- Research and innovation policies need to be rooted in the real world researchable challenges addressed at a range of time and system scales.
- Addressing the challenges needs to focus on levers and opportunities in AFFF systems.

There is potential in our land based industries but this potential does not exist parallel to what we all call agriculture, food and forestry. At least in Europe practically no unused biological resources are available for other usages without competition with existing usages (be it a use in the market or a use in the ecosystem). We need policies rooted in the realities of sustainably using and enhancing the natural resources on which these industries depend. We need research that supports strategic capability relevant to a wide range public and private goals operating across short and long timeframes in this sector. In particular, we need research policy which gives equal weight to reductive basic research and research aimed at understanding and enhancing systems at the field, farm, national and global scales.

What is the 'bio-based economy'?

The term 'bio-based' economy is not defined and this is a significant weakness of the consultation. However, we note that the term 'bio-based economy' or 'the knowledge-based bio-economy' is used by the German Bioeconomy Council to describe all industrial and economic sectors that produce biological resources.[5]

Considering the literature cited in this paper, the interpretations of the term 'bio-economy' range from:

1. Another term for agriculture, forestry etc and their associated industries.

to

2. A new economy built on exploiting biological resources (esp. biomass), using biotech products protected using patents etc.

These views of the bio-economy are used interchangeably even though they are quite different. In public and in many research circles, the phrase is usually used to mean (1) i.e. rebadging of

[5] The German Bioeconomy Council. http://www.biooekonomierat.de

'agriculture, forestry and fisheries' (as Franz Fischler suggested to the conference in Brussels last September).[6]

However, much of the debate seems to be about a bio-based economy that is closer to interpretation 2. According to the alliance of Technology Platforms in this area (Becoteps), the bio-economy refers to the sustainable production and conversion of biomass into a range of food, health, fibre and industrial products and energy.[7] The promise is this new bio-based sector will create wealth so far untapped by AFFF. There is a strong suggestion that exploiting proprietary biological knowledge and technology (patents on genes, biotech products etc.) in an industrialised agriculture will deliver this wealth.[8]

If the bio-economy is something different from AFFF then policy driven to deliver a distinct 'bio-economy' may be unbalanced for 'AFFF' (e.g. agricultural) purposes. This leaves us with some rather awkward political questions. If the 'bio-economy' is new– then what is new about it? The public deserve an honest and clear debate about such a development. An overriding principle in open policy development is that debate must use plain language. The use of the phrased 'bio-based' or 'bio-economy' is confusing, particularly as it remains undefined by the EC, and subject to several different interpretations.

Opportunities for the bio-based economy

In commenting further, we assume that the bio-based economy draws on interpretation 2, i.e. that it is something new and additional to AFFF. The development of a new bio-based economy to reduce reliance on fossil carbon and other non-renewable resources will be driven largely by climate protection and energy objectives. It is important that interventions in markets are focused on and driven by these outcomes. The importance of this is illustrated now by the mistakes that have been made by current biofuel policies whereby subsidies that are linked to costs rather than public benefits have seriously distorted markets. In addition to food, there are countless technical opportunities for using biogenic resources to replace fossil carbon and other non-renewable resources. These opportunities will develop as the price of non-renewable resources increases. We conclude that there are opportunities in extending AFFF in line with 'bio-based economy' concepts.

Risks

The current difficulties arising from the development of a new bio-based economy, particularly in Germany show that there are significant risks. Bio-based products such as biogas from maize, bioethanol from wheat in petrol and biodiesel from oilseed rape and palmoil have been rejected by a broad section of society. The environmental performance of these bio-based products is so poor that the policy driving them may result in increased GHG emissions when all the global consequences are considered. Despite this, a new economy based on biological resources is still presented as having great potential, just as it was twenty years ago in Germany. Over those twenty years, very significant sums of public money have been invested in 'biofuels', 'bio-materials' and 'biotechnology' and related research for non-food uses. These promises have not been fulfilled. Non-food crop production in Germany is dominated by heavily subsidised biofuel crops – particularly oilseed rape for biodiesel and maize for biogas – with significant negative effects on the food economy and the environmental performance of agriculture.

On 'biotechnology', much has been promised but relatively little delivered in public policy terms over the same two decades. However, we acknowledge that biotechnology in its broadest sense offers opportunity, particularly to deliver high value – low volume 'fine' products from AFFF

[6] http://www.franzfischler.org/fao/nt/pdf/bruessel_092010.pdf
[7] http://www.plantetp.org/index.php?option=com_content&view=article&id=57&Itemid=67
[8] En route to the knowledge-based bio-economy. http://www.bio-economy.net/reports/files/koln_paper.pdf

resources, for example vaccines from plants. These applications bring great benefits, but their niche character at farm level should not be overlooked in developing policy. The Becoteps White Paper[9] emphasises the production of biomass. If farming and forestry concentrates on producing mere biomass to which parts of supply chains add value in delivering bio-products, there is a risk that revenue within supply-chains becomes even more concentrated after the farmgate simplifying and degrading the on-farm economy. This could reduce on-farm employment especially if food production is displaced.

What is remarkable about much of the contributions from the promoters of the 'bio-economy' is the lack of reference to the existing knowledge base and innovation infrastructure, public goods affected by agriculture etc. and agricultural policy (esp. the Common Agricultural Policy). The proponents of a new bio-economy promise benefits for public goods and interests (such as climate protection and energy security), but the proposals for addressing these are often focused strongly on private goods and markets. This market-oriented position has benefits but may result in very significant risks. It risks overlooking the interaction between 'the bio-economy' and the huge range of public goods affected by agriculture, food and forestry and the infrastructure already in place to deliver this unique combination of public and private goods. This risks leading the policy community to conclude that the 'bio-economy' functions just like other sectors of the private sector such as pharmaceuticals or telecommunications. Therefore the same paradigms for extracting economic value from research and development can be applied to unlock wealth creation through 'innovation', all enabled though proprietary knowledge and technology.

In addressing these risks, it must be remembered that plants and animals produced on land do not function like factories. Farms and forests are the primary producers. In all this, the reality that biotechnology products require two conditions for success has been overlooked:

- The 'biotech' product (for example a genetic sequence) is expressed in real crop plants grown in agricultural crops considering plant, field and farming system factors controlling that expression.
- That these new crop plants or animals can function adequately in real farming systems and can compete with the technologies and market opportunities farmers already have.

Rightly, DG Research is creating a framework for optimising the role of agriculture, forestry, fisheries and food (AFFF) research in the delivery of Europe 2020, especially the Innovation Union and Resource Efficient Europe. In this, there is increased emphasis on private innovation and the commercial exploitation of the outputs of public research. This model implies increased private commercialisation and exploitation of the outputs of public AFFF research, particularly in the non-food area, with expansion in non-food generally. All this is coherent and can be supported.

However, there is a risk that policy rooted in the realities of improving the performance and sustainability of the AFFF sectors will be replaced, or at least influenced, by a narrow focus on proprietary biotechnology based solutions developed in isolation from the resource base that they depend on, e.g. processes on farms and in forests.

Future actions

We have a particular interest in research and so we confine forward-looking comments to research.

We believe that the literature around the new 'bio-based economy' does not highlight with sufficient vigour the important role of agricultural research generally, particularly agricultural systems research. The debate also fails to adequately address key agricultural and research policies. It should be noted that the challenges the new bio-based economy is claimed to address

[9] http://www.plantetp.org/index.php?option=com_content&view=article&id=57&Itemid=67

relate in practice to processes that are well known in the established AFFF research community - for example nutrient use efficiency, crop improvement, animal nutrition, developing new agricultural supply-chains and so on. There are also economic and technical challenges such the consequences of the application of private standards in markets leading to increased waste, and the consequences of production specialisation driven by technologies that reduce direct costs.

Current EU research recognised these fundamental European agricultural system challenges and is addressing them with some innovative systems research projects. For example, our project (Legume Futures) is addressing the challenge posed by Europe's dependence on imported protein and is seeking to optimise European cropping systems using legume crops while reducing nitrate and greenhouse gas emissions. FP7 is also investing in promising research to reinvigorate mixed farming systems in Europe to conserve resources while addressing the need for efficient production. We believe that a return to research policy focused on buzzwords such as 'bio-economy' risks compromising the progress in agricultural research made in FP7 and risks distracting us from real world challenges that will vary greatly from case-to-case.

One of the challenges for the bio-based economy is supporting more sustainable patterns of food consumption. Europe ranks alongside North America as the societies most characterised by high levels of livestock product consumption with the resulting large food system environmental footprints. This 'Western' pattern of consumption has negative consequences for public health and is the major consumption determinant of the structure and impact of our agricultural system, i.e. most of our 'bio-economy'. In this wider public context, the USA 'bio-economy' can hardly be presented as successful (as it sometimes is) in terms of socio-political or environmental outcomes. In addition to supporting very intensive livestock production contributing significantly to air and water pollution, the consequences of our consumption include the effect of European agriculture on the global trade in major commodities and associated impacts such as expansion of agriculture in countries such as Brazil. We need to look at global agricultural systems and at the related flows of resources, including scarce resources such as nutrients. This involves analysing European agricultural systems within a global context, and understanding the interdependence of carbon, nitrogen energy and water flows. Most importantly, we need public research that enables the AFFF sectors to address the global challenges so identified. We fear that an abstract debate about the 'bio-economy' does not foster the focus on such real world processes that we need.

European farming systems have become increasingly polarised. In addressing the consequences (e.g. nutrient excesses), there is currently no strategic approach in most of Europe to nutrient use efficiency. EU policy has boosted the use of arable (food) crops for biofuels and the negative system effects are now becoming clear. A strategy for the bio-based economy needs to signal the global risks associated with increased exploitation of biomass from food crops and the need for systems research in a public policy context generally. This is closely linked to the need to develop strong policies on nutrient and soil-carbon management and monitoring. Addressing these challenges is a matter as much for the on-going regulation of the private sector as it is for the public support of the private sector through innovation etc.

Research strategy

It is questionable if decades of intensive debate about agricultural research policy at EU and national level has prepared us for the challenge of feeding 9 billion people in a resource constrained world. This shows the need to invest in research and education that maintains and enhances strategic capability rather than running after narrow short-term technical targets and the policy buzzwords of the day. Research strategy must face properly in several directions – science disciplines and coherent researchable questions; the use of research outputs in different contexts; and the enhancement the same research capability to address the long-term challenges we don't yet know. There is a tendency in research and education to focus on today's problems and commercial opportunities rather than on the disciplines that underpin long-term solutions. Developing a sustainable bio-based economy demands multidisciplinary insight. Solutions based on ecological and bio-physical knowledge are not highlighted by those promoting biotechnology-

based solutions. Research to support a sustainable bio-based economy must be balanced to ensure biotechnology-based solutions are supported by understanding of the ecological and bio-physical processes delivering the bio-resources from our agricultural, fisheries, forestry and food sectors.

Dr Donal Murphy-Bokern

On behalf of the Legume Futures Consortium

30 April 2011