European Commission

AgriResearch Conference

Innovating for the future of farming and rural communities

2-3 May 2018, Brussels

Report, 2019

Agriculture and Rural Development

Directorate-General for Agriculture and rural development

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More information

Conference web page:
https://ec.europa.eu/programmes/horizon2020/en/news/agriresearch-conference-innovating-future-farming-and-rural-communities

Disclaimer

This report assembles the contributions made by participants in the context of a conference held on 2-3 May 2018. These contributions do not represent the views of the European Commission.

Executive summary

The AgriResearch conference 2018 assembled around 600 scientists, farming and related downstream and upstream sector and NGO representatives, policy makers and stakeholders to discuss on-going and future agricultural and rural research and innovation activities. The conference's objectives where to **take stock of the implementation of the strategic approach to EU agricultural R&I** and to **kick-start a participatory process** to discuss agricultural and rural R&I activities under future EU policies.

The plenary sessions of the first day looked at the main challenges and at how EU agricultural research and innovation tackled these so far. The key question brought by keynote speakers was "**how to achieve change?"**, change from a vicious circle of decreasing social, environmental and economic benefits to a virtuous system delivering for health, environment and society. The audience considered that **innovation has a central role to play in bringing about this change** and that investment in agricultural research and innovation, which remains too low worldwide, should be stepped-up. Systems approaches came in as necessary, especially for framing research questions and agendas combining hard and social sciences. "*Not every project needs to look at every part of the system but every project should identify its potential influence on the system*", said Tim Benton. Ways to trigger change included making the costs and benefits of the system more explicit, to create incentives for people to act. It is also important to strengthen innovation systems and extension services, better engage end-users and balance technical research with research on aspects such as finance, climate services, digital services, policies and incentives that also influence change. Recent international commitments such as Sustainable development goals and the Paris agreement on climate appeared as major opportunities for change.

The audience supported very broadly the novelties introduced in the management of agricultural research and innovation since 2014, in particular the **synergies with the CAP through the agricultural European innovation partnership (EIP-AGRI)**, the focus on the **multi-actor approach**, the **strategic thinking** and thematic clustering of activities and the novelties around **cooperation with Member States** and **international cooperation**. To improve further, participants and speakers suggested to:

- **use innovative farmers to bridge the gap between science and other farmers** (eg. through demonstration farms, pilots and labs, communication and facilitation skills upgrade);
- **strengthen and broaden innovation under rural development policy** & EIP networking, with stronger networking activities and better connections between EU and local levels;
- **set up a data governance framework which favours a race to the top** (setup a robust and sensible to collect and manage data helping a performance-oriented CAP);
- **increase focus on systems approaches and integrated ecological approaches**, enhance cross-policy programming, especially with environment and climate;
- **move towards more performance-based research** that is more farmer-centric, communicates better; to that end adapt the "publish or perish" model of science reward;
- **improve synergies between funds**, by making it easier to combine instruments from various funds to support enabling innovation ecosystems (including regional or interregional ones); support the increase of capacities in countries with lower R&I capacities, as well as education and training;

- keep **improving synergies with Member States** via joint programming, and strengthening the European research Area (ERA), taking advantage of the Standing committee on agricultural research;

- make **international cooperation easier** through larger scale, longer-term, light-transaction, grand challenge based research funding at a global level.

On the second day, in three parallel sessions, participants discussed research and innovation priorities of relevance to "*smart resource management*", "*healthy plants, animals and ecosystems for healthy people*" and "*attractive smart and resilient rural communities*". Their findings were discussed in a final panel.

On ***what*** research and innovation should look at, issues emerged around the need to unpack the **complexity of interactions** between various species, resources, landscape levels, sectors, governance levels, etc. Research is needed on **synergies and trade-offs** between various resource uses, seeking an optimal use of multiple resources at landscape level rather than optimising the use of one resource in one field. We do not fully understand yet how to **balance the multiple functions of agriculture** to cater for the multiple needs, while staying within planetary boundaries. Enhanced investment in **biodiversity** research was found to be paramount for efficient farming systems, healthy ecosystems and, beyond, for **people's health**. Participants called for broadening the health perspective to cover humans and in particular **farmers' health**. They stressed the great potential of **digital** tools to support more sustainable decision-making and to make farming a more attractive job.

Across the three parallel sessions, participants highlighted the need to focus on **economic and social drivers of behaviour** (farmers, industry, consumers) and on innovative business models that benefit farmers, rural communities and society. They brought forward concepts like "**well-being**" or "**resilience**" as substitutes to "growth" as an end goal driving the long-term thinking on R&I and policies in general. Resilience was particularly important in the session on health, where participants stressed the need to **research in anticipation of upcoming environmental problems**. Social issues came very strongly in the session dedicated to rural communities, in particular the **potential of social innovation and social processes** to produce local, bottom-up, solutions for the achievement of sustainable development goals. Participants discussed the research needs to **improve governance for sustainability**, including monitoring and evaluation frameworks and indicators as well as policy insights into various approaches and the need to inform the development of multi-dimensional policies. They provided concrete ideas on research and innovation needs regarding valuation of public goods, business models for various types of value chains and innovation systems.

As regards the ***how*** should research and innovation be implemented, participants in the three sessions felt that **the current set of instruments is right** but that the funding landscape is hard to navigate. They suggested **improving the capacity to combine funds** and organisation collaboration with programmes (eg. INTERREG, LIFE, ERASMUS) and keeping a diversity of funding schemes for various project and participant sizes. They recommended to keep **enhancing participatory research agenda setting**, including with better involvement of the private sectors, SMEs, stakeholders and policy makers, building on existing networks and **taking better into account the regional level**. They stressed the importance of **training and education** and of attracting new talents to agronomic sciences. And above all, they advocated for **continuing the multi-actor approach**, **EIP-AGRI** and knowledge and innovation systems, supporting farmers to take a leading role in R&I, combining education and research, improving the **circulation of project results** and improving all interfaces, in particular the **science-policy interface**.

Introduction

The European Commission organised the AgriResearch conference 2018 to discuss on-going and future EU agriculture and rural research and innovation (R&I) activities. These activities are driven by a long-term strategic approach to EU agricultural research and innovation which was published in July 2016, and underpinned the development of **Horizon 2020** activities and the organisation of synergies with innovation support provided under the **Common agricultural policy** through the EIP-AGRI. With the final Horizon 2020 work programme for 2018-2020 published in Oct. 2017, and as the dialogue was accelerating on how to design future EU policies, the time had come to take stock of the implementation of the strategy and reflect on next steps.

The conference objectives were:

- to **take stock of the implementation of the strategic approach to EU agricultural R&I** and present its first achievements on knowledge produced, linkages established between EU policies or new avenues opened in terms of implementation approaches;
- to **kick-start a participatory process** to discuss how to further structure agricultural and rural R&I activities under future EU policies, in particular the future EU framework programme for research and innovation and the future CAP, by identifying key issues deserving particular attention under the different strategy priorities and exploring how to maximise impact and synergies between the various EU policies and instruments.

The conference formed part of a series of events reflecting on EU agricultural research and innovation. These include in particular the "Designing the path" conference on 26-28 January 2016 during which the EU strategic approach to agricultural research and innovation was discussed and finalised. Two other events were also important in the same trimester: the 11th OECD rural conference themed on rural innovation which preceded on 9-12 April 2018 in Edinburgh and the Bulgarian presidency event on Food 2030, which followed on 14-15 June 2018.

Maria-Angeles Benitez Salas, Deputy Director General at European Commission's Directorate general for agriculture and rural development opened the conference on behalf of the European Commissioner for Agriculture and Rural development Phil Hogan. Phil Hogan closed the first day of the conference together with Commissioner for research and innovation Carlos Moedas. They relayed their vision of the achievements from the past years, linked to the new synergies between Horizon 2020 and the CAP through EIP-AGRI as well as their ambition for the future, strengthened by the adoption of the European Commission proposal for future Europe's budget on the same day.

The key role of agricultural research and innovation in answering global challenges

This session aimed at setting the scene and describing the challenges that farming and food systems are facing as well as rural areas at European and global levels. It also aimed at placing these challenges in perspective with global commitments linked to sustainable development goals (SDGs) and the Paris climate agreement. Finally, it aimed at opening the discussion on the role that research and innovation can play in answering these challenges.

Systems approaches: sustainable farming at the interface of land and food systems - Tim Benton – University of Leeds

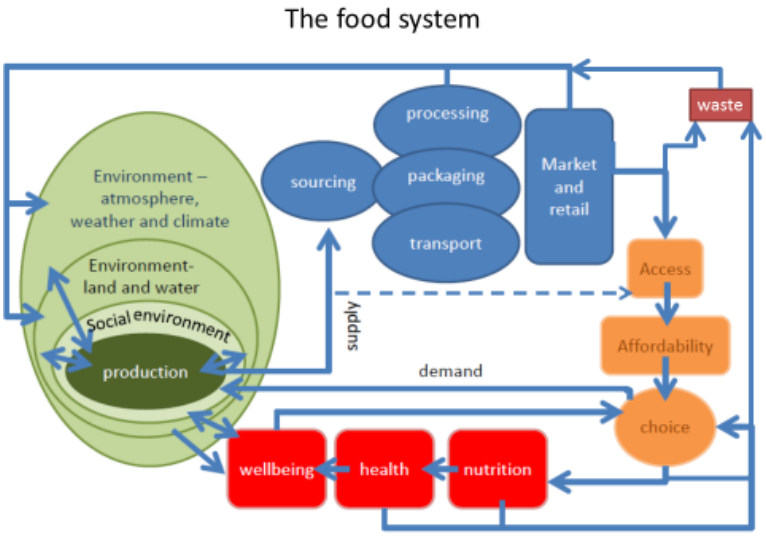
We should reframe our arguments, not to downgrade the importance of agriculture in the food system, because agriculture underpins it, but to question how we can manage it to improve the overall system's efficiency.
Tim Benton

Tim Benton opened the session with an intervention on systems approaches and their transformative potential. He first described the **inefficiencies of the current food system**. He argued that looking at the food system mainly through the lens of production in the past 40 years, and focusing on productivity as a main goal, has driven the food system towards the production of **high quantities of a limited number of products**. High specialisation rates trigger the delivery of lots of calories but poor nutrition and generate waste, environmental and health costs, which together are multiple times the profit from the food system. He advocated for reversing the argument to measure the expected outcome of the system itself in terms of e.g. "*number of people healthily fed by input unit*" rather than "*tons of produce per input unit*". This is not to downgrade the importance of agriculture in the food system, he said, but to manage farming so it contributes to the overall system's efficiency.

He then talked about **systems approaches from a land point of view**. There too, adopting systems approaches leads to looking not only at the demand for land of a particular sector but at the aggregated demand for land from all the potential uses. Statistics show that, if nothing changes, the evolution of demand for all the different land uses will create a need for 1 or 2 billion extra hectares which cannot be found on a finite planet. Instead of looking at ways to meet the demand through adequate supply, we should **identify the maximum land availability for a given type of land use and shift consumption patterns to make demand**

"Sustainability is about managing these ecosystem services in a way that does not give primacy to any one of them". Tim Benton

compatible with supply, taking into account the need to preserve all ecosystem services.



He finally explained how systems approaches could help society move from an incremental improvement of the system to a real transformative change. Explaining how the current thinking locks us into a vicious circle of decreasing prices and decreasing social, health, environmental and climate benefits, he advocated for a **step change that would put us on a virtuous pathway to increased revenues for farmers, improved nutrition for consumers and higher environmental, climate and social benefits.** "*Systems approaches are very useful, primarily for setting the research agenda*", he said. Framing questions as systems questions allows us to look in a completely different way at some of the challenges that we have to face. "*We have to conceptualise the systems considering the trade-offs and how parts relate together, uncertainties, lock-ins, what are the multiple loops and how, if you touch a button, multiple things might change*", he explained. Systems approaches help **identify where are the points of intervention that are likely to deliver the biggest effect on the system's efficiency as a whole**. You can apply systems approaches at different levels, in particular at programme level but ***"not every single project has to work on every single part of the system at the same time",*** Tim Benton said. However, each project should identify points of intervention on the system that can make a change. To conclude he added that systems approaches provide the ground to build a social discourse explaining the rationale for the investment in a given area and who will benefit from the investment, something that has not been done well in the past and created barriers to technology adoption.

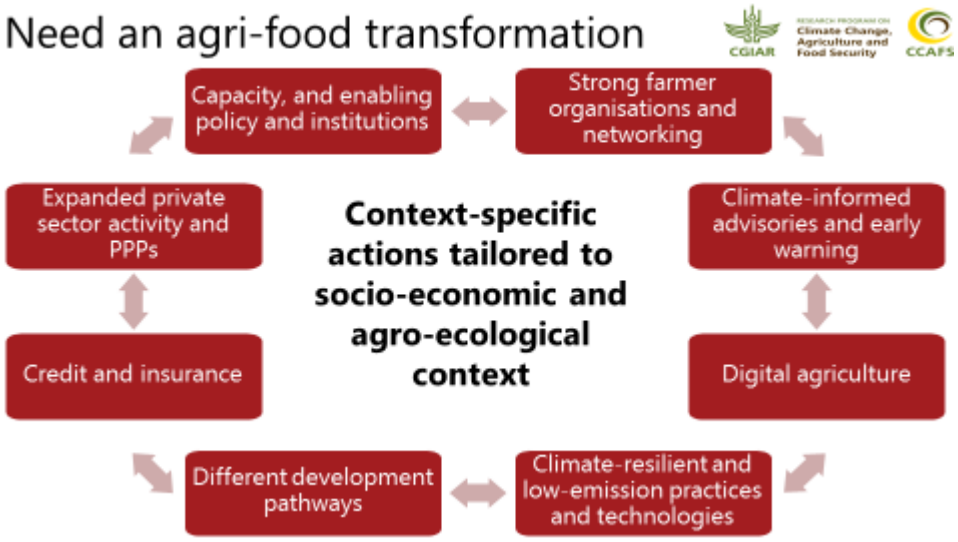
> *"Systems approaches are very useful, primarily for setting the research agenda". Tim Benton*

Invited by the moderator to further elaborate on the current drivers for change, he said that as costs and benefits of the system become more transparent, people who have the possibility to respond will respond, not only for themselves but also for future generations. Just as it was unthinkable in the 1970s to intervene on smoking, it could seem impossible to intervene on diets today. The change on smoking policy was triggered by making the costs and benefits of the system more explicit.

Agriculture R&I: a key contribution to the implementation of SDGs – Bruce Campbell, CGIAR

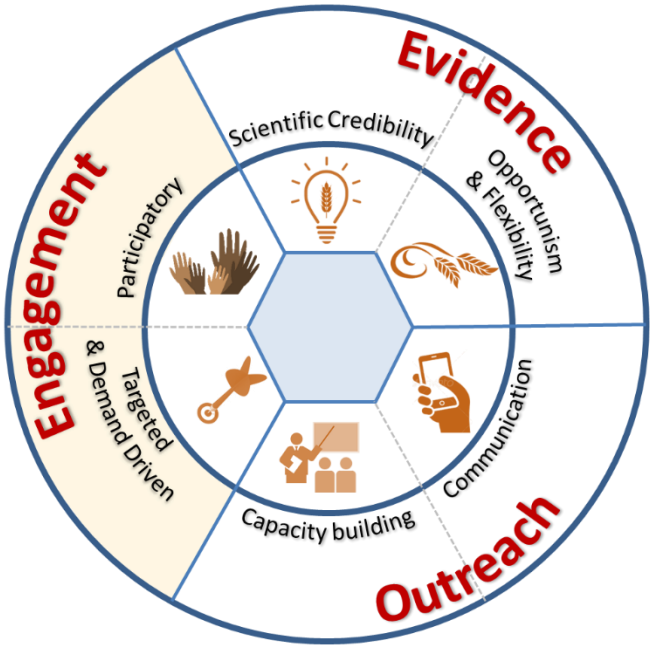
Bruce Campbell spoke on behalf of the CGIAR, with a particular perspective on developing countries and on climate change, the theme of the research programme that he manages at CGIAR. He started by emphasizing the **great opportunity that comes from the Paris agreement.** *"We almost have a global plan for climate mitigation in agriculture"*, he said. Most of the countries also have plans for climate adaptation, although Europe and Northern America have not included these in their plans linked to the Paris agreement. This great opportunity comes with huge challenges and **considerable trade-offs**. He elaborated on the changes needed to achieve climate mitigation on one side, and those needed to achieve climate adaptation on the other side, showing that these do not necessarily fit well together. *"Different countries may decide to go different ways to solve this",* he said. He emphasized the role of **two overarching SDGs "*Responsible production and consumption*" and "*partnership for the goals*"** in providing arenas to discuss and decide on these trade-offs. Agriculture and its adaptation to climate change is very context-dependent and you can only make progress through a combination of public and private investment. He questioned why there are major investments in energy, transport and other industrial sectors when investment in climate mitigation and adaptation technologies for agriculture is hardly seen anywhere.

"We almost have a global plan for climate mitigation in agriculture. But the challenges are huge and the trade-offs considerable".
Bruce Campbell



So "*how to programme R&I to contribute to a rapid transformation of the agri-food system?"* he asked, recalling that current technologies, even widely adopted, could help us achieve only maximum

40% of the targets that have been established. "*Developing climate resilient and low-emissions practices and technologies are still an important part of the equation but they are sometimes overplayed*". One major element that needs to be upgraded is **private sector** investment, and for that we need research to **understand how creative finance, blended finance or public-private-partnerships work**. Research is also needed on how to get the **right policy and institutional framework**: which are the instruments and incentives that work the best? Bruce Campbell also sees a **massive need to upskill meteorological services** and to **improve the advice they provide to farmers**. **Digital technology** is a major area of innovation. Digital connectivity is moving very rapidly, including in Africa where all farmers could be expected to have access to a smart phone in the coming decade. Digital connectivity allows farmers to access better **advisory services**. Finally yet importantly, **farmers networks** are tremendously important. Bruce Campbell said he was very impressed by the prominent role networking plays in the EU's agricultural research and innovation strategy. Just as the EU, he sees research on **innovation systems** themselves as being key to making progress.

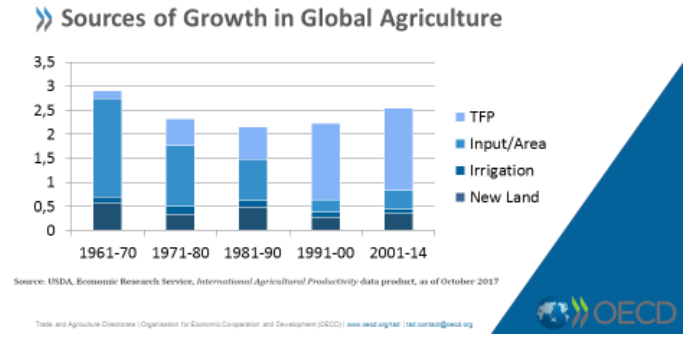


Beyond research themes, we need to change the way the agricultural research and innovation systems work and the measurement of their performance, he said. He presented the approach adopted for the measurement of performance in the Climate Change, Agriculture and Food Security (CCAFS) programme, which involved three tiers (see figure): i) **upfront engagement** to understand the needs and build trust with end-users; ii) **evidence building** (i.e. more classical research), iii) **outreach** (creative communication, capacity building and getting research used). Hence, the measurement of performance still includes writing publications, which remain important, but this is one in several factors. Scientists should rather be encouraged to develop **opportunism and flexibility** and jump on opportunities to interact with end-users and develop solutions to their problems. It can be "*good and exciting research too*", he said.

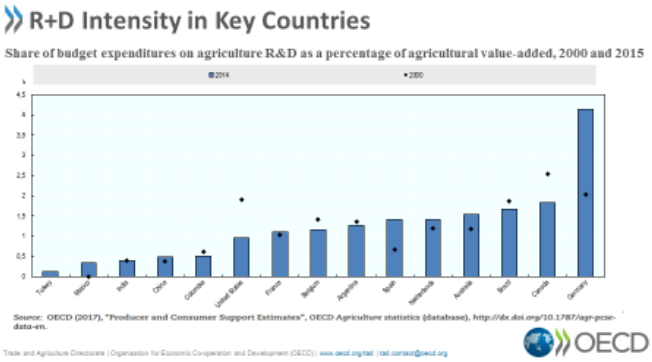
A global perspective on agricultural trends and policies – Carmel Cahill, OECD

Carmell Cahill spoke from the department for trade and agriculture of the OECD. This department has conducted, since 2012, twelve reviews of national policies that impact or support agricultural innovation. She started by highlighting the **key role that innovation plays as a productivity-increasing driver that does not necessarily require using more resources, capital or inputs**. Building

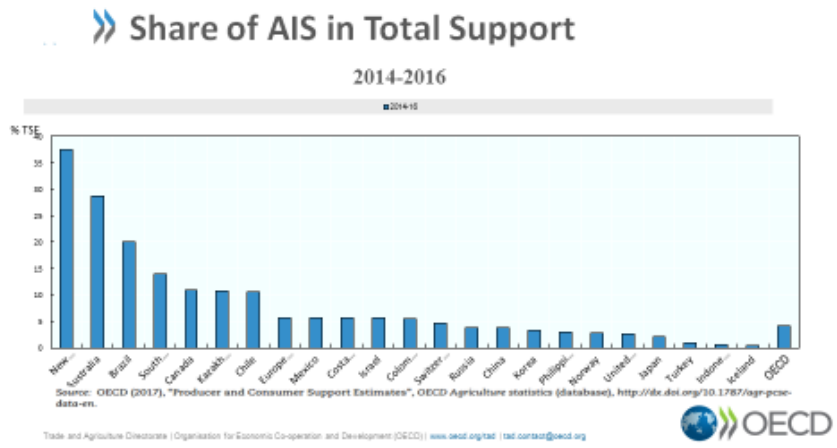
on historical statistical series, she showed that productivity growth until the 90s was mainly driven by intensifying use of land, water, fertilisers, pesticides and power. Since the 90s, **most of the productivity growth comes from increased total factor productivity (TFP)**, in which innovation plays a key role. Productivity growth in the future will have to come from innovation and a more efficient use of our resources, as using more is not an option. She then showed that, despite the challenges, **investment in agricultural research and development remains too low**, both as a proportion of total support to the sector and as a proportion of the value added generated by it. Emerging economies like China are not investing enough and former agriculture R&D powerhouses like USA and Canada have reduced their efforts: there is a great need to step up efforts in this context.



"Future growth will have to come from innovation". Carmel Cahill



Moving on to the analysis of policies for agriculture and how they support innovation, Carmel Cahill explained that **awareness of the challenges related to agriculture, the food system and climate change are well known from the policy makers**. However, she noted that, despite this good level of awareness and a pro-active discourse at strategic level, **policies remain misaligned with the challenges they are supposed to address**. Two thirds of the support to agriculture goes to trade distorting measures that incentivise increased production and increased use of inputs, she claimed. A significant part of support goes to direct payments, which are better but still do not target the problem, she argued. Finally, the **overall support to innovation represents only 4% of total support to agriculture at OECD** level, 6% at the EU level. There is room for a significant increase of support that would come from shifting resources from policy support measures driving food systems' inefficiency and resource depletion towards problem-solving measures such as support to innovation.



Carmel Cahill then presented OECD's views on how to improve the innovation systems. Like the previous speakers, she stressed the need for

bottom-up, non-linear innovation systems placing end-users needs at the centre of the innovation agenda and using **engagement** and **participatory** methods. The innovation system should also have a much **broader coverage** than it used to have in the past. Similarly, **extension services**, which had seemed to go out of fashion, need to be upgraded and to cover a broad range of issues, not only technical issues but also issues related to resilience, climate change, market mechanisms etc. The role of the government in improving innovation systems is to **define the priorities**, in dialogue with the end-users, to set a **reliable monitoring and evaluation system**, and to **provide an enabling environment** for all actors to innovate. She also stressed the importance of **involving the private sector** more but reasserted that **the government should step in where the private sector cannot provide the required innovation support services or agricultural advice**.

In conclusion, she stated that governments should dismantle harmful policies which stifle innovation and exacerbate the depletion of resources and shift resources to supporting innovation systems, environmental care, risk management and resilience.

Exchange with the audience

Katrina Sichel then coordinated an interactive debate based on questions from the floor:

- ***Should somebody lead the way or is it a collective, simultaneous move?*** The three speakers agreed there is no one-size fits all. To achieve a major transformation of farming and food systems by 2030, everybody will need to make substantial moves, possibly in different ways depending on each locality: policy makers by providing adequate policies and sending out the right messages, consumers by shifting their habits, farmers by transforming their practices, the private sector by engaging to address the challenges.
- ***Are there good practices or inspiring countries to follow?*** There again, every story is place-specific and context dependent. There has been interesting progress in many places, like in the EU with the introduction of new instruments in the last reform, or in Brazil with EMBRAPA. Carmel Cahill felt however that Australia and New Zealand had made a real progress in shifting innovation-blocking policies to a right type of support.
- ***Which are the causes of the food systems' inefficiencies: subsidies or the sustainable intensification concept?*** Tim Benton linked the current intervention logic to the post-war idea in which cheap food was a real public good. Like for smoking earlier, he said that now is the time to ask ourselves if subsidising food so it can be cheap, overconsumed and wasted is a wise use of public resources or if we are willing to invest public resources in supporting societal goals, including the reduction of poverty. In the latter case, the current system needs to be changed.
- ***How do we make change happen at the various levels?*** Bruce Campbell recommended visioning and future scenarios as a way to overcome the conservative nature of farmers for whom business as usual is still an option. As regards society, Tim Benton stressed the need to differentiate consumers from citizens and to come up with the right research questions such as: How do we change the discourse? How do we change the business model? How do we change the investment environment? How do we engage in discourse with the public? How do we make transparent what drivers are driving the system? Unless it becomes a popular issue to engage in, politicians are not going to invest in reforming the food system.

Key take-away lessons for EU agricultural R&I
Future productivity growth will mainly come from innovation: investing in innovation is paramount. However, current investment in R&I is too low. R&I need to be broadened to look at food and land systems as wholes.
Systems approaches are about identifying system components and how they interact (trade-offs, lock-ins, uncertainties) to spot the most efficient intervention points to create change.
Systems approaches are mostly important in framing research questions and setting the research agenda, both from a hard science perspective and from a social, political science perspective. Not every project needs to look at every part of the system but every project should identify its potential influence on the system.
Current food systems and land use systems are in a vicious circle of decreasing social, environmental and economic benefits in which societal costs largely exceed benefits. This is partly exacerbated by agricultural and R&I policies (despite good awareness at strategic levels). We need to create a virtuous system delivering for health, environment and society instead. Supporting innovation is an important part of this policy change.
Ways to trigger change include making the costs and benefits of the system more explicit to create incentives for people to act where they can: consumers on their consumption choices, industry on their practices, policy makers in shifting towards the right instruments.
The Paris agreement on Climate change is a great opportunity to change. It comes however with major trade-offs in achieving SDGs: local arbitrage and place-based approaches are needed to make decisions. SDGs on responsible production and consumption as well as partnerships will play a key role in managing these trade-offs.
Technical research excessively dominates science: finance, climate services, digital and extension services, policies and incentives, farmer networks and innovation systems, social, economic and political factors that hinder or foster change all need more research.
The private sector needs to be more involved. How to do so in an efficient way is also a research question.
The research and innovation system needs to be transformed in a way that pays balanced attention to engagement, evidence-building and outreach.
Innovation systems, including extension services, need sufficient support. They need to be non-linear and end-user oriented. The role of the governments is to define priorities, associated monitoring and evaluation systems, to provide an enabling environment and to step-in where private sector does not cater for the needs of the actors.

High-level policy session: European policies advancing agricultural research and innovation

This session aimed at providing the views of European and national policy makers on how European policies have, so far, addressed the challenges presented in the session before and how they should address them in the future.

Raising Europe's ambition in agricultural research and innovation – Czeslaw Adam Siekierski, Chair of the AGRI committee of the European Parliament

Czselaw Siekierski, Chairman of the AGRI committee of the European Parliament, welcomed the conference. He said it took place at the right moment to reflect on the role of science in achieving policy objectives, in relation with the communication on the future of food and farming published in November 2017 by the European Commission, future Europe's budget published on the conference day and legislative proposals on the CAP under preparation. He stressed the key role that research and innovation have to play towards the achievement of the UN sustainable development goals as well as the Paris agreement on climate change. "*If we want modern and intelligent development, it must be based on innovation and scientific research*", he said. Referring to the Treaty of Rome's objective to ensure accessibility to agricultural products, he emphasized the need to **improve productivity while preserving the environment**, including biodiversity, through an **effective use of resources**, in particular **soil** and **water**. Potential ways forward include the **development of digital technologies** (along with access to broadband) and of **more effective equipment and machinery** helping to reduce the use of chemicals, as well as new effective environmentally practices.

"Research has to be done in line with agricultural practices and that should be a condition for funding such actions". Czselaw Siekierski

He then emphasised that "*research has to be done in line with agricultural practices and that should be a condition for funding such actions*", hence supporting the European Commission's multi-actor approach. He called for scientists, farmers, other innovation agencies and private companies to work together in science and innovation. He advocated for a **good system to ensure the implementation of new innovative technologies**, saying most farmers are open to innovation but they need support to invest and improved training and education, especially young farmers. He also mentioned the importance of international cooperation and suggested there should be a **research and innovation component in all trade agreements**. He advocated for transdisciplinary and applied research covering all segments of the production and processing chain and helping to

"Faming is not only about producing food. It has got huge opportunities in terms of producing renewable energies, producing public goods, protecting the landscape and the environment and helping to stop climate change". Czselaw Siekierski

develop the bioeconomy. He finally recalled that "*faming is not only about producing food. It has got huge opportunities in terms of producing renewable energies, producing public goods, protecting the landscape and the environment and helping to stop climate change*", echoing Tim Benton's earlier call to a systems' approach to land use. "*Achieving our strategic objectives will depend on the steps we take in future research and innovation and this conference is an important contribution in this regard*", he concluded.

Building synergies between the EU and Member States on agriculture and food research and innovation – Rumen Porodzanov, Minister for agriculture, food and forestry of the Republic of Bulgaria, Chair of the Agriculture and Fisheries Council

Rumen Porodzanov highlighted the key role of the conference in informing the development of research and innovation, which have a crucial role to play in addressing European and global challenges. "*These challenges mean that we need new adapted green farming technologies and innovation for the modernisation and efficiency of the agricultural sector and the food chains*." He also emphasised the key role of research in providing **a sound basis for long-term policy making addressing these challenges**. He further specified these challenges as being: i) viable food production in response to growing global demand; ii) sustainable management of natural resources and climate action; and iii) balanced development in rural areas and their communities. The scope of research and innovation activities addressing these challenges should be **strategically thought** via the development of **EU and national strategies** to tackle specific environmental and climate challenges, **developing solutions for good quality food and feed** for Europe and **facilitating the creation of new value chains and new jobs** in particular in **rural areas**. On that basis, he listed four priority areas for future R&I:

"These challenges mean that we need new adapted green farming technologies and innovation for the modernisation and efficiency of the agricultural sector and the food chains". Rumen Porodzanov

- **productivity** and sustainable increase of biomass and of quality food and feed;
- **sustainability** (biodiversity, biosecurity, maintaining and strengthening natural values, protection against cross-border pests and diseases);
- **resource efficiency** and circularity (efficient use of biomass including through bio-based value chains); and
- **rural development** (increasing the viability and attractiveness of rural areas and society).

He then explained how Horizon 2020's societal challenge 2 has contributed to many EU policy areas, including the CAP but also health, international development, climate and environment policy, circular economy, digital single market to quote a few. "*We must continue bridging the gap between theory and practice*" he said. Recalling that innovation is one of the cross-cutting objectives of rural development policies, he quoted initiatives on **demonstration farms**, **peer-to-peer learning** and **pilot** projects as very interesting instruments to develop innovation for the farmers and reach out to them. He also stressed the need to improve **synergies** between policies in support to the **regions that perform less well under Horizon 2020**, mentioning the BIOEAST initiative, which supports this

goal in several Eastern Member States. He said there is a need to improve coordination and synergies both **between research and innovation policy and the European structural and investment funds** and between **European Research and innovation policies and national research funding programmes**. He asked to make full use of the Standing Committee for Agricultural research (SCAR) as a "*reliable and respected source of advice and as a catalyst for the coordination of national research programmes, which has mobilised, over the last 10 years, over EUR 500 million in R&I investments through nearly 30 different ERANETS*". Finally, he called for future special attention to **small and medium sized farms**, who are the ones having less and more difficult access to research and innovation while they need it the most. He suggested including young farmers in the ERASMUS programme so they can gain experience. He concluded by informing participants about the Flagship Bulgarian presidency event on Food systems research and innovation taking place on 14-15 June in Plovdiv.

Key take-away lessons for EU agricultural R&I
Broad agreement on the key role of research and innovation in addressing global challenges and achieving commitments.
Need to focus on the right innovation system to foster co-creation & implementation of innovation. Demonstration and pilots are important activities. All actors need to collaborate (public and private, science and practice).
Key role of education and training, in particular for young farmers (upgrade possibilities under ERASMUS)
Need for specific focus on small and medium size farms: those who need innovation the most and have most difficulty in accessing it.
Productivity, resource efficiency, sustainability and rural development as priorities
Importance of digital technologies, more efficient machinery and equipment, to reduce chemical inputs and improve animal welfare, animal health and plant health, protect the environment and halting climate change.
Need to improve capacity of less well performing regions, especially through European structural and investment funds. Specific needs in eastern countries (BIOEAST initiative).
Need to build further synergies between EU and national funding programmes. The SCAR has a key role to play in this, especially in pooling funding together through ERANETs until now.

Creating knowledge to answer societal challenges: EU agricultural research and innovation in the spotlight

This aim of this session was to go deeper in the analysis of the strategic approach implemented under Horizon 2020 and the EIP-AGRI and to discuss with a panel of stakeholders what worked well, what has brought improvements, what we could still improve and how to foster impact.

Agriculture R&I under Horizon 2020 and EIP-AGRI: priorities, approaches and main achievements – Nathalie Sauze-Vandevyver, Director for quality, research and innovation and outreach, DG Agriculture and rural development, European Commission

Nathalie Sauze-Vandevyver introduced the main novelties brought in the implementation of EU support to agricultural research and innovation since 2014. These include mainly five points:

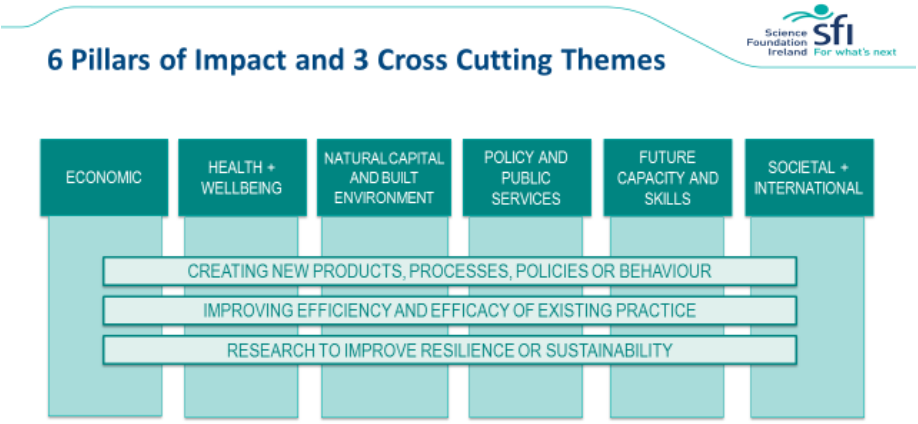
- the embedding of Horizon 2020 programming within a **long-term strategic approach** elaborated jointly with stakeholder organisations in 2016;
- the **clustering of activities into key themes** which ease **cross-policy programming**, **science-policy interface** and the long-term **monitoring** of activities and their **impacts**;
- translating the concept of open innovation into the operational and practical "**multi-actor approach**", which has brought newcomers on-board the programme and speeds-up impact;
- the design and implementation of a framework which puts **Horizon 2020 and the Common agricultural policy in full synergy**, with EIP-AGRI as a connector and a multiplicity of links between the different components;
- the **enhancement of synergies with Member states** through the use of **new instruments** such as the European Joint programmes;
- the **development of ambitious interregional partnerships**, especially with China, Africa or more recently the Mediterranean as well as the development of international research consortia which represent successful initiatives bringing public and private sectors together at the global scale.

She invited participants to refer to the AgriResearch Factsheets prepared for the conference and which contain more details on the various achievements.

Mark Ferguson then offered his thoughts on how to organise research and innovation under the future European framework programme for research and innovation, building on the conclusions from the High-level group on maximising the impact of European research and innovation collected in their "LAB-FAB-APP" report. Mark Ferguson considers agriculture to be at very exciting times, with a wide range of new

technologies likely to bring disruptive change and with the convergence of agriculture, food, health and pharmacological, environmental and digital research and innovation. Some of the key features recommended in the LAB-FAB-APP report include **missions** and **challenge-based** research funding. "*Missions are big projects that capture the public imagination, that are really important, that pool together many actors, that have an end point which is measurable from the point of view of time and objectives, and around which you can organise people. And if it is going to be a European mission, it has got to have European added value"*, he said. "*Missions will be defined by people discussing them and they will have to be something no one country could do on their own*", he added. He also explained that missions are a good way to galvanise actors, just as the European commission has already been galvanising actors through the multi-actor approach.

Mark Ferguson then delivered a series of recommendations for future policies. He advocated for **cross-disciplinary programming**, or, as far as the European Commission is concerned, **cross-DG or cross-policy programming**. "*You have been doing that already in the agriculture space with the EIP-AGRI and Horizon 2020 and that's great. You can probably do more by reflecting on the lead agency and by bringing environmental people on-board for example*". He also pushed for a policy that encourages **disruption**, explaining that the majority of science delivers only incremental progress. "*What you measure is what you get*" he said: performance of R&I should be measured in ways which favour real disruption on the ground. Excellence is required but it is not enough: you also need to have **impact**. He offered the Irish framework for measuring impact as an example that could be used across the board (see picture below).



According to him, good ways to improve impact are:

- to build a "**varied portfolio of uncorrelated risk**", i.e. a mix of big and small projects, rewarding youngsters or more experienced researchers, different types of activities;
- to build an intelligent **mix of top-down and bottom-up** support schemes;
- to support **outstanding people, projects, centres, infrastructure, movement, collaboration, exchange or partnership**;
- to **experiment with different forms** of support, evaluation, competition: funders should be as creative as the people that they aim to fund.

He concluded saying that "*in uncertain times, investment in innovation will always be an excellent use of taxpayers and shareholders money*" and "*that market shares are won or lost at times of change*".

How do EU R&I activities deliver for society? What needs to be improved? A science-society-policy panel

Six panellists talking from different perspectives were asked first what the new approaches introduced for the period 2014-2020 had brought, what could be improved and how to increase impact.

All panellists were supportive of the novelties introduced under both Horizon 2020 and the CAP with the EIP-AGRI as a connecting initiative.

Panellists emphasized **interactive innovation** as one of the most important achievements. "*The multi-actor approach is really something fantastic*" said Alfred Grand, an innovative farmer who is busy creating research farms in Austria. He proposed to use the approach in the most radical way, not only bringing scientists and farmers together but younger students and older farmers, information technology and traditional knowledge etc. Aniko Juhasz, talking on behalf of the strategic working group on agricultural knowledge and innovation systems (AKIS) of the Standing committee for agricultural research (SCAR), was even more positive. "*I love the EIP, I love the idea to work together and I love the measure,*" she said, explaining that the framework setup under rural development and Horizon 2020 was really triggering change in Hungary.

The **systems approaches** came next. Patrick ten Brink welcomed the allocation of 10% of the current Horizon 2020 budget to "integrated ecological approaches" component of the strategy. He said that the increase in budget for agricultural research in the next period was welcome and an opportunity to invest more in this field in the future, not only looking at interlinkages but also exploring the feedback loops and tipping points and relations between production and various ecosystem services, which can help move away from linear approaches. He insisted on the importance of bottom-up knowledge and data and of combining technological innovation with social innovation. Joao Lima, from INIAV, stressed the need to combine different fields of science to accelerate innovation.

On global challenges and **international cooperation**, Hayden Montgomery, talking on behalf of the Global research alliance on agriculture greenhouse gases (GRA), said the experience had been positive so far but also that there were lessons to learn to break national silos and make it easier for international cooperation to take place. He highlighted joint programming initiatives as important gateways and also listed useful instruments such as COST, ERANETs, EJPS and CSAs but advocated for a reduction in complexity for international counterparts.

Panellists also discussed **synergies between different funds**. Joao Lima explained that one of the triggering factors for organising the Agri-Innovation summit in Lisbon in October 2017 was the feeling of both a gap in the interaction between the funds and a difficulty in bringing local innovation to the European level. "*When we brought all these people in one place, we saw that challenges were the same. We truly believe that by bringing people together, not the funds, the people, we can really bring something that is unique and that is common across Europe. The human capital is essential*", he said. Judit Anda Ugarte, speaking on behalf of the regional government of Andalucia, elaborated

further on this. In her opinion, "*one of the most powerful instruments we have in agri-food innovation are rural development programmes (RDP), which we coordinate closely with other European structural and investment funds*". An important strength of the RDP is its focus on innovation. She also said the programmes can be hugely complicated, addressing multiple sectors and actors and that funders have to be "*very innovative in designing the support mechanisms which are put into play*". The government of Andalucia is combining different measures from different funds to support two main goals from their smart specialisation strategy: digitalisation and bioeconomy. In these initiatives, they try to match the demand from local actors with the supply of knowledge and technology available in the region or elsewhere. She stressed the need to involve the regions to better involve SMEs and favour the integration of project outcomes in policy making.

When asked what could be done to improve the framework and its impact on people, panellists came up with a range of concrete suggestions:

Use the "crazy" famers: both Alfred grand and Aniko Juhasz agreed farmers have more trust in other farmers than in scientists or administration and the also use the same language. However, not all farmers are interested in innovation right away. We need to use those innovative farmers who are engaging easily in EIP activities to talk to other farmers. Beyond pursuing the multi-actor approach, practical suggestions include:

- Invest more in **demonstration farms** and **research farms** that are run by innovative farmers and will serve as a platform for communication and exchange of knowledge, as well as experimentation and trust building places.
- Invest in **pilot projects** and "**labs**" approaches which are very popular at the moment and can help test and co-create new solutions
- **Adapt language and communication tools**: communication towards farmers should be in an **attractive language** that leaves the scientific cautionary language aside and invites experimentation. Use **short videos**, filmed on demonstration farms for example and channelled through regular digital newsletter, instead of papers.
- Upgrade **communication** and **facilitation** skills from researchers and other actors.

Be more farmer centric in research and innovation: one of the lessons from the Agri-innovation summit in Lisbon was the need to combine top down challenges with bottom-up implementation. "*The model of operational group is one of the best way to go forward. We have produced tremendous amounts of knowledge in the past years but we have been very bad at transforming this into real business applications on the ground,*" said Joao Lima. He also supported researchers to engage in a network of experimental farms to test innovation developed locally and elsewhere in Europe. Aniko Juhasz recommended integrating outreach, advisory activities and networking in the evaluation of scientific excellence. Alfred Grand emphasized the need for diversity in research as well. "Not all farmers are going to be small scale, we should not put all eggs in the same basket," he said. One participant also highlighted the need to move away from the "publish or perish" system that prevails in universities and to work on a performance-based reward system for scientists.

Favour a race to the top with a robust and sensible data governance framework: digital and sensor technologies offer a huge potential for improving data collection and management for knowledge creation and for monitoring and evaluating performance, especially in the context of the future

performance-oriented Common agricultural policy. However, the right framework for handling open data for societal goals is not there yet. Practical suggestions for improvement include:

- Create a robust and sensible way to handle data to protect privacy while allowing actors to share data in a way that is beneficial to societal goals;
- Combine private and public datasets to feed into research and policy making.

Make it easier for international cooperation to take place: the research system that is needed to achieve the sustainable development goals is not there yet, especially on climate. Hayden Montgomery advocated for global "grand challenges" funding which would be light in transaction, longer-term and larger scale. "The trouble is we are still locked into national rules which often forbid funding extra-territorial scientists," he said. For him, it is the mission of the EU innovation system to promote this move through co-funding and seed funding.

Make it easier for interregional cooperation to take place: Andalucia invests in an ecosystem which will support farmers in getting access to the digital technologies that match their needs. They started to invest in this because there was a lack of connection between ICT and agriculture. The administration acts as a catalyst and the region is close enough to the field to play that role. The focus is not only technologies for farmers but also for consumers and for linkages between farmers and consumers. Andalucia leads a partnership which is part of the Smart Specialisation platform on Agri-food and assembles 20 regions. Practical suggestions from Judit Anda Ugarte was to provide specific instruments to support interregional cooperation and investment on agro-food innovation.

The debate also touched upon some themes, like digitalisation, breeding techniques, working better with nature and combining these different approaches. Panellists confirmed that the way forward is to get inspired by nature, understand natural processes better and use e.g. digital technology to support new ways of working. Mark Ferguson illustrated this point with an example of mixed crops and weeding: "*the reason you do not mix crops today is because you need to be able to spray in a uniform manner. With the automatic weeder, you can go back to the old way of controlling weeds, mixing crops, because you do not need to spray anymore"*. Consumers demand more sustainable practices and farmers are also increasingly concerned about the sustainability of their practices.

Key take-away lessons for EU agricultural R&I
Use innovative farmers to bridge the gap between science and other farmers. ***Practical suggestions: more demonstration/research/experimental farms; pilots and labs, adapted language and communication tools; training in communication and facilitation; pursue and strengthen the multi-actor approach; bridge the gap also between producers and consumers, with support from scientists.***
Strengthen and broaden innovation under rural development policy & EIP networking ***Practical suggestions: maintain a strong focus on innovation and EIP in the CAP; consider European level operational groups; strengthen networking activities (favour different level of connections within the EIP networking system) and allow local innovation to come at European level and be tested and adapted to other contexts; change focus to look not only at agriculture but more broadly at job creation, rural attractiveness (especially to young people).***
A data governance framework which favours a race to the top ***Practical suggestions: set up a robust and sensible way to collect and manage data acquired through sensors and applications on farms, so that data remains open, managed respecting privacy and favouring monitoring of performance for the result-based CAP.***
Systems approaches and integrated ecological approaches: do more of it. ***Practical suggestions: raise budget share going to integrated approaches; invest in better understanding natural processes and use digital technologies to support new –or old- ways of working; look into interactions but also feedback loops and tipping points. Combine different fields of science. Enhance cross-policy programming especially with environment and climate.***
Move towards more performance-based research ***Practical suggestions: be more farmer-centric in research; improve communication to show that researchers are working to solve their problems. Adapt the "publish or perish" model currently applying to allow proper reward of impact-oriented research.***
International cooperation: make it easier, especially for countries with low capabilities ***Practical suggestions: move towards larger scale, longer-term, light-transaction, grand challenge based research funding at a global level. Remove national barriers to funding "extra-territorial scientists"; EU to play its role by providing co-funding and seed-funding incentivising cooperation and alignment of national research agendas and programmes; investing in countries which have low capability but which can really make a change if they act.***
Improve synergies between funds ***Practical suggestions: make it easier to combine instruments from different funds to support an innovation ecosystem that brings together different actors from different sectors; involve the regions in implementation of EIP and Horizon 2020 so they can integrate results in policy-making; provide instruments supporting inter-regional cooperation for innovation.***

Commissioners' closing

R&I and CAP in synergy for sustainable farming systems and thriving rural areas – Phil Hogan

Phil Hogan highlighted for the audience the main achievements and actions already taken at EU level to meet the challenges identified throughout the first day of the conference. He stressed the new and unique framework put in place to support innovation through two policies working in synergies: the CAP and Horizon 2020, with the EIP-AGRI as a powerful connector. While acknowledging the good progress made, he also told the audience that the EU had to **step up efforts,** if it was to meet the challenges of both today and tomorrow. He was pleased to announce that, as a result of discussions concluded in the morning, a budget of **EUR 10 billion** had been secured for research and innovation on food, agriculture, rural development and the bioeconomy under the European Commission's proposals for the next framework programme for R&I "Horizon Europe". "*At times of budget cuts due to Brexit, at times of increasing demands from other policy areas, this has to be seen as a major achievement*", he said, grateful to the college of Commissioners for realising that agriculture and research and innovation can do much more together.

"The future is research and innovation. We cannot implement many of the objectives that we have set out in our CAP communication if we do not have the type of support we need from science and innovation."
Phil Hogan

Moving on to the CAP, he said that **innovation was included as a core element of the future CAP in an unprecedented way**. "*The future is research and innovation; we cannot implement many of the objectives that we have set out in our CAP communication if we do not have the type of support we need from science and innovation*," he said. He stressed both the importance of **new technologies**, digital-based opportunities and digital farming, as well as **social and organisational innovation** and the role it plays in triggering new business models, emerging sustainable value chains or collective action delivering environmental and social benefits. He referred to the Cork 2.0 declaration "A better life in rural areas" which sets the goals that we have to achieve for rural communities. Arguing that both technological and social innovation require adequate **skills, knowledge sharing facilities and networks**, he said the European Commission puts priority on enhancing agricultural knowledge and innovation systems (AKIS) both through the stream of projects on the subject funded through Horizon 2020 and through support to advisors and knowledge sharing in the CAP.

He concluded saying these are very exciting times for collaboration between research and innovation and the Common agricultural policy.

The way forward: the future framework programme for research and innovation in post-2020 EU policies – Carlos Moedas

"For the first time ever, we will have 10% of everything that is invested in research and innovation invested with you, on food, agriculture, rural development and bioeconomy."
Carlos Moedas

Echoing Phil Hogan, Carlos Moedas communicated his satisfaction regarding the agreement obtained at European Commission level on the EUR 10 billion for research and innovation on food, agriculture, rural development and the bioeconomy. "*For the first time ever, we will have 10% of everything that is invested in research and innovation invested with you, on food, agriculture, rural development and bioeconomy*", he said. This will allow us to make a big leap in supporting the most innovative agro businesses, supporting the rural communities, developing new technologies, innovating the entire food chain and improving sustainability and combatting climate change.

Agriculture is one of the key areas when we talk about merging digital and physical worlds, he further explained. He then elaborated on three dimensions that are key to agricultural research and innovation in his opinion: **collecting and using data** and **making it open data; developing traceability** using the opportunities opened by technologies like Blockchain, to inform consumers better and to solve sanitary crises more rapidly; and finally **scientific advice**. "*People are tired to be told what to do, they want to understand*", he said, mentioning the science advice mechanism, which has been set up at European level to inform policy makers on scientific matters. He also supported the fact that people should be in the driving seat of innovation, in particular farmers for what regards agriculture.

He concluded that research in agriculture is probably one of the best ways to connect to the citizens. "*If we make research and innovation and agricultural policies more open to one another, the potential is huge*", he ended.

Building on achievements to shape the future

Three parallel sessions aimed to shape proposals for the future, building on an overview of R&I activities programmed in the 2014-2020 period and on insights from inspirational speakers and panellists talking from different perspectives. Sessions followed a three-step approach, first taking stock of the activities programmed under Horizon 2020, then looking into other EU programmes or specific implementation approaches, finally opening to inspirational insights to discuss future research and innovation activities under Horizon Europe and how to organise collective work to design these future activities.

Parallel session 1: Smart resource management in farming

The session followed a three-step approach:

1) Activities, achievements and gaps under Horizon 2020

Showing how Horizon 2020 Societal Challenge 2 addresses the strategic priority of "Resource management" and the cross-cutting issue "ICT as an enabler" and identifying gaps/issues that should receive priority attention in the future.

2) How to maximise synergies between various instruments and approaches?

i) Draw attention to specific instruments or implementation approaches used under Horizon 2020 Societal Challenge 2 and other parts of the programme;
ii) Draw attention to other policies or funds, which complement Horizon 2020 activities and/or increase EU R&I impact.

3) Shaping the future: how to best design R&I to support transition towards resilient and sustainable farming systems and rural communities?

i) Discuss what are key issues in future EU R&I activities, either in the future framework programme for R&I (Horizon Europe) or in the next CAP (EIP-AGRI) to advance resource management;
ii) Collect ideas of participatory activities contributing to the programming of Horizon Europe.

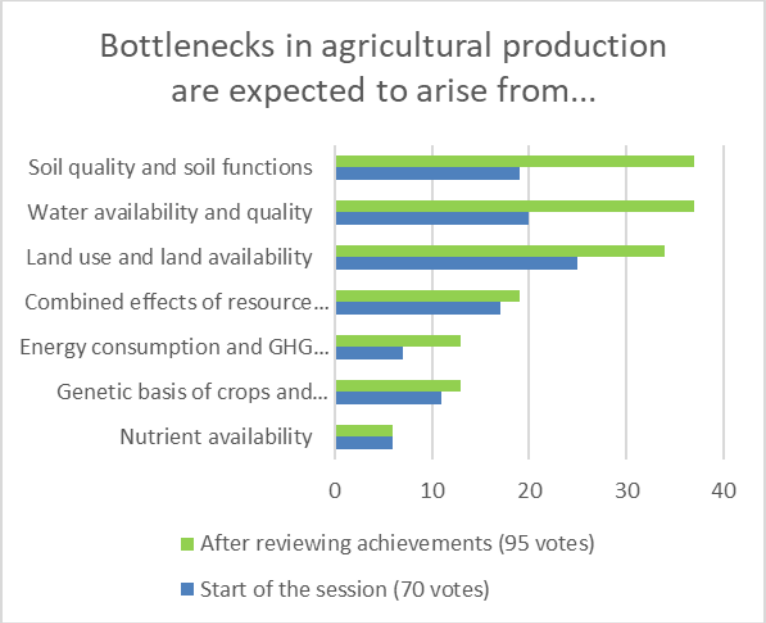
During the first two parts of the session, Horizon 2020 or other EU-funded projects (see table below) presented their project's objectives and achievements, highlighting either their contribution to the portfolio of actions on resource management (first part of the session) or the added value of the approach or policy instrument used to increase impact under which it is funded (second part of the session). Elin Roos (SLU) and Ralf Seppelt (Helmholtz Centre for environmental research) introduced the third part of the session with inspirational insights on global resource use and the ecological footprints arising from agricultural production. A panel discussion followed involving Jürgen Vangeyte (ILVO), Iris Bouwers (CEJA), Pavel Horcicka (SELGEN), Mute Schimpf (Friends of the Earth) and Joerg Jasper (Yara International). The session was moderated by Fabien Santini and Nikos Kastrinos. Agnes van den Pol (Wageningen University) acted as rapporteur. All presentations as well as video recordings are on the conference website. Overview of presentations in parallel session 1:

Activities, achievements and gaps	Maximising synergies
Overview of Horizon 2020 Societal Challenge 2 projects for smart resource management - *Annette Schneegans – European Commission DG AGRI*	Overview of approaches and other EU R&I activities *Louis Mahy – European Commission DG AGRI*
Improving soil and soil functions (LANDMARK) *Francesca Bampa – Wageningen University*	EIP-AGRI & operational groups (EURODAIRY) *Ray Keatinge, AHDB Dairy*
Improving agroecosystems and crop efficiency (SolACE) *Philippe Hinsinger – INRA*	EIP-AGRI Focus groups and INTERREG (Biorefine) *Erik Meers, Ghent University*
Regional value chains from animal genetic resources (TREASURE) *Marjeta Candek-Potokar, Agricultural Institute of Slovenia*	International cooperation (EU-AU partnership on FNSSA) *Yemi Akinbamijo – FARA*
Smart resource management - Internet of Things (IoF2020) *Cristina Micheloni – Valoritalia - AIAB*	European Infrastructures (SMARTCOW) *Richard Dewurst, SRUC*
	Open Science (AGINFRA+ & E-ROSA) *Thodoris Kontogiannis, Agroknow*

What important factors or key issues emerged?

Key priority issues for the future

Resource use and complexity in agricultural production



- Participants considered **water availability and quality**, **soil quality and soil functions** as well as **land use and land availability** as the three main bottlenecks in agricultural production (see poll results).
- Availability and status of natural resources are closely interlinked and pressure on individual resources is exacerbated by **simultaneous peaks** in the use of various resources.
- **Soils** were given particular attention in terms of highlighting their **multiple functions** (ranging from productivity, to biodiversity, carbon capture, water purification and nutrient cycling) and the trade-offs arising from multiple demands on soils.
- **Complexity in resource use**: a systems approach is needed to take into account the synergies and trade-offs in the management of various resources as well as simultaneous, multiple stresses arising from scarcity, surplus or quality of resources. Examples given included crop and soil management under simultaneous water and nutrient scarcity.
- **Diversity is a challenge for resource and landscape management**. How do we make sure that we do the right thing at the right place at the right time?
- **The time horizon is relevant**: management of resources also requires dealing with different time scales and inherent uncertainty. For example, when using genetic resources, breeders need to anticipate climate and growth conditions expected in about 10 years and foresee future relevant traits. Similarly, farmers need to have a long-term perspective with regard to soil management to improve soil properties.

Designing resource-efficient farming systems

- **A paradigm shift is necessary to move towards resource efficient farming systems**. This requires seeking an optimal use of multiple resources rather than maximising the use of individual resources. Examples given showed how acquisition of water and nutrients (phosphorus and nitrogen) by plants can be improved by deploying a mix of agro-ecological

innovations such as the use of crop genotypes with below ground traits or crop and soil management to support interactions between plants and soil microbes.

- **Economic drivers of farmers' behaviour:** Farmers respond to market signals. In addition to technical and organisational solutions for resource efficiency, economic incentives are needed. Farmers are worried about climate change and they are willing to make a change. But they need support for investments that are beneficial for society and do not necessarily increase immediate profit. Young farmers in particular need access to land, access to credit, access to knowledge and incentives to produce in more sustainable ways in a long-term perspective. This will not happen via market rules only but requires political steering.

- **Promote long-term thinking** for good resource management e.g. in soils management. This remains challenging in the current economic set-up.

Digital technologies and farming for resource use efficiency

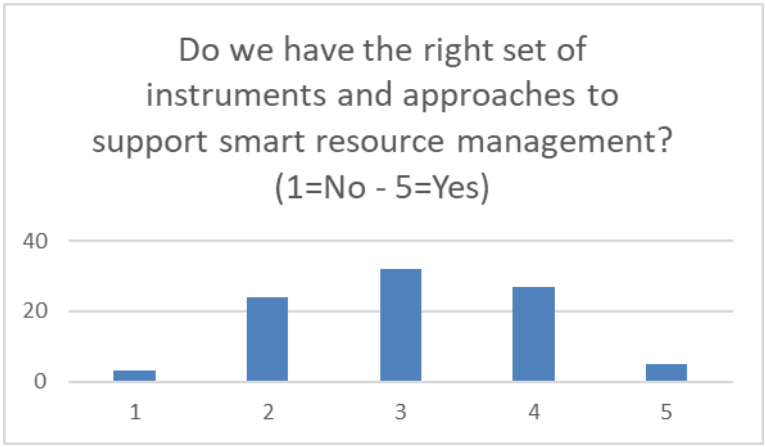
- **Take advantage of the digital transformation**: precision farming is quickly advancing, allowing to establish more accurately the status and use of resources at farm level. Emerging digital technologies will help to improve nutrient efficiency and bring smarter nutrient management.
- **Digital decision-support systems** should be taken one step further: from only measuring and signalling to providing advice - what do farmers need to do when, where...
- Adoption of digital technologies is not straightforward and requires actions at various levels beyond research and innovation:
    - **Improved business models, training and education,** for both farmers and society are key to benefit and take part in the digital transformation of agriculture, the food chain and consumption.
    - **Consumer information and certification schemes are key** to increase transparency, trust and new types of producer-consumer relationships. Information and communication technologies (ICT) can create an openness from farmers to society that has never been seen before.
    - **Better connectivity** across regions is also necessary to make full use of opportunities provided by digitisation and circularity of nutrients.
- **ICT as a way to make farming more attractive and ICT for a new generation of farmers** - ICT may play a role on the attractiveness of farming as a job and shape the work of a new generation of farmers (professionalised farmers with autonomous machines etc.). They will be the ones that will have to farm more efficiently and cope with up-coming challenges.
- When propagating digitalisation we need to be well aware of **potential risks** and negative side effects of digital technologies such as the increased energy use or its impact on jobs.

Instruments and approaches

Presentations allowed identifying the following benefits in implementing different approaches:

- **The multi-actor approach is highly appreciated in research projects** but is only at its start. Genuine efforts are needed to further bridge the gap between practice and science and between practice, science, consumers and society as a whole. We need to assess the role of farmers and society in on-going multi-actor projects. Are they really central in the research? How do they convey their ideas to research partners? Special attention needs to be given to the need for a common language between different players, e.g. farmers and researchers.

- **We need to combine research and innovation and education for effective involvement of farmers**. Young people are the future of agriculture. "If you reach a young farmer, you will see the benefits for 40 years, if you reach an old farmer..." said a participant.
- **Peer-to-peer learning** - Farmers value examples. Good practices, training and awareness are important. Farmers like to see and 'touch', learn from their peers. A blended approach to learning is needed.
- **Diversity in funding for research and innovation** – Different problems require different approaches, a different mix of basic and applied research and different scales (local, national, European). We need to reflect at which level a project needs to take place, sometimes operational groups or other within-country projects are more efficient. The range of (European) funding instruments is welcome but is often too complex to be fully known by applicants.



- The **clustering of projects** (see for example the crop diversification Horizon 2020 project cluster) has proven useful to exploit synergies between on-going, parallel projects working on similar issues. It allows to share resources, learn from each other and develop joint activities. Clusters are also relevant to build a portfolio of projects with a critical mass of research activities, thereby increasing impact of research funding.
- **Research Infrastructures** are another good instrument to pool resources (technological, human or experimental sites) across Europe. Infrastructures examples presented showed their relevance for smart resource management by closing resource loops of by-products between industries and farms.

What concrete actions did the group recommend?

Participants recommended a number of measures to promote resource efficiency both in research activities and in farming itself ranging from the use of specific instruments to approaches and specific research topics, such as:

- **Strengthening the multi-actor approach** in research and innovation projects, with particular emphasis on the participation of farmers and society in the discussion of R&I needs for smarter resource management and the implementation of research projects.
- **Involving young farmers** in research and innovation and investing in their education. The ERASMUS scheme for young farmers should be scaled up.
- **Inviting smaller groups to implement smaller projects**. This is considered to allow for more diversity and innovation in research.
- Similarly, **promoting more open, bottom-up research**. This requires a longer preparation phase for developing proposals and more fllexibility in research is relevant to deliver more and more relevant output.
- **Including the diversity of agroecosystems and conditions for production** in research and innovation activities. Context specific research and innovation is key to address local variation in farming across Europe. Research needs to produce locally or regionally tailored solutions to do "*the right thing in the right place at the right time*". This includes putting technologies in a context, i.e. work in close connection with end-users, starting from the needs and challenges and then identify appropriate solutions and technologies.
- **Giving more attention to bringing new students to agronomic sciences** based on a truly multidisciplinary curriculum including ecological and economic sciences as well as skills in communication and practical experince. Research and innovation projects do not only deliver knowledge and solutions. They also play a role in the training.
- **Taking better into account the economic dimension** of the uptake of proposed solutions in research projects. Research is also needed on incentives (e.g. policies, instruments) to introduce more environmentally and climate friendly agricultural practices.
- **Improving the guidance on openings and instruments for research funding** - applicants need more guidance on instruments available and how to best use them.
- **Keep strengthening the European Research Area** to pool resources and reduce overlap in research activities. However, more information and coordination is needed between Member States. It is also necessary to put more efforts in creating a "common language" between participants in European projects to support sharing of experiences.

Parallel session 2: Healthy plants, animals and ecosystems for healthy people

The session followed a three-step approach:

1) Activities, achievements and gaps under Horizon 2020

Showing how Horizon 2020 Societal Challenge 2 addresses the strategic priorities of "Healthier plants and animals" and "Ecological approaches" and identifying gaps/issues that should receive priority attention in the future.

2) How to maximise synergies between various instruments and approaches?

i) Draw attention to specific instruments or implementation approaches used under Horizon 2020 Societal Challenge 2 and other parts;
ii) Broaden the picture to other policies or funds, which complement Horizon 2020 activities and/or increase EU R&I impact.

3) Shaping the future: how to best design R&I to support transition towards resilient and sustainable farming systems and rural communities?

i) What are key issues in future EU R&I activities, either in the future framework programme for research and innovation (Horizon Europe) or in the next CAP (EIP-AGRI) to advance "Healthy plants, animals and ecosystems for healthy people"?
ii) Collect ideas of participatory activities contributing to the programming of Horizon Europe.

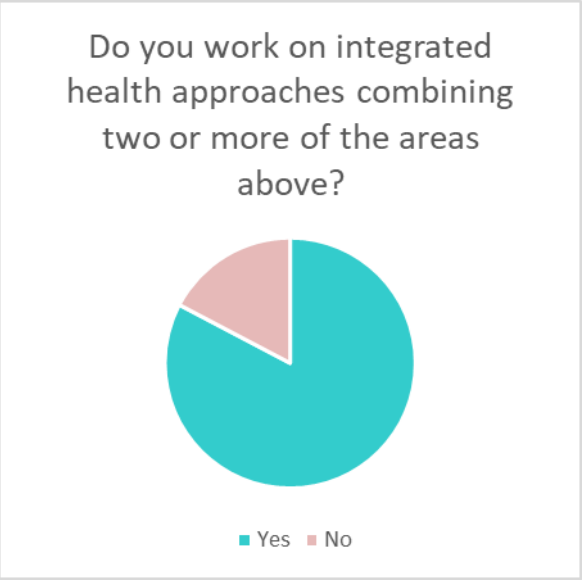
During the first two sessions, Horizon 2020 or other EU-funded projects (see table below) presented their project's objectives and achievements, highlighting either their contribution to the portfolio of actions on resource management (session 1) or the added value of the approach or policy instrument under which it is funded (session 2). The moderator coordinated discussions in the room and on-line after presentations. Christian Huyghe (French National Institute for Agricultural Research) and Graham Rook (University College London) introduced the third session with inspirational insights. A panel discussion followed involving Marta Hugas (EFSA), David Cary (IBMA), Eduardo Cuoco (IFOAM-EU), Maurizio Ferri (Federation of veterinarians Europe) and John McNamara (TEAGASC).

All presentations are on the conference website as well as video recordings.

Activities, achievements and gaps	Maximising synergies
Overview of Horizon 2020 Societal Challenge 2 projects on health *Eleonora Ganci, European Commission DG AGRI*	Overview of approaches and other EU R&I activities *Jean-Charles Cavitte, European Commission DG AGRI*
Integrated weed management (IWMPRAISE) *Per Kudsk, Aarhus University*	EIP-AGRI Thematic networks (WINETWORK) *Fanny Prezman, IFVV*
Animal health - Immune response (SAPHIR) *Isabelle Schwartz, INRA*	Aligning national R&I programmes (HBM4EU) *Sofie Norager, European Comission, DG RTD*
Integrated pest management (EMPHASIS) *Maria Lodovica Gullino, University of Turin*	International cooperation (FAB EU-CHINA) *Paul Brereton, Queens Univ. of Belfast*
Foodborne zoonoses, anti-microbial resistance and emerging hazards (EJP One Health) *André Jestin, ANSES*	International public-private cooperation (STAR IDAZ) *Ariel Pereda, Institute of Biopathology Argentina*
	European research area (CORE Organic Cofund) *Niels Halberg, ICROFS*

Luis Vivas-Alegre from European Commission's DG Health and Food Safety moderated the two first steps while Sophie Norager, from DG Research and Innovation moderated the second. Hans Keune from the Belgian Biodiversity Platform, the Research Institute Nature & Forest (INBO) and the Department for Interdisciplinary and Primary Care Antwerp (ELIZA), Faculty of Medicine and Health Sciences University of Antwerp, acted as rapporteur of the session.

The session started with an invitation to participants to answer the question on the conference interactive application about the area(s) most related to their work. 52 participants answered this question, which is by estimate some 50% of all people participating in the session. The majority of respondents (77%) worked on plants, and about half of them on animals (52%) or the environment (48%). Only a minority indicated to work on human health (25%). A large majority (83%) moreover indicated to work on integrated health approaches combining two or more of these areas. This by no means is a representative picture of the research or practice community related to agriculture and linkages with health issues. However, the session clearly seemed to indicate the links with human health to be least well developed.



What important factors or key issues emerged?

Key priority issues for the future

- **Potential of biodiversity**: healthy ecosystems are essential to increase resilience and agricultural production in the face of change. Production needs to be sustainable: capitalising on resources without compromising natural capital such as biodiversity. Participants acknowledged that the potential of biodiverse rich foods for human consumption has been untapped. Only a small percentage of edible plants are cultivated for consumption.
- **Balancing needs**: research is needed on ways to balance agricultural production, ecosystem services and biodiversity. Agriculture should not be only about food and yields but go beyond, e.g. sequestering carbon sequestration and providing other ecosystem services. A dynamic agricultural sector is needed with a more transparent production cycle.

- **Food safety**: research should support food safety with risk assessments and identify emerging risks, while comparative assessments are needed to measure the impact of food safety research.
- **Broadening the health perspective**: the contribution and the importance of plants and crops to human health was mentioned. Moreover, the One Health concept should be broadened to Eco Health or Global Health concepts encompassing not only animal and human health but also at plant and ecosystem health. Plant health needs to be incorporated in One Health or Global Health approaches and there is a need for a systems framework regarding testing. The World Health Organization (WHO) Health Systems Framework can be of inspiration, to incorporate all organizations relevant from a health care perspective.
- **Advocating for farmers health:** more attention should be given to systems to exchange with farmers, looking at farm safety and behaviour. A multidisciplinary approach is needed, taking into account the human and social capita farmers provide.
- **Advancing and incentives for regulatory sciences**: there is a need for support from science to regulators and policy makers to address regulatory-research questions, backed up by data, evidence, expertise and access to robust science. Examples mentioned were the following: more knowledge needed on chemical exposure, animal/non-animal testing and food fraud defence. The question of how to support the (risk) assessment of biological control and complex mixtures and testing was also raised.
- **Environmental problems and necessary transitions**: climate change effects on alien species, fundamental systemic features like intensive practices, the use of antimicrobials and pesticides, and the combination of nutritional security and food safety for both humans and animals need research. A key social dilemma concerned job loss among farm workers due to technological innovation: how should research consider this?

Instruments and approaches

- **Research programming**: Joint partnership programmes, such as the One Health EJP, are already running in parallel or are in the pipeline. How can coordination between these programmes be enhanced and the research programme structure be simplified?
- **Improved coordination and collaboration** are key for future research agenda setting. Creating more incentives to include different actors such as industry, SMEs and stakeholders will also be important.
- **Participants appreciate the multi-actor approach** and said it should be part of Horizon Europe. They discussed **how farmers can be reached,** whether or how they were involved in co-designing the research process and how meetings between scientists and practitioners were organized.
- **Knowledge management and dissemination:** participants discussed the management of knowledge and in particular its long-term availability. Building trust between different actors, such as researchers and society, by making data and knowledge more accessible ("open science") seems important. More generally, participants mentioned the challenge of how to measure success in research and practice, availability of research project outcomes after a project has ended and the tension in vaccine research between public research funding and lack of open access to research results.

What concrete actions did the group recommend?

1) **Crack the integration challenge**: if any cross-cutting theme was detected throughout the session, both in the presentations, the panel discussion and the session dialogue, it was integration. Most respondents indicated on the event's interactive application that they work in an integrated manner and several projects presented work with integrated approaches. However integration challenges remain significant for future research activities. We distinguish integration on **content**, of **actors** and of the **science-policy interface**.
2) **Integrate research areas**: integrating animal, plant and human health under the One Health umbrella is high on the international agenda. The World Health Organisation (WHO), in collaboration with the Convention on Biological Diversity (CBD) (2015), proposed One Health as an umbrella framework for several equivalents like "EcoHealth" and "Planetary Health", encompassing both nature related health benefits and risks, which was recently agreed by the CBD Member States. Building on this, CBD and WHO developed a One Health strategy. This kind of integration poses methodological and managerial challenges that need to be addressed more explicitly in future integration work. For example, how to combine methodological cultures from different disciplines and how to manage the accompanying complexity? The projects presented at this session presented transparent and well-structured approaches for integration only to a limited extent.
3) **Integrate actors**: when looking at disciplines, stakeholders, experts and practitioners, science and policy, similar challenges remain for the future. Projects often were rather unclear about how to deal with governance and decision making with such mix of actors involved. A challenge with transdisciplinarity is to be clear on roles and responsibilities: e.g. how can researchers remain independent from stakeholder influences, who are the end-users, how to deal with the local versus global perspective? In addition, to benefit from multi-actor involvement from the start, including the proposal development stage, some incentives are needed. Participants advised that seed money be available as a mechanism to make facilitate an early engagement in practice.
4) **Integrate the research-policy interface**: an improved dialogue and interaction between the scientists and policy makers is necessary to improve linkages between policy needs and research programmes and feed research results back into policy making. This dialogue should take place at all levels - local, regional, national as well as international.
5) **Knowledge management** needs to be improved to build effective ways to combine different forms of knowledge and decide how to better define the quality of knowledge. At the same time the long-term availability of knowledge remains a concern. Producing good quality knowledge is a crucial challenge of science but also of society as a whole. However, how to define and decide on quality when different forms of knowledge come together in one project? The question applies to knowledge from different scientific disciplines, to scientific knowledge and practitioner's knowledge. Of course, the role of norms and values in science plays a role.
6) In the discussion, **research impact evaluation**, during but also after a project has ended, was considered important. Participants identified that significant evaluation challenges remain for future research, largely mirroring the integration challenges. Participants also discussed how to take into account societal demands a as a crucial challenge, with the importance of a preventive turn to addressing health care and the importance of biodiversity (e.g. from a microbial diversity health perspective), as prominent examples.

Parallel session 3: Attractive, smart and resilient rural communities

The session followed a three-step approach:

1) Activities, achievements and gaps under Horizon 2020

Showing how Horizon 2020 Societal Challenge 2 addresses the strategic priorities of "New openings for rural growth" and "Enhancing the human and social capital" and identifying gaps/issues that should receive priority attention in the future.

2) How to maximise synergies between various instruments and approaches?

i) Draw attention to specific instruments or implementation approaches used under Horizon 2020 Societal Challenge 2 and other parts;
ii) Broaden the picture to other policies or funds, which complement Horizon 2020 activities and/or increase EU R&I impact.

3) Shaping the future: how to best design R&I to support transition towards resilient and sustainable farming systems and rural communities?

i) Discuss what are key issues in future EU R&I activities, either in the future framework programme for research and innovation (Horizon Europe) or in the next CAP (EIP-AGRI) to advance rural development;
ii) Collect ideas of participatory activities contributing to the programming of Horizon Europe.

Mike Gregory (ENRD) acted as a moderator and Hilka Vihinen (Luke) as a rapporteur. During the first two sessions, Horizon 2020 or other EU-funded projects (see table below) where invited to present their project's objective and achievements, highlighting either their contribution to the portfolio of actions on rural development (session 1) or the added value of the approach or policy instrument under which it is funded (session 2). Enrique Garcilazo (OECD) and Laurent Frideres (ESPON) introduced the third session with inspirational insights. A panel discussion followed involving Kirsten Birke Lund (ELARD), Kevin O'Connor (University College Dublin), Cynthia Giagnocavo (University of Almeria, Adrien Guichaoua (ACTA & SCAR AKIS SWG) and Barna Kovacs (BIO-EAST).

All presentations are on the conference website, as well as video recordings.

Activities, achievements and gaps	Maximising synergies
Overview of Horizon 2020 Societal Challenge 2 projects for rural development *Marc Duponcel – European Commission DG AGRI*	Overview of approaches and other EU R&I activities *Alexia Rouby – European Commission DG AGRI*
Social innovation (SIMRA) *Laura Secco - Univ. Padova*	EIP-AGRI & thematic networks (SMART-AKIS) *Spyros Fountas – Ag. Univ. Athens*
Public goods delivery (PEGASUS) *David Baldock – IEEP*	INTERREG & ERDF (ERUDITE) *Emilia Stojmenova Duh – Uni Ljubjana*
Food chains, quality and procurement (STRENGTH2FOOD) *Matthew Gorton – Univ. Newcastle*	LIFE (LifeCoop2020) *Priya Devasirvatham – Transfer Consultancy*
Sustainable finance (SUFISA) *Erik Mathijs – KU Leuven*	Bio-based-Joint Undertaking (AGRIMAX) *Dieter Brigitta – BBI-JU*

What important factors or key issues emerged?

Key priority issues for the future

- **Sustainable local development** – research is needed on how to implement Sustainable Development Goals via local development strategies and assess the impact of this evolution. There is a need to facilitating community-level solutions and build on the experience and methodology of LEADER, to bring evidence that it works.
- **Social processes, social innovation, social capital** – Social processes are key to delivery of environmental and social benefits (inc. management of power relations). Needs include to:
    - improve the understanding of their functioning, drivers and obstacles;
    - find out how to build social capital when it is not there?
    - analyse the role of communication and media (including negative e.g. fake news) and the role of legal and institutional aspects (legal entities helping collaboration).
- **Infrastructures** - How do they play a role in the transition capacity of rural areas?
- **Interfaces** – There is a need to strengthen research at the interface of rural and urban, global and local, environment and social, technological and social, social processes and infrastructures.
- **Evaluation frameworks and indicators** – there is a need for:
    - *methods* to measure outcomes of local initiatives and collective action in a comprehensive manner (e.g. measuring the total economic value including the economic value of social impacts; social networks analysis);
    - *Joined up evaluation of social and environmental benefits* or impacts (build high-quality socio-cultural indicators);
    - *methods for external validation of various health or environmental claims*;
    - *much more data and indicators at disaggregated levels* (LAU2 or grid cells).
    - *Data* – increase ease of access and use of the wealth of available data (eg. for Public Goods);
- **Policy insights** – more knowledge is needed on:
    - *Well-being* of rural communities as the goal (not – only- growth);
    - *Rural diversity* - Comparative tailored analysis and policy approaches for different types of rural territories (in or close to cities vs remote): drivers, trends; urban-rural relationships and synergies;
    - *Demographic change and associated spatial planning*; population changes and labour markets (potential shortage of people managing land?); next generation farmers and entrepreneurs, new entrants into farming; trends in people's attitudes and behaviours and their role in shaping rural futures;
    - *Smart mobilisation of key rural assets* (diversify in the use of assets, create and retain value, **smart specialisation/diversification**);
    - *Multi-dimensional policy approaches* affecting several drivers at the same time (skills, economic opportunities, infrastructures); Rural proofing not enough (patchy): need for really adapting policies to rural needs.
    - *Collective action/social innovation*: how to scale-up support?
    - *Governance arrangements*: how to make them work to achieve change at scale (beyond individual farms); economic, social and environmental governance;

- *Low-carbon economy*: how to move towards it? Transitions beneficial to rural areas (e.g. transition towards decentralised production and consumption patterns).

> *"Understanding and harnessing social processes is absolutely key to the provision of environmental as well as social public goods". David Baldock, IEEP.*

- **Public goods** – there are needs for:
  - better understanding of the demand and supply sides (different types of land management generating public goods);
  - deeper understanding of trade-offs between different public goods or ecosystem services;
  - more effective, lower cost means of measuring environmental change at farm level, linked to engagement and empowerment strategies;
- **Value chains** (food and other bio-based) – there are needs for:
  - *Small vs large scale; niche vs mainstream* – Research to identify transition pathways, benefits and impacts, support mechanisms is needed for several business models;
  - *Sustainability* – holistic performance assessment: economic, environment, health, rural development, society impacts;
  - *Public procurement* - more emphasis on its role (in complement to work on unfair trading practices); market structure, barriers to entry of new companies; scale and impact; environmental and social benefits;
  - *Trade* - Impacts of trade changes, export potential of Geographical Indications and how to best exploit it, competitiveness of domestic versus imported products;
  - *Fraud & falsification* - New testing and control methods (genetics, blockchain)
  - *Consumer behaviour* - More field experiments on real behaviour when exposed to more information (past research has been naïve)
  - *Food quality schemes* - Improving registration processes to increase environment and social benefits and local development (more market aspects);
  - *Additive and distributive manufacturing* (personalised high-quality products);
  - *Improve farmers' understanding of biomass* - composition, seasonality, transformability into high value-added products and market aspects. R&I involving farmers as leaders.

> *"Building an R&I programme which promotes farmers to move up the value chain is critical. Currently farmers are often invisible or at the bottom of the value chain." Kevin O'Connor.*

  - *Viable rural business models,* involving social innovation and building on natural capital. Management of risks and perception. Side streams of biomass and food as drivers for competitiveness of rural entrepreneurs. Socio-economic and environmental aspects of bioeconomy. Small-scale biorefineries as important in particular in Eastern countries.
  - *Participative governance,* through meaningful involvement or rural communities.
- **Digital transformation** - there are needs for research and innovation on:
  - *Impacts* – continue understanding complex systems. Different logics with winners and losers to manage carefully.

- *Governance* – data ownership.
- *Internet of Things* as a source of data for decision making and resource efficiency;
- *Technologies shaping opportunities* available to rural people (drones, IoT, AI etc.), in particular in the service sector, new employment opportunities. Interoperability and gender issues as gaps.
- *Improvements in services and infrastructures* available to rural people (and impact on rural regions competitiveness).
- *Digital technologies improving knowledge flows.*

- **Knowledge and innovation systems** - R&I are needed on:
  - *Diversity of farming systems* - cultural heritage and geographical differences as important aspects to take into account.
  - *Human, policy and social aspects* are as important as technological aspects and require investment. Build a culture of research and innovation throughout society and actors involved.
  - *Education and training* (including vocational); skills, in particular soft skills;
  - *Advisory and innovation support services* as key intermediaries.
  - *Supporting Member States strategies* (especially through the AKIS chapter in future CAP strategic plans).
  - *Shifting scientists' career reward systems* from rewarding high-level scientific publications to rewarding outcomes for society. Needs for new indicators, besides scientific excellence, to measure applicability, dissemination via end-user channels, number of farms reached etc.

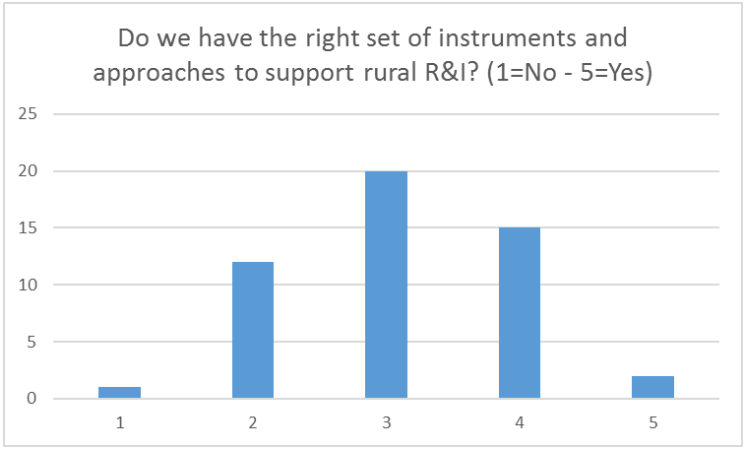
"Not only university people are researchers, we are all researchers". Cynthia Giagnocavo.
"Farming systems are very diverse. If farmers are not ready to integrate the technology developed, we are throwing money throughout the window". Adrien Guichaoua.

Instruments and approaches

Presentations allowed identifying the following benefits in the different approaches:

- **Interactive innovation & EIP-AGRI** - Multi-actor approach has transformed research: farmers starting to see themselves as innovators, grassroots innovation captured, industry incentivised to share information, scientists encouraged to be more applied in their research, more newcomers and new entrants that were not there in the programme before.
- **INTERREG** fosters innovation by bringing scientists and regional policy makers closer together. It favours ERDF investment into solutions identified or developed through the project; connects scientists to the regional "innovation ecosystem". However, participants find it very bureaucratic.
- **LIFE** is thought to be interesting to upscale innovation and help small actors access funding to take up simple innovative measures that can have significant impacts. There is a need for better disseminating results and for lightening bureaucracy.

- **Public-Private-Partnerships** are interesting for close to market actions – public-private cooperation helps designing R&I calls which fit industry needs and contribute to policy goals. However, a bias towards larger companies needs to be avoided.



Participants raised the following issues and made the following suggestions for improvement:

- **Set of instruments** – The set is right but instruments are too many. This is confusing for applicants, especially small-scale or new ones. Suggestions:
    - **EU level:**
        - Continue with networks and the multi-actor approach to support farmers and rural actors stepping in the driving seat. Involving farmers in R&I should mirror SME involvement throughout Horizon 2020. Favour farmer to farmer collaboration and ease administrative rules for practice partners.
        - Improve information on the different programmes, their logic, rules and the types of actions for which they are relevant (target group: applicants). A guide or Application with questions to guide people through the maze of funding opportunities could help (an on-going SCAR-AKIS study could inform on this).
        - Simplify and align rules and provide seed-funding and trainings for new entrants in R&I projects (for proposal preparation and implementation).
    - **National level:** improve connections between networks supporting the different programmes (NRNs, NCPs, EEN, LIFE implementing bodies etc.).
    - **Regional level:** capacity building for regional authorities.
    - **All governance:** organise cross-programme thematic events.
- **Improving circulation of project results –** Projects websites are maintained for two years and then generally become progressively inaccessible. There are many platforms but they are not well connected. Results do not reach far enough out of the community of actors involved. Language is a barrier to dissemination. Suggestions:
    - **EU level:** create a simple and searchable database of all projects, with regional tagging; avoid multiplying interconnection platforms; improve solutions for automated translation.
    - **National level:** use the opportunity of future CAP plans to improve the AKIS; build on operational groups (OGs) as a vehicle for deployment of research outcomes.
    - **Regional level:** improve cooperation between projects at regional level and test the validity and transferability of the solutions produced.
    - **All levels:** support advisory services and innovation support service to bridge the gap between research and practice; involve early adopters and “crazy” farmers who are

trusted and can then spread the word; improve dissemination efforts (videos, understandable extracts).

- **Project size and applicant size**: participants felt H2020 projects were too big and only big organisations could participate when many small organisations have good ideas. Suggestions included: to adapt scale to increase participation of smaller organisations; to provide seed money to participate in the development of proposals (like for EIP or LEADER); to use blockchain as a way to engage smaller parties in science; to test alternative tools to reward participation such as awards, contests or certificates.
- **Science-policy interface and governance**: there is a constellation of coordination mechanisms (RIS3, H2020-ESIF groups, Rural networks assembly) at EU level and also some in the Member States. Suggestion: improve coordination mechanisms and the communication of results of interest for policy-making (also to national and regional levels).
- **Synergies with Member States**: there is a need to support Member States in the development of their own research and innovation strategies, especially in Eastern Member States. There is also a need for R&I to supply data necessary for their strategic thinking about agriculture, food and bio-based value chains. Work is needed on the design the ERANETs 3.0.
- **Strengthen networking and coordination capacities: s**uggestions included to establish more direct links between the EU level and intermediary development bodies trusted by rural communities; use NGOs and networks as information relays better; use "permanent dedicated collaboration facilitators" across projects and funding schemes; sufficient support to human resources playing these facilitating and networking roles.
- **Support the improvement of skills: f**armers who engage in current activities tend to be the ones that are already interested. To reach beyond this advanced group, effective training and information is needed. Ways to raise the attractiveness of agricultural faculties should also be explored.
- **Evaluation processes**: improve the evaluation of projects with multi-actor strategies and stakeholder engagement processes. Strengthen practice-oriented evaluation criteria for proposals, include actors from the field in the evaluation process and take into account longer-term impacts of R&I.

What concrete actions did the group recommend?

The rapporteur of the session summarized the recommendations as follows:

- **Better include national, macro-regional, regional and local levels in the programming process -** The programming of Horizon Europe should take into account national and regional diversity and better involve national and regional authorities in the process. Macro-regions are also relevant territories that could play a role in defining research and innovation needs. *Suggestions:*
    - *Discuss R&I priorities in a variety of contexts, to build a programme that reflects the local, regional and national diversity.*
    - *Consider co-funded instruments of regional relevance (like joint programming for macro-regions), and/or model demonstration regions.*
- **Raise awareness about the importance of R&I at the Agricultural Council -** Synergies between the CAP and Horizon Europe will be even greater in the next period. There is a need to raise awareness of ministers of agriculture on the importance of rural development and of

research and innovation, to improve the use of CAP funding for rural innovation. *Suggestions: DG AGRI to raise awareness on R&I at the AGRIFISH Council.*

- **Engage with well-functioning existing societal groups (incl. LAGs, OGs, Rural networks, AKIS players) –** The stakeholder community is already well structured. Engagement should be early and focus on interacting with existing groups (in particular young people). Suggestions:
    - *keep building on the work of the SCAR, in particular on the SCAR AKIS working group;*
    - *build on existing societal groups and networks, including EIP, ENRD, cooperatives, farmers' organisations, LEADER organisations, NGOs etc.;*
    - *use digital technologies to engage with a wider array of stakeholders;*
    - *use currently funded projects as ambassadors to engage with stakeholder communities, show what interesting things they are doing and involve them in the thinking about the future;*
    - *build facilitation capacities;*
    - *strengthen the link between researchers and communication experts to teach scientists how to communicate simply, effectively, without using too technical terminology.*
- **Support a better and renewed organisation of farmers so they can take a leading role in research and innovation and favour business models that benefit them and rural economies.** Future farmers organisations should be experts outside of their core activities, to understand they market counterparts and reflect on required investments.
- **Unpack conference results and organise more focused workshops at different levels.**

Reporting and wrap-up: designing the path towards future EU research and innovation policies

The last plenary sessions aimed at bringing together the outcomes of discussions throughout the two days in terms of i) key issues that deserve priority attention in the future and ii) practical steps to be taken to organise the programming of Horizon Europe in a participatory manner. Janez Potocnik was invited to open the session with an inspiring speech recalling the grand challenges that need to be addressed. The three rapporteurs then reported on the three parallel sessions. Finally a panel discussed the practical steps to be taken.

R&I looking ahead towards more resilient and diverse farming systems

Janez Potočnik started his intervention recalling that over 15.000 scientists have called for urgent action to reverse current trends of excessive use of the planet's resources. He argued this depletion comes from current market economies **over rewarding financial capital, under valuing human and natural capital**, and leaving environmental externalities of current production and consumption systems to be paid by either by the health system, or by next generations. Comparing indicators of growth and indicators reflecting improvements of social and natural capital, he showed that the last years have actually led to negative growth. He then moved on to the necessary transition towards sustainable food and farming systems, highlighting the imbalances in the distribution of power along value chains, with retailers being the most concentrated component.

> *"We need to move towards a situation in which actors are favoured to pay for labour to save materials, rather than materials to save the labour."*
> *Janez Potočnik*

Moving on to recommendations, he said we should **focus on the drivers that have the power to trigger change** (or to hinder it). A holistic look at farming within its food and land-use systems context is therefore necessary. He also said that food security should remain in focus, but that our credibility would be increased if we address food waste, obesity and needs for dietary shifts beforehand. Health and well-being are also key elements. "*In the mid-term, there will not be a shortage of resources that will force us to change our habits. The consequences will force us. This will be the drive*", he said. In relation to health, he also called for **deepening the understanding of how pesticides affect environmental and human health, including the cocktail effects**.

He then called for **changing the incentives and signals sent to consumers**, so that sustainable production and consumption can happen. "*We need to move towards a situation in which actors are favoured to pay for labour to save materials, rather than materials to save the labour*". He said the International Resource Panel believes that human well-being can grow faster than economic activity, if you **decouple economic activity from resource use and both economic activity and resource use from environmental impact**. According to him, the best way to decouple is the **circular economy**, i.e.

keeping resources in the cycle of production and consumption as long as possible and **keeping their value high**. He also mentioned the bio-economy, but claimed it could work only if the bio-based materials also follow the principle of circularity. He also preached for a holistic approach to climate change, looking not only at energy supply but also at the whole cycle of production and consumption of material. He quoted nutrient management, local and seasonal production, new business models, and digital transformation as important R&I areas. Biodiversity should also be object of increased attention: biodiversity and nutrient management are the areas in which planetary boundaries are most exceeded. "There is no healthy food and no healthy future without healthy ecosystems", he recalled.

Janez Potočnik ended his inspirational speech on governance issues. The challenge will be cooperation and implementation. Businesses need to change. They need to move to a socially responsible action where they manage risks not only for their companies but also for society. And this will require policy interventions. "*Farmers were in the past acting in good faith. They need and deserve public support for necessary transition to make it fair and possible. This is essential. Without this sort of support, transition cannot happen*." He also said that we should redefine sovereignty at global level and that the European Union should lead the way, building on its experience on redefining sovereignty to achieve peace and avoid conflicts. A new instrument that would connect existing conventions such as a "Natural resource management convention" would be useful. He concluded on the urge to the European Commission and to the Member States to align policies to support transition: **there is only one cycle of policies left until 2030**.

"Farmers were in the past acting in good faith. They need and deserve public support for necessary transition to make it fair and possible. ".
Janez Potočnik

Flash reports and final panel discussion: which concrete steps do we need to take? Which roles for the different actors involved?

Asked to react on presentations by the three reporters of the outcomes of the parallel sessions, the **panel broadly supported the relevance of both the challenges** listed in the conference and **the issues proposed to receive priority attention**.

COPA COGECA's representative Maira Dzelzkaleja emphasized the role that **new technologies** will play in the future and the importance of a **good governance of the data economy**. She also emphasized the importance of farm economic **competitiveness as a condition for generation renewal**. Inger Pehrson, speaking on behalf of the Swedish National Rural Network stressed the need for farmers to benefit from **decision-making tools** that help them **assess their performance on various aspects**, weigh their choices and **communicate about their performance to society**. Both her and the previous panellist highlighted what they perceive as a persistent gap between farmers and society. Speaking from a Member State's government perspective, Philippe Vinçon invited to strike a **balance between good academic research** and **answering the expectations** of the farmers and rural communities. "*The multi-actor approach was a very important evolution, we need to keep in this direction*", he said. He invited to be positive to convince the Member States and European Parliament that a transition is already underway, with the principles of agro-ecology increasingly well accepted, and that it can be accelerated with **sufficient resources allocated to the CAP and agriculture R&I** under EU's future budget for 2021-2027. Finally Stefan Lange, speaking from a

science perspective, emphasized the need for finally **successfully implemented solutions**, beyond technological knowledge which will be sufficient to address the challenges. "*Natural scientific findings and insights will not change our production systems and will not improve our world. Crucial is the cultural and socio-economic frame for the people in this system, farmers and consumers." He insisted on the need for* solutions that are **sustainable both in terms of ecology and economy** and that are also **socially accepted**. Inger Pehrson confirmed that farmers feel squeezed between increasing ecological demands and an incapacity to set the right price for their products.

The panel discussed then **what are the concrete actions to take next** and **who should be involved**.

Farmers first! Referring to the progress made since the first AgriResearch conference in 2016, Maira Dzelzkaleja said "*the introduction of **the multi-actor approach in Horizon 2020 was a milestone for increasing the impact for the beneficiaries**. And it must be continued*". She explained how, from her personal experience, she could see that researchers started to look around for contacts with the farming society because of the multi-actor concept. She also highlighted that it remains challenging to bring researchers and farmers to speak a common language. "*It is difficult for both sides but we must continue to build this bridge*". She sees indeed the **collection of different opinions from various scientists and stakeholders as a condition to find sustainable workable solutions**. What more do farmers need to jump in the driving seat of innovation? A strong CAP and rebuilding the links with society, she said. In terms of governance, she pleaded for the Agricultural Directorate General of the European Commission to remain responsible for the agricultural and rural part of the EU research and innovation programme. "*We need to make sure that this mission oriented research remains attractive to the SMEs and the final end-users*", she said. Finally, she emphasized the key role of **advisors, advisory services, agricultural knowledge and innovation systems** and the **EIP-AGRI** in the innovation system. "*We have these instruments: we need to continue. And then we will have solutions that our agricultural sector can implement*", she concluded.

For **rural networks** and managing authorities of rural development programmes, Inger Pehrson made a plea for simplification. She still sees it as difficult for project owners to cope with the application process and for programme leaders to process the applications. "*Everyone is afraid of auditors, she said, but auditors need to understand what innovation projects are*". She also pointed at delay in payments that led some project owners to abandon. Advance payments would be an important feature for the next period. She emphasized the role of rural networks, who should continue to be a neutral arena where people can meet and connect various actors from various organisations, make information available and help people learn from each other, balance conflicts of interest and build common visions of the rural needs.

Member States will also have a role to play in organising their own research and innovation resources and systems at home. Philippe Vinçon acknowledged the expectations from the farmers and the need to build bridges with science and innovation, including through the improvement of education and maybe indeed pre-financing. He made a **plea for continuity** in the new instruments that have been put in place under the 2014-2020 period and required some adaptation, notably the EIP-AGRI and the AKIS approach. "*Sometimes, a revolution is keeping at it for some time until it delivers results*." Asked about the role of the Standing Committee on Agricultural Research (SCAR) in coordinating national agricultural R&I funding (90% of European agricultural research), he depicted the SCAR as a wonderful structure for interaction between the EU and Member States to guide

programming. He emphasized the need for good academic research to produce the knowledge that will be needed in the future. And he asked for the European Commission to have a good listening capacity and to keep flexibility for supporting joint initiatives coming from Member States.

Last but not least, Stefan Lange was asked about the role of scientists. He emphasized the need for a **more systematic involvement of scientists in strategic programming of R&I**. Quoting the example of Germany, he explained that two thirds of the 5000 agricultural scientists work in universities of applied sciences and that they are in absolute minority when they conduct strategic processes. The reason for that is lack of time and reward. Scientists are evaluated, rewarded and maybe tomorrow paid based on the number of PhD students they manage, amount of acquired third party funds, number of peer-reviewed articles in highly ranked journals. *"We should not substitute this but we should **amend these criteria and measure the practical impacts of research***", he said. He similarly argued that farmers should not only take part in experimenting but also in strategic processes prior to public competitions for funding. He noted some positive developments in how scientists are involved in programming at EU level, but insisted on the needs for rewards. Moving on to science-policy-interface, he insisted on the importance of **defining clear strategies before funding projects**. "*If you want to build a new house, would you start by appointing the craftsman? First you need to answer some questions. We need an architecture before funding projects"*. He said he could see some positive developments there and hoped the allocation of 10 billion euros would go with careful preliminary strategic joint work.

Closure – Conclusions and next steps towards participatory programming

Nathalie Sauze-Vandevyver concluded the conference, thanking the participants and speakers for their active involvement and inputs into the process for developing future R&I activities under Horizon Europe. These will be collected in a full report, going beyond the summary presented in plenary. "*The inputs that we have received show that our strategic approach is still very relevant and that the novelties introduced since 2014 go in the right direction*", she said. She committed to continue the multi-actor approach, which has been highlighted, throughout the conference, as a key element of this strategy, as well as the networking structures, in particular the EIP-AGRI. She also listed issues that have been said to require improvement, such as even greater links with other EU policies, greater engagement of consumers or better evaluation of projects. These will be picked up by the services to improve the future programme.

Confirming previous statements, she suggested that this future programme would not be a revolution, but on the contrary would try to bring the continuity and consistency that was also called for. "*We will keep working on bridging science and practice, supporting all actors in the AKIS in speeding up innovation*", she said. She also committed to keep implementing an integrated approach, mixing up top-down and bottom-up instruments, deepening synergies between instruments, valuing what research is doing on one side as well as what stakeholders are doing at their level. The idea under post-2020 policies will be to increase synergies with other EU programmes, namely with structural funds, LIFE, ERASMUS. The most important will be to deepen the synergies, both upstream while elaborating our calls for projects (cross-policy programming), and downstream while exploiting the outcomes of the projects (EIP-AGRI).

She recalled that support for innovation would also be reinforced under the future CAP, as mentioned by Phil Hogan the day before. This will be done in the context of the new delivery model, with a lot of flexibility given to the Member States and support from the European Commission in achieving a good level of ambition for agricultural innovation.

Finally, she announced that this conference was only a starting point, and that other engagement activities would come at a later stage, to work in participatory ways, as in the past years, on the future research and innovation activities.