FACCEJPI

Agriculture, Food Security
and Climate Change

FACCE-JPI Workshop on Technologies

Fostering the adoption of existing (and emerging) technologies for primary production in the context of climate change that are on the edge of being mature but not yet widely adopted

Copenhagen, 21 November 2017

Aalborg University Copenhagen
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1. Summary

The workshop highlighted opportunities, gaps, potential and priorities how to foster the adoption of existing (and emerging) technologies for primary production in the context of climate change that are on the edge of being mature but not yet widely adopted. Several key players and stakeholders came together to gain better mutual understanding of new technologies, to increase awareness within the agricultural sector and to propose key actions and topics to be potentially addressed by FACCE-JPI[1] in its upcoming Implementation Plan.

Starting with four key presentations, the scene was set from the perspectives of policy, farmers and researchers. Within break-out groups, delegates reflected on gaps, barriers, potential and priorities for agricultural technologies and eventually identified enablers, resources and potential actions for FACCE-JPI. This resulted in the following priorities:

	Objective / Goal	Tool / Instrument
RESEARCH TOPICS	**Prioritization of technologies** (particularly with respect to precision agriculture, gene editing / new breeding technologies and sensor technologies), to be taken forward by FACCE-JPI	**Sensitivity analysis**, **modelling**, **research call, workshops**
RESEARCH TOPICS	**Roadmap on technologies** to complement FACCE-JPI's Strategic Research Agenda	**Research study** / **workshop** based on impact assessment and analysis of existing FACCE / non-FACCE projects to elaborate and build on **achievements** and **failures**
ADOPTION / IMPLEMENTATION	**Implementation of research results** on field, farm and in industry and **acceptance** of new technologies in the **society**	Mandatory **multi-actor approach** for FACCE-JPI projects
ADOPTION / IMPLEMENTATION	**Adoption of technologies** on field and farm	**Identification** of and **alignment** with **networks & initiatives**, which strongly collaborate with farmers followed by **active involvement of farmers**
POLICY	Strengthen FACCE-JPI's role as **policy advisor**	Initiation of **multi-stakeholder network** on agricultural technologies (including consumers, society, industry, farmers, researchers, etc.) to establish a mutual learning environment, which will serve as platform for FACCE-JPI to advise policy makers

[1] Joint Programming Initiative on Agriculture, Food Security and Climate Change

2. Introduction

Niels Gøtke, Head of Division at Danish Agency for Science, Technology and Innovation, Denmark
Hartmut Stalb, Head of Division for Research and Innovation within the Federal Ministry of Food and Agriculture, BMEL, Germany

The workshop was opened by Niels Gøtke, FACCE-JPI Governing Board leader for this workshop. After a brief introduction to Aalborg University and Research, he explained the goals of the workshop: The workshop aims to identify

- the potential of technologies to contribute to the goals of FACCE-JPI
- potential barriers to their adoption and how these could be explored through research
- crucial enablers to capitalize full potential of existing (and emerging) technologies from different perspectives
- infrastructures and tools to be used by FACCE-JPI at joint action level.

Hartmut Stalb, Chair of the FACCE-JPI Governing Board introduced FACCE-JPI's Vision and Mission: FACCE-JPI aims to create an integrated European Research Area that addresses the challenges of Agriculture, Food Security and Climate Change to achieve sustainable growth in agricultural production, meet increasing food demand and develop a European bio-based economy, while maintaining and restoring ecosystem services. Therefore, the initiative will promote the integration and alignment of national research resources in Europe under a common research strategy, to address the diverse challenges in agriculture, food security and climate change.

FACCE-JPI was launched by the European Council in 2010, bringing together of 22 Member Countries, including New Zealand, plus the European Commission and the EU Standing Committee on Agricultural Research (SCAR) as observers. FACCE-JPI has mobilized over 100 Mio € so far.

FACCE-JPI aims to align national research programmes at the *intersection* of agriculture-food security-climate change. It thereby focuses on five Core Themes, which are described in the Strategic Research Agenda (SRA)[2]. Regularly updated Implementation Plans[3] describe how FACCE-JPI addresses its SRA priorities by implementing joint research actions and other activities launched. The Exploratory Workshop on Technologies is part of Core Theme 1: "Sustainable food security under climate change" and will help FACCE-JPI to identify where investment should be targeted.

3. Setting the scene - in four key presentations

I. Policy perspective – *Valeria Forlin, European Commission, DG Clima*

Valeria Forlin started her presentation with a retrospective look to the Paris Agreement, which aims to hold the global temperature rise this century well below 2 degrees Celsius above pre-industrial levels and to pursue efforts to limit it to 1.5 degrees Celsius. The EU committed to reduce emissions of at least 40 % compared to 1990. In October 2014 the European Council gave guidance on how to implement the 2030 climate and energy framework to achieve the common goals of the Paris Agreement. The 2030 Climate and Energy Framework foresees a 40 % reduction of greenhouse gas (GHG) emissions achieved by three policies: (1) the Emission Trading System (ETS), (2) the Effort Sharing Regulation (ESR) and (3) the Land Use, Land Use Change and Forestry (LULUCF) Regulation. The contribution of the agricultural sector is crucial in all three mitigation pillars, but the highest potential of GHG mitigation lies in the enhancement of carbon sinks and in the bio-economy, the latter providing multiple opportunities for the agricultural sector, such as the provision of bio-based materials/feedstocks to replace fossil-based materials.

According to DG CLIMA, the future Common Agricultural Policy (CAP) can be a crucial policy tool to create incentives for the uptake of new technologies and support farmers' transition towards Climate-Smart Agriculture. The result-oriented approach should prioritize measures that create a "win-win" situation for farmers and the society as well as consider trade-offs between different land uses, to ensure food security. The design of robust indicators to monitor and evaluate the performance is equally important as the increase of transparency and trust between farmers and other key players. The adoption of technologies at farm level can enhance the simplification of data

[2] https://www.faccejpi.com/Media/FACCE-JPI-SRA-2016
[3] https://www.faccejpi.com/Media/Implementation-Plan-2016-2018

usage and technology handling as well as lower administrative burden. An example is the voluntary resource efficiency programme led by the Irish Farmers' Association, in conjunction with the Environmental Protection Agency, which accounts for significant cost savings and reduction of climate impact on participating farms.
In conclusion, the European policy can create incentives for climate-smart agriculture and one of the objectives of its CAP will be to support the uptake of reliable technologies in the agricultural sector.

II. Farmer's perspective – Hans Roust Thysen, SEGES / Copa and Cogeca

Compared to 2005 several approaches within the agricultural sector will reduce the production of GHGs to good extent in several European countries. However, in Denmark there is still a remaining deficit of 11-13 % to achieve the desired goal of 40 % GHG reduction in 2030. Agriculture is one of the main producers of GHGs, while the source can be assigned to animal feed digestion, arable farming and storing of manure to approximately one third each.
Contribution within these sectors to GHG production is difficult to measure and relies on several sources of information. In arable farming for instance, soils can act as sources and sinks for GHGs such as carbon dioxide (CO_2), methane (CH_4), and nitrous oxide (N_2O). To improve carbon storage in soil lowland projects, catch crops, increased grassland growing, and the change from maize to grass for forage can support the GHG reduction but will only contribute by 4 % to the Land Use, Land Use Change and Forestry (LULUCF) sector. N_2O sequestration can be mitigated by improved fertiliser utilisation, increased yield, precision farming, forest and energy crops and plant breeding. Currently it is estimated that about 1 % of all nitrogen in fertilisers, organic manure, crop residues is converted into N_2O. However, there is need to develop more accurate measurements to determine the real contribution of manure and fertiliser application to GHGs.
With respect to the livestock sector, several approaches for instance increased feeding and breeding efficiency, acidification of slurry, etc. will contribute to the GHG reduction. However, the entire sector, from stable to field, needs to be considered to monitor and mitigate the contribution of livestock farming to GHG production. Finally, Hans Roust Thyssen emphasised that it is important to raise awareness and increase knowledge of both, farmers and consumers, to change attitudes and behaviour towards a more sustainable agricultural production. There is need to generate benchmark indices for climate smart agriculture and to consider the entire value chain from soil to the consumer when evaluating and mitigating the impact of agriculture on climate change and vice versa.

III. Research perspective I – Prof. Robbie Waugh, University of Dundee / James Hutton Institute, Dundee, UK

Phenotypes are the physical and biochemical characteristics of an organism. They arise from a combination of genetics and the influence of both the environment and management practices (genotype x environment x management). After plant domestication and during an extended period of migration into different environments, plant species adapted to the different situations they encountered, through a process of mutation and selection that is reflected by their genetic diversity. As a result, much of the variation needed to meet challenges of changing climate already exists. However, we still need a much better understanding of the underlying genetic mechanisms and their impact on phenotypes in order to develop more robust and resilient plants. Being able to accurately measure phenotypes in large genetic populations is therefore a major goal. Recently, novel

phenotyping technologies have developed rapidly but in many cases still fail to provide sufficient detail or throughput to exploit the power of genetics and reveal the molecular basis of the phenotypic traits. There is therefore need for advanced technologies to identify adaptive traits and alleles with respect to their phenotype. Enhancing the links between modern phenotyping technologies and genetics is therefore a major opportunity to improve our understanding of the molecular basis of adaptation to different environments. Then, with an idea of the role of specific genes in a given process, new gene editing technologies such as CRISPR/cas have a fundamental role in proving function and offer the opportunity to modify genes to align with current or future environments.
While classical arable farming on field is a clear focus for climate-proofing agriculture, new, industrial scale growth systems are being developed that are climate agnostic: for example, vertical farming or automatically managed and controlled crop cultivation in modern highly efficient smarthouses are emerging, and these will likely have a role in coupling local production of fresh produce to distribution and sale. Lastly, the question of how massive and complex data can be exploited in a suitable way to address the challenges of Climate Change is a significant concern. The development of data-driven predictive crop and environmental models therefore has a major role in the integration, translation and application of multi-dimensional information in crop improvement and agriculture.

IV. Research perspective II - Prof. Georg Thaller, Institute for animal breeding and welfare, Kiel, Germany

Livestock phenomics describes the identification and characterisation of traits, such as animal health and welfare, productivity, methane emission, etc., which addresses challenges in the wide field of animal agriculture. To provide information for new breeding strategies, livestock phenomics relies on precise, cost-effective technologies and the user-friendliness on farm.
Phenomics and genomics are closely linked with respect to the prediction of desired phenotypes based on selected genotypes and a respective reference population. One example for the use of high quality livestock phenotyping is the anticipated prediction of subclinical ketosis risk at early stages of lactation using milk infrared spectral data, which can be easily obtained also at low costs. This technology is also very versatile up to assisting in the prediction of methane emissions of ruminants, whereby the consistency among studies is still unsatisfactory. The rumen microbiota, its variation and interrelations with the host genome as well as with forage is still not explored sufficiently to draw respective conclusions and to intervene with its composition and activity to mitigate methane production. Novel sensor technologies enable the monitoring of livestock activity, feed intake and somatic cell concentration to evaluate the animal’s health and thereby ensuring the quality of the produced food. Portable devices e.g. to measure methane concentration, as well as camera assisted monitoring are further examples of the vast portfolio of modern livestock technologies.
Hence, animal breeding is in transition and increasingly depends on the utilisation of new biotechnologies, whereby care must be taken to conserve the genetic variability. Last but not least, the key to successful, sustainable livestock farming lies in the transformation of big data sets into valuable breeding concepts, a challenge not only concerning the research community.

4. Present situation: gaps & barriers, potential & priorities

Participants of the workshop were divided into two groups, according to their previously chosen preference:

(1) Technologies in the remit of crops, plants and environment
(2) Technologies in the remit of animal and livestock

If applicable, delegates added emerging topics and technologies. In each group, gaps & barriers, potential & priorities of the respective technology were discussed in connection with research, networks, infrastructures but also taking into account the integration of farmers, consumers & society and industry.

A number of key technologies were confirmed[4] or newly identified to be in the remit of FACCE-JPI:

Technologies in the remit of crops, plants and environment:	*Technologies in the remit of animal and livestock:*
(1) Conventional and new breeding technologies	(1) New breeding technologies
(2) Automated phenotyping	(2) Automated phenotyping
(3) Sensor technologies	(3) Precision Livestock Farming (physiological, environmental (grazing, building))
(4) Remote sensing data collection	(4) Next generation nutrition
(5) Precision agriculture and management (including tillage, robotics, new fertilisers and pest management)	(5) Housing and manure management
	(6) Pharmaceuticals / veterinary medicine (disease monitoring, prediction…)
	(with delegates agreeing on (6) being less important and (2) & (3) being most important for FACCE-JPI)

Both groups concluded that the key aspect of agricultural technologies is the **integration** of technologies and the concerted, goal-oriented use of single technologies. Therefore, *farming management* approaches as Precision Agriculture (PA) (including Precision Livestock Farming) have been seen as most important for FACCE-JPI.

[4] Cf. background paper for this workshop: https://www.faccejpi.com/Media/Workshop-big-data/background

Aspects, which need to be considered to advance agricultural technologies, are:

OVERARCHING TOPICS:

- Agricultural technologies need to be conducted **inter- and transdisciplinary**; intersections should be elaborated and reinforced.
- **Multi-stakeholder approaches** are crucial to successfully transfer technologies from the stage of research to the stage of implementation.
- Objectives and perspectives of different stakeholders are often not well understood or taken into account.

RESEARCH:

- **Sensor technologies** are still not yet developed sufficiently. There is need to promote research aiming at complex traits, especially with regard to climate change objectives. (Sensor technologies thereby include plant and livestock sensors equally, as e.g. high-throughput phenotyping technologies, but also sensors for precision livestock farming, remote sensors, as UAVs and satellites.) The **intercompatibility of generated data** needs to be improved[5].
- **Gene editing** (GE) and **New Breeding Technologies** (NBT – as e.g. CRISPR/Cas) still need to be improved. The off-target effects of gene editing in plants and animals are not yet well understood. There is still more research needed to understand the epigenetic and - with regard to animals - the rumen microbiome.
- The research life cycle needs to be leveraged from a pure scientific approach to a more contextual research taking into account **impact assessment** at advanced technology stages but also the transfer of purely observing technologies to **forecasting and predictive** approaches.
- Monitoring technologies are quite advanced, but **technologies**, which help to **mitigate climate change**, need to be fostered. In addition, the **aspect of climate change** in existing technologies should be reinforced.
- The monitoring of **benefits and drawbacks** from technologies should be improved as well as communicated to create transparency and trust between different key players.
- **Standardization and harmonization of data**[6] is necessary and a pressing issue to accelerate the comparison of results and the compatibility of technologies.
- **Lack of accuracy of measurements** (especially for livestock sector technologies) and absence of validation often result in false advises; correct implementations would also be facilitated by better interconnections.
- There are **cross-cutting** themes between **plant, animal** and **environmental** sciences / technologies and the **interaction** between these research areas should be improved.

NETWORKS of individual technologies do exist but need to become more **interconnected**.

FARMERS:

- Barriers for the acceptance on farm level need to be removed by increasing the **integration of and collaboration** with farmers. Successful uptake of technologies depends on their user-friendliness and their benefit for the farmer, which need to be demonstrated.
- A **farmer peer review process** could help to demonstrate the practicality of new technologies on the farm.
- Farmers need to be **advised** which technology they should invest in to meet a range of expectations and demands as profitability, environmental impact, regulations and risks.

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[5] *Note:* Further aspects with regard to data handling have been addressed in the next day's FACCE-JPI workshop on Big Data.

[6] *Note:* Further aspects with regard to data handling have been addressed in the next day's FACCE-JPI workshop on Big Data.

CONSUMER / SOCIETY:

- The **acceptance** of new technologies in society needs to be improved by clearly **demonstrating** the **benefit** and potential drawbacks of new approaches and by increasing consumer's awareness and perception of new approaches.

INDUSTRY:

- **Rules, regulation and IPR** must be clarified and simplified to enable the implementation of new technologies on **industrial** scale.

The greater context of technologies should be taken into account. There is a societal need to implement the existing technologies. However, indicators to assess the impact of agricultural technologies on society have not been developed yet. The economic and societal cost-benefit of implementing and risk of not implementing new technologies has to be demonstrated and communicated to society to raise awareness and to create trust. The political agenda will be of elementary importance for the success.

5. Enablers, resources & actions

The aim of the second break-out group session was to elaborate ***how policy*** can support the previously identified needs and ***how*** agricultural technology can be improved with regard to ***research***, ***farmers***, ***consumers / society*** and ***industry***.

POLICY CONTEXT:

- A clear and understandable **roadmap** to clarify the goal and approach of agricultural policy is necessary to overcome uncertainties of different stakeholder groups.
- **Policy Coherence**: Agricultural policy needs to be aligned with climate objectives.
- FACCE-JPI should consider strengthening its **advisory role for governance**.
- "**Exemplary testing environments**" / "action labs" should be developed to create non-competitive spaces for farmers, industry partners and researchers.
- Regulations need to be **liberalised** to create testing environments for farmers

RESEARCH:

- Research strategy should base on a **multi-stakeholder** approach; **Co-creation** and involvement of farmers will improve the uptake and implementation of new technologies.
- **Research life cycle** and **long-term perspective**: The continuation of R&I across all life stages and TRL needs to be taken into account and facilitated. A clear understanding what basic research at low TRL can achieve is crucial to meet expectations.
- Systematic **review of successful and unsuccessful projects** and approaches: **Evaluation of FACCE-funded research projects** to assess their impact and to build on strength and opportunities and to learn from failures.
- A **research study** might help to **understand** the objectives and perspectives of **different stakeholders**, which needs to be taken into account for the adaptation of new technologies.

FARMERS:

- **Incentives** need to be created to adopt technologies on the farm.
- **Advisory services** for farmers need to be improved.

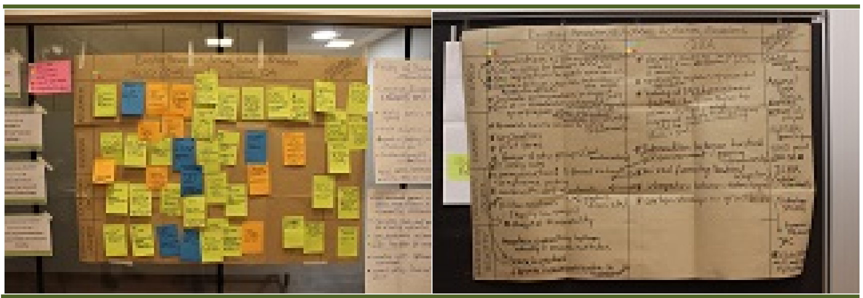
CONSUMERS / SOCIETY:

- Involve "unusual players", e.g. art and social scientists to **communicate** scientific results to end-users
- The development of "**climate-smart agriculture labels**" could be promoted.

INDUSTRY:

- Industry **involvement** in research should be **promoted** and considered to be mandatory to improve the implementation of scientific results.

EXISTING ACTIONS, ACTIVITIES AND NETWORKS, FACCE-JPI COULD WORK WITH are listed in Annex 1 p. 12.



6. Conclusions and possibilities for FACCE-JPI

The goal of this exploratory workshop was to seek opportunities, how to foster the adoption of existing (and emerging) technologies for primary production in the context of climate change that are on the edge of being mature but not yet widely adopted. It brought together researchers, stakeholders, policy makers, funders and FACCE-JPI members

- to gain better mutual understanding of the barriers and constraints, which hinder the uptake of new technologies by relevant end-users,
- to enable networks to increase awareness within the agricultural sector and
- to propose key actions and topics to be potentially addressed by FACCE-JPI in its upcoming Implementation Plan.

The figure below illustrates key objectives for FACCE-JPI and possible tools for their achievement as elaborated during the workshop. Further details can be found in the text hereafter.

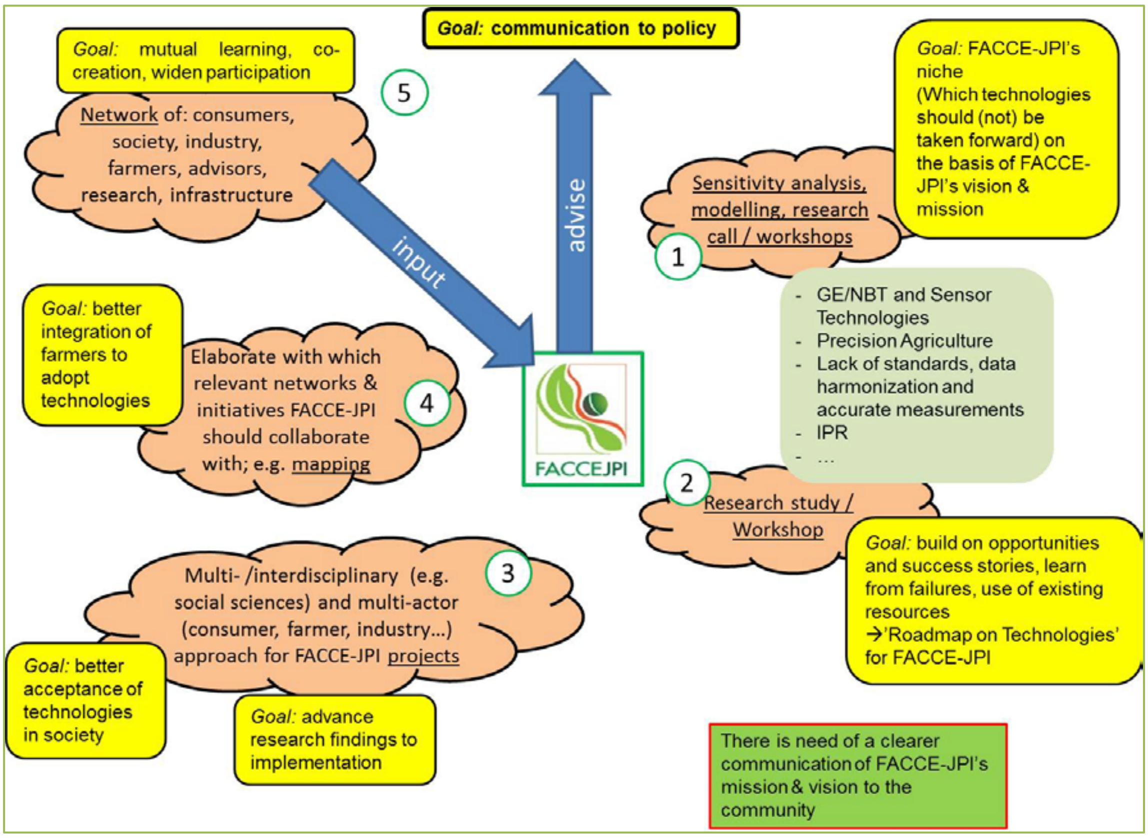


Figure 1: Key objectives for FACCE-JPI and possible tools for their achievement as elaborated during the workshop. *Yellow boxes*: goals; *orange clouds*: approaches; *light green box*: potential technologies and topics; *dark green box*: general recommendation; for detailed information see text.

①Several research gaps and needs were highlighted during the discussions the discussions, predominantly addressing **sensor technologies** and **gene editing / new breeding technologies** (GE/NBT). FACCE-JPI's next Implementation Plan foresees **two exploratory workshops** ([1] the Application of Novel Breeding Techniques in Crops and in Livestock to Mitigate and Adapt to Climate Change and [2] Phenotyping/Genotyping in the Livestock Sector) which will address challenges with respect to GE and NBT. However, there is need to clarify, if sensor technologies are in the remit of FACCE-JPI and moreover, **which technologies in general** are able to deliver solutions in the intersection of food security, agriculture and climate change. This could be addressed via a **sensitivity analysis**, **modelling approach** or a **research call**.

②FACCE-JPI should invest in the evaluation of FACCE-funded and probably non-FACCE projects to **assess their impact** and to **build on success stories and failures**. A systematic **research study** with a follow-up **workshop** might deliver respective insights about the gaps, needs and priorities, which in turn should result in a roadmap on technologies for FACCE-JPI.

Lack of standards, **data** harmonization and accurate measurements were repeatedly mentioned but were elaborated in more detail during next day's FACCE-JPI workshop on "Big Data".

Farming management approaches as **Precision Agriculture** (PA) have been seen as a key approach to tackle the challenges with regard to food security, agriculture and climate change. The potential is huge, ranging from automatic monitoring to warning and managing of livestock farming, tillage, arable farming, etc. taking into account the threats of Climate Change but also mitigating the impact of agriculture on the environment.

There has been a clear and overarching consensus that **farmers**, **industry** and other relevant **stakeholders** have to be **more integrated** into FACCE-JPI approaches to foster the adoption of technologies on field and farm but also to leverage the implementation of research results in pilot experiments, demonstration projects and on industrial scale. There are several scenarios and approaches conceivable with different objectives:

- ③It should become mandatory for FACCE-JPI (research) projects to be implemented as **multi-actor projects** considering a **multi-/ interdisciplinary approach** to accomplish better acceptance within the society and to advance results and outcomes.

- ④FACCE-JPI should identify **relevant networks and initiatives**, which support the integration and **active involvement of farmers** to foster the adaptation of agricultural technologies on farms. Interfaces should be determined to align strategies and resources and if applicable to launch new collaborative activities. **EIP-AGRI** was considered as highly relevant for FACCE-JPI; however, further platforms and networks and also members FACCE-JPI's stakeholder advisory board should be considered likewise.

- ⑤FACCE-JPI seeks to provide expertise and tools for decision and to support relevant European policies and initiatives. However, with regard to agricultural technologies FACCE-JPI should consider to **initiate a multi-stakeholder network** including consumers, society, industry, farmers, advisors and researchers to establish a **mutual learning environment** including the co-creation of actions and activities. This network should further support FACCE-JPI in **advising policy makers** on relevant subjects.

Finally, it should be emphasised that this exploratory workshop was set-up as a multi-actor approach. Delegates with a variety of background and expertise participated in the event, elaborating stepwise initial thoughts and ideas of a vast and comprehensive topic. Considering the workshop's set-up, the activities listed above serve as a valuable and solid basis for FACCE-JPI to move forward. The majority of delegates are not connected with FACCE-JPI and thus not familiar with the JPI's vision and mission. Consequently, FACCE-JPI's goals and objectives need to guide the JPI's decision on which recommendation should be taken forward and how to foster the adoption of existing (and emerging) technologies for primary production in the context of climate change that are on the edge of being mature but not yet widely adopted

7. Acknowledgements

The organisers thank the speakers, moderators, chairs and rapporteurs for their contributions as well as the participants for their active involvement. We would further like to thank the FACCE-JPI Secretariat members who helped throughout the day, Per Mogensen for photos and excellent support, Bent Mikkelsen and his colleagues for facilitating laboratory tours during lunch as well as Aalborg University for providing the venue.

Annex 1: Existing actions, activities and networks, FACCE-JPI could work with

This Annex is a **non-exhaustive** list of relevant initiatives and (stakeholder) networks in the context of technologies FACCE-JPI could work with or should be aware of. The initiatives were identified during the workshop.

Plant / crop / environmental research networks:

- Wheat Initiative
- DivSeek
- EPPN^{2020}- European Plant Phenotyping Network (linking national plant phenotyping networks)
- IPPN - International Plant Phenotyping Network
- FA COST Action FA1306 (Phenotyping at plant and cellular level)
- EMPHASIS (infrastructure project, ESFRI Roadmap)
- ANAEE (infrastructures on terrestrial and aquatic ecosystems)
- International Wheat Yield Partnership
- SGN - Sol Genomics Network (database)
- Copernicus.eu (European information services based on satellite Earth Observation and in situ (non-space) data)
- ICT-AGRI
- EPSO (European Plant Science Organisation)

Multi-actor networks (including researchers, farmers and / or industry)

- EIP-AGRI
- SMART-AKIS
- IoF2020
- ATF - Animal Task Force (public-private platform; knowledge providers, industry organisations and farmer organisations
- Plant ETP - European Technology Platform "Plants for the Future" (multi-stakeholder platform; academia, industry, farming community)
- FABRE-TP - Farm Animal Breeding and Reproduction Technology Platform
- TP Organics - European Technology Platform for organic food & farming research

Research – policy platforms:

- JRC – European Joint Research Centre (science policy platform)

Research funding instruments

- EU-LIFE Programme (funding climate action projects)

Global networks:

- GRA - Global Research Alliance (capacity building and knowledge sharing)
- GACSA - Global Alliance on Climate-Smart Agriculture (multi-actor network)

Farmer advisory services / Integration of farmers:

- EUFRAS – European Forum for Agricultural and Rural Advisory Services
- NEFERTITI project (European network of demonstration and pilot farms)
- AGRIDEMO (farmer to farmer)
- PLAID project (Peer-to-peer Learning: Accessing Innovation through Demonstration)
- COPA-COGECA (European farmers and agricooperatives representative organisation)
- EU-PLF - Precision Livestock Farming (PLF)

Livestock / Animal (research) networks:

- ICAR - International Committee for Animal Recording
- EMR - European Milk Recording (EEIG of European milk recording agencies)

Annex 2: Agenda

08:30 – 09:00	***Registration - Coffee***
09:00 – 09:15	**INTRODUCTION**
15'	**Welcome, Introduction to FACCE-JPI and aims of the workshop** *Niels Gøtke, FACCE-JPI Governing Board; Hartmut Stalb, FACCE-JPI Chair*
09:15 – 10:00	**SETTING THE SCENE I: POLICY AND FARMER'S PERSPECTIVE (each: 15' presentation, 5' discussion)**
45'	**Policy perspective** *Valeria Forlin, European Commission, DG Clima* **Farmer's perspective** *Hans Roust Thysen, Copa and Cogeca*
10:00 – 10:30	**SETTING THE SCENE II: RESEARCH PERSPECTIVE (each: 10' presentation, 5' discussion)**
30'	*Professor Robbie Waugh, University of Dundee/James Hutton Institute, Dundee, United Kingdom* *Professor Georg Thaller, Institute of Animal Breeding and Husbandry, Kiel, Germany*
10:30 – 11:00	***Coffee***
11:00 - 12:45	**BREAK-OUT GROUP, SESSION 1: GAPS & BARRIERS, POTENTIAL & PRIORITIES**
90'	What are major needs for each technology with respect to driving forces / context (e.g. research, networks, integration of key players, etc.)?
15'	Prioritize needs / requirements
12:45 – 13:45	***Lunch*** ***Possibility to join lab tours "Samsung Lab" or "Robot lab" by Aalborg University***
13:45 - 14:30	**PLENARY SESSION: PRESENTATION OF RESULTS + DISCUSSION**
45'	Presentation of results + common discussion
14:30 - 15:45	**BREAK-OUT GROUP, SESSION 2: ENABLERS, RESOURCES & ACTIONS**
75'	Map existing resources, identify enablers, propose actions
15:45 – 16:15	***Coffee***
16:15 – 17:15	**PLENARY SESSION: POSSIBILITIES FOR FACCE-JPI**
60'	Presentation of results & identification of possibilities for FACCE-JPI to get involved / to launch new actions
17:15 – 17:45	**WRAP UP**

Chair: ***Professor Margaret Gill****, Professor of Integrated Land Use at the University of Aberdeen, UK, Chair of the FACCE-JPI Scientific Advisory Board*

Moderator Group 1 "Crops & Environment": ***Professor Katharina Helming****, Head of Research Group Impact Assessment, Leibniz Centre for Agricultural Landscape Research (ZALF), Germany*

Moderator Group 2 "Animal & Livestock": ***Professor Nicolas Gengler****, Professor at Liège Université Gembloux Agro-Bio Tech (ULg – GxABT), Belgium*

Annex 3: List of participants

First Name	Second Name	Organisation	Network	Country
Aleksandra	Malyska	Plant ETP	FACCE-JPI (StAB)	Belgium
Anders	Herlin	Swedish University of Agricultural Sciences	ATF	Sweden
Anja	Techen	ZALF (Leibniz Centre for Agricultural Landscape Research)	BonaRes - Soil as a sustainable resource for the bioeconomy	Germany
Bent Egberg	Mikkelsen	Aalborg University, FoodScape Lab Studies	Richfields	Denmark
Bruce	McCallum	Ministry of Business, Innovation and Employment	FACCE-JPI	New Zealand
Chuanxin	Sun	Swedish University of Agricultural Sciences	FACCE-JPI	Sweden
Davide	Guariento	BioSense Institute / IoF2020		
Emily	Clark	The Roslin Institute		United Kingdom
Georg	Thaller	Institute of Animal Breeding and Husbandry		Germany
Gudrun	Langthaler	Research Council of Norway	FACCE-JPI (GB)	Norway
Hans	Thysen	SEGES, Copa and Cogeca	FACCE-JPI	Denmark
Hartmut	Stalb	Federal Ministry of Food and Agriculture	FACCE-JPI (GB Chair)	Germany
Iver	Thysen	Innovation Fund Denmark	ICT-AGRI	Denmark
Jan	Erpenbach	BLE	ICT-AGRI	Germany
Johanna	Vilkki	Natural Resources Institute Finland	Research	Finland
Johannes	Venneman	FABRE TP	FACCE - JPI (StAB)	Belgium
Jonas	Kathage	European Commission, Joint Research Centre		Germany
Jürgen	Vangeyte	ILVO- ICT AGRI		Belgium
Karin	Andeweg	Wageningen UR	Global Research Alliance Wageningen UR Big Data programme	Netherlands
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