



RESEARCH PROGRAM ON
**Climate Change,
Agriculture and
Food Security**



Summary Report:

International Conference on Agricultural GHG Emissions and Food Security – Connecting research to policy and practice



September 10 – 13, 2018, Berlin, Germany



Federal Ministry
of Food
and Agriculture



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International Conference on Agricultural GHG Emissions and Food Security – Connecting research to policy and practice

September 11th-13th, 2018, Berlin, Germany

In short:

- ◆ Around 300 scientists and stakeholders from over 50 different countries met in Berlin for the “International Conference on Agricultural GHG Emissions and Food Security – Connecting research to policy and practice”.
- ◆ The event was organized jointly by BMEL, GRA, FACCE-JPI, CCAFS and the Thünen Institute
- ◆ Participants held intense discussions and exchanged ideas regarding possible solutions to reduce GHG emissions from agriculture
- ◆ High-level keynote speeches were given by Andy Reisinger (NZAGRC), René Castro Salazar (FAO), Jerzy Bogdan Plewa (EU Commission), Theo de Jager (WFO), Minister Hon Damien O’Connor (Ministry of Primary Industries, New Zealand) as well as Secretary of State Michael Stübgen (Federal Ministry of Food and Agriculture, Germany)

Key take away messages:

- ◆ Greater focus on how to act upon scientific findings and implement scientific recommendations is needed, e.g., how to incentivize, finance, and scale some solutions
- ◆ In this regard, participants highlighted the need to increase investment in:
 - ◆ demonstration sites to test some scientific findings,
 - ◆ knowledge brokerage, extension services and technical assistance, to translate scientific findings into practical and scalable solutions,
 - ◆ technology transfer and the exchange of good practices to mitigate GHGs from agriculture
- ◆ Move to a science of implementation, not just the science of options or measurement
- ◆ More boldness in policy design: large-scale initiatives and learning
- ◆ Co-designing solutions with farmers, investors, input suppliers, advisory services to mainstream mitigation is essential
- ◆ For MRV regional data platforms, novel methods and information systems are promising solutions
- ◆ Put a priority to reduce loss and waste: food and other resources – circularity
- ◆ Ensuring effective policy coordination and coherence
- ◆ Political will – we need it all: top-down and bottom-up, good governance
- ◆ Koronivia Joint Work on Agriculture: science, practice and policy – all have a role to play

Endorsements:



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Disclaimer:

This report and the summaries of discussions held at the „International Conference on Agricultural GHG Emissions and Food Security – Connecting research to policy and practice“ do not imply the particular expression of any opinion whatsoever by any given individual or endorsing institution. The mention of specific individuals, agencies and institutions does not imply their endorsement of any specific recommendations included in this report. The report is simply our best attempt to capture the discussions and suggested actions by a range of participants. The content of this document and any conclusions or recommendations that it contains do not reflect the official policy or the views of the organizing or endorsing institutions. Endorsement does not imply that the endorsing organization supports any particular recommendation or position reflected at the conference or in this report. It reflects broad support for recognizing the connection between agricultural GHG emissions and food security and further research in this area.

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1 Introduction



From September 11th-13th 2018, approximately 300 scientists and stakeholders from government, public administrations, industry and farmer organizations from over 50 countries gathered in Berlin for the “International Conference on Agricultural GHG Emissions and Food Security – Connecting research to policy and practice” to discuss the central question:

What are the options and longer term visions to mitigate greenhouse gases and enhance carbon sinks in the agricultural sector while ensuring food security?

The conference was sponsored by the German Federal Ministry of Food and Agriculture (BMEL) and organized jointly with the Ministry, the Joint Programming Initiative on Agriculture, Food Security and Climate Change (FACCE-JPI), the Global Research Alliance on Agricultural Greenhouse Gases (GRA) and the CGIAR Research Program on Climate Change,

Agriculture and Food Security (CAAFS) and the Thünen Institute, the German Federal Research Institute of Agriculture, Forestry and Fishery. In parallel to the scientific conference, the 8th annual council meeting of the Global Research Alliance on Agricultural Greenhouse Gases present took place.

The conference was structured in an innovative format: A scientific conference followed by a stakeholder forum. Scientists from all over the world were invited to submit abstracts. Around 120 scientists were selected

„We need to produce the same amount of food, with less energy, with less pesticides, with less fertilizer and less water. We also have to make sure, that the agricultural sector really becomes climate-smart.“

Hartmut Stalb



The scientific keynote speech was given by Andy Reisinger, IPCC lead author and Deputy Director at the New Zealand Agricultural Greenhouse Gas Research Centre. In his presentation, he emphasized that the emissions from the livestock sector are too large to be ignored. Agricultural intensification needs good policy support to deliver on climate change objectives and to avoid unintended outcomes. Managing the global demand for land intensive food as a climate mitigation strategy is obvious, but difficult. The connection of monitoring, reporting and verification (MRV) of GHG emissions with policy measures leads to advanced inventories which enable more flexible policy goals and choices for implementation. Consequently, the challenges ahead for everyone are:

to present their latest research results on the first days of the conference. High-level keynotes and thematic working groups followed the science part advanced the discussion how to get from research to policy and practice. advanced the discussion how to get from research to policy and practice.

„It is an exciting opportunity to be here in Berlin – with 300 people – from across policy, research and end users. Focusing on this very important challenge of feeding the growing? Population in the most suitable way possible.“
Hayden Montgomery



Reducing emissions, safeguard food security and sequestering carbon.

Following Andy Reisingers keynote presentation, four other keynote speakers, Werner Kutsch, Agustin del Prado, Ana Maria Loboguerrero and Ben Henderson, introduced different scientific themes. In addition, around 70 presentations and over 100 poster presentations were given, showing the impressive engagement of the scientific community.

The presentations were clustered around four different themes:

- ◆ Innovative approaches in GHG monitoring and MRV
- ◆ Mitigation potential of different measures
- ◆ Cost and implementation aspects of different measures
- ◆ Global challenges and policies for climate change mitigation

A wide range of topics were discussed, ranging from improving methodologies for national GHG accounting over the new approaches in livestock, grassland and rice cultivation management to the economic analysis of GHG emissions policies and scientific evaluations of national climate protection plans. Additional

topics focused on global challenges such as climate mitigation and food security, options and challenges for agroforestry and systematic land use management approaches.

The scientific part of the conference was followed by a stakeholder outreach conference with presentations in plenary, panel discussions and thematic working groups. After welcome remarks by Secretary of State Michael Stübgen from the German Federal Ministry of Food and Agriculture and Hon Damien O'Connor, the Minister for Agriculture, Biosecurity, Food Safety, and Rural Communities, New Zealand, three high-level keynotes followed:

1. Director-General Jerzy Bogdan Plewa, Directorate-General for Agriculture and Rural Development, European Commission,
2. René Castro Salazar, Assistant-Director General for the Climate, Biodiversity, Land and Water Department of the Food and Agricultural Organization of the United Nations (FAO) and
3. Theo de Jager, President the World Farmers' Organization.

They outlined their views on the nexus between food, nutrition, agriculture and climate change.





„None are more impacted by climate change than the world’s farmers and none are better placed to do something about it than the world’s farmers“

Theo de Jager

During the subsequent panel discussion, challenges and opportunities for implementing agricultural mitigation measures were

debated. The keynote speakers were joined by Sonja Vermeulen – Global Food Lead Scientist at the WWF. The participants used the chance and posted their most relevant questions via an interactive tool. The interests ranged from examples of successfully implemented policies over the potential of urban agriculture as a part of cities resilience to the prospects of alternative proteins (such as insects). Other important topics addressed were the consumer choices and how consumer knowledge could be improved as well as a discussion about the most important barriers to reduce GHG emissions from agriculture on a global level. Intense debates also included the question, how serious progress could be made towards the adoption of mitigation at the farm level, without penalties for the production of emissions. In line with this question was also the discussion if farmers know that they need to tackle climate change and how a behavior/production change can be addressed in Europe’s highly subsidized agriculture.



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Another important part of the conference was the presentation of best practice examples from research projects by farmer organizations from three different regions: India, Uruguay and Finland. The chairman of the Punjab State Farmers Commission, Ajay Vir Jakhar presented the results of new research initiatives (e.g. conservation agriculture, diversification, micro-irrigation, solar-energy) and also highlighted the challenges for farmers (e.g. limited subsidies, weather disturbances and climate change, increased investment for new infrastructures) to reduce agricultural GHG emissions. He states that productivity should not be the only goal of agriculture, because this focus would exclude environmentally and socially more acceptable measurements which can be a disadvantageous



for the farmers. Gonzalo Becona, associated with the extension service “Plan Agropecuario” from Uruguay highlighted that an increase in production without increase in emissions is possible, although it is important to keep in mind other environmental indicators in order to avoid potential negative spill-over effects. Liisa Pietola from Finland emphasized the importance of the carbon balance at the farm level and the impact for climate

actions, food security and resource efficiency. The subsequent discussion amongst the three farmer representatives and the audience focused on the topic “How to get from research to policy and practice?”. A variety of topics – such as the soil optimization on the farm level, compensation for the foregone income of farmers, more research on behavior change, education targeting young people, were addressed.



2 Scientific Part: Facts and Figures

Under the guiding question: What are options, global potentials and visions to the mitigation of greenhouse gases and the enhancement of carbon sinks by agriculture by ensuring food security? The scope of the scientific conference aimed to broaden the focus and discuss holistic, integrative state-of-the-art research in the light of political and societal challenges.

„We will only develop suitable localized solutions, if we talk to each other. So sharing information in international networks like FACCE-JPI, like the GRA, provide, are really important. They help us to develop relevant solutions.“

Andy Reisinger

options can be integrated internationally. Werner Kutsch from the European ICOS network gave an introductory keynote to the



2.1 Innovative Approaches in GHG Monitoring and MRV

During Theme 1 of the conference new innovative approaches in GHG monitoring and MRV were presented and how MRV

topic by highlighting the function of ICOS for innovative reporting and verification.

Major research highlights

Considerable progress has been made in the national GHG reporting. Additionally, Tier 2 and Tier 3 approaches are increasingly



developing. There is significant motivation to include mitigation options, beyond “shooting the cow”. Major challenges are to keep transparency in the reporting, to integrate new activity data and validate data back to 1990. Large GHG monitoring programs and networks serve as a basis for reporting.

Measurements have been diversely and sophisticatedly developed and take place at different scales and include different disciplines. Thus, measurements for CH₄ verification include microbiome, genotyping, chambers, tracer gases as well as different modelling approaches. For nitrate oxide also many options like molecular microbiology, flux chambers and towers and different models are frequently in use.

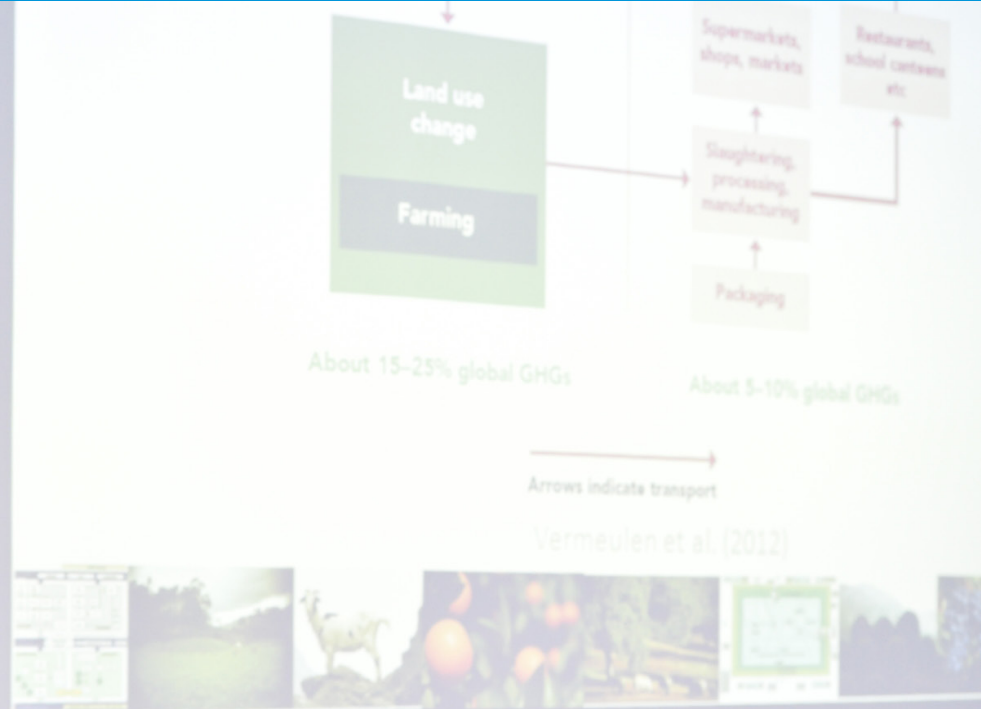
Major research gaps

The most important research gap is data harmonization: different scales, models or

inventories are currently being used. We need to discuss more a regionalization of emission inventories, the increasing number of farm scale GHG models and the consistency of different inventories (e.g. GHGs and NH₃). Additionally, it is important to keep in mind GHG mitigation and the linkage to other agro-ecological goals. Furthermore, strong regional biases of research activities and results exist – the question of how to support and include other regions and countries in research activities should be on top of the agenda.

2.2 Mitigation Potential

Under Theme 2 innovative measures to mitigate GHG emissions in livestock, cropland, rice production and carbon rich-ecosystems were discussed. Furthermore, the question was raised how intelligent land use management could contribute to less GHG



emissions. Regional and national differences in the mitigation potential were also taken into account. In his introductory keynote, Agustin del Prado from the BC3 Basque Centre for Climate Change highlighted the climate change mitigation potential of measures in agriculture.

Major research highlights

Especially for methane emission, measures such as a 3-NOP feed additive might help reduce enteric methane emissions enormously. Here, delivery mechanism, cost benefit and consumer acceptance need to be further analyzed. In rice production, alternate wetting and drying can also reduce CH₄ emissions. However, questions need to be answered regarding N₂O emissions and uptake of the measures. Urease inhibitors on urea fertilizer will reduce N₂O compared to calcium ammonium nitrate (CAN) fertilizer and keep ammonia emissions in line with

CAN. Also, evidence could be found of continued C sequestration on intensively managed grassland soils in Northern Ireland. A preview of 2nd State of the C Cycle report – C stocks and net C uptake in grasslands can be maintained by appropriate land management and grazing. Furthermore, many other strategies were presented: agroforestry/silvopastoralism, water management in peat, sustainable cultivation of durum wheat, urea coated with neem oil and others. More detailed information are available in the book of abstract (www.agrighg-2018.org).



Major research gaps

Many mitigation options are under investigation, but it is important to also consider adoptability, trade-offs and barriers to adoption. There are no universally applicable measures – they need to be tailored to regions and production systems. Further research activities should address the knowledge about management to increase soil carbon. The increase of efficiency of a system is still most promising – for example in animal/plant breeding and genetics, soil quality, animal/crop productivity, etc. – but this endeavor is rather difficult, because change beyond business as usual progress must be implemented by people. Furthermore, all actors need to be involved (for example the end users, industry, community and consumers) in scoping out viable mitigation options. In the future it will be decisive to proof mitigation strategies and to increasingly consider adaptation and mitigation win-win measures.

2.3 Costs and Implementation

In theme 3 the integration and implementation of effective GHG measures was the main point of discussion. What are current best practice instruments to integrate GHG



emissions by agriculture in national NDCs and how are they implemented? What are innovative integrative approaches with multiple benefits/win-win options that can be transferred to other regions? What are the barriers to the uptake of mitigation options? The keynote speech was presented by Ana Maria Loboguerrero, Head of Global Policy Research of the CGIAR Research Program for Climate Change, Agriculture and Food Security (CCAFS).

Major research highlights

There are cost-efficient GHG mitigation measures which increase productivity and/or save inputs: For example improved rice cultivation, improved pastures and forage



production, silvo-pastoral systems, nutrient management. In connection to mitigation measures, future rebound effects also have to be considered. The adaptation to climate change, increase of productivity or cost saving are important entry points for implementing mitigation measures. An understanding of the farmers' situation and views is important; also small-scale farmers should be taken into consideration. In order to overcome limits to implementation of mitigation strategies: raise awareness, knowledge, finance, new markets, and cooperation.

Major research gaps

Only few UNFCCC parties report on abatement cost in agriculture. Nonetheless, it is important to fill the data gap in the cost of abatement. A methodology should be

developed to highlight multiple (non-mitigation co-) benefits for relevant stakeholders. In addition, a discussion evolved around the usefulness of marginal abatement cost curves (MACC). 'Negative' abatement cost can be misleading if barriers to adoption are not fully taken into account. Moreover, "cost" is not the only ranking criteria for abatement and the level – for example farm or national economy – should be considered. MACC help to raise awareness of potential costs, however, they should be complemented by an analysis of barriers to adoption. An open point for discussion was how to put measures into practice, since many of them only exist on paper. It was identified that more research on acceptance and willingness to adoption is needed, as well as the creation of enabling environments and improved education and extension.



2.4 Global Challenges and Policies

Possible policy design and implementation options from a scientific point of view have been discussed under theme 4. What are the challenges in mitigation regarding food security and other political priorities (natural resources management biodiversity, adaptation and further socioeconomic factors) and how can solutions look like? The keynote was given by Ben Henderson of the Organization for Economic Co-Operation and Development (OECD) on global policy options and challenges and policies for GHG mitigation in agriculture.

Major research highlights

It is necessary for all countries to mitigate in agriculture to achieve the emission targets. However, mitigation competes with other policy objectives, despite political pressure

for win-win arrangements. Examples are food security trade-offs or a uniform carbon tax which would increase the prices of beef, milk and rice. Also, “wet” peatland management conflicts with the Common Agricultural Policy (CAP) – for example in maintaining permanent grassland. How to minimize these trade-offs was examined by various global policy scenarios. Regarding global taxes and subsidies, a global subsidy for mitigation produces best overall results in the assessments, but also has to be paid for. The models also showed, that a global coordination outperforms regional and sectoral efforts. Generally, diet shifts would produce significant mitigation at low costs. Targeting can enable higher efficiency of mitigation. Soil organic carbon and land use change as well as technical and structural Non CO₂ emissions would reduce trade-offs in the best way. Bioenergy intensification produces least trade-offs with regards to food prices.

Major research gaps

Mitigation-driven policies need to be in line with larger sustainable development; e.g. with regards to social equity: Policies that balance across objectives and include broader metrics are essential. Furthermore, it is important to be careful about narrow analyzes that do not consider other sectors and objectives. There is a need for more integrative frameworks and for modeling (including multiscale modeling).

Furthermore, the consumption and diets of the consumers should receive more attention. Another aspect is the examination of countries' ambitions and the progress made towards mitigation. Not only with Nationally

Determined Contributions (NDCs), but also in comparison to actual policies and their implementation. The transparency of the countries' intended mitigation contributions is an additional challenge.

Other open points for discussion which have been identified are the need for regional approaches: e.g. technical options, carbon taxes, higher efficiency and targeting countries with larger land areas for agriculture, forestry and other land use (AFOLU) mitigation options. In terms of synergies between adaptation and mitigation, more robust evidence exists on trade-offs than synergies between the two. There is need for further research and evidence on this matter.



3 Thematic Working Groups

Scientists and stakeholder gathered in eight different thematic working groups and discussed various aspects with regards to food production, food security and climate change. In the first part, participants could choose a group according to a sector. In the second part, cross cutting questions with a broader thematic scope were discussed.

3.1 Livestock

The livestock sector contributes significantly to agricultural greenhouse gas emissions worldwide. With regards to a growing population and an increasing demand for livestock products, the reduction of the sector's emission and its environmental footprint are getting more and more urgent. Approx. 14.5 percent of anthropogenic GHG emissions are related to livestock production activities. On the other hand livestock production is an important source of food and income security and is interlinked with grassland and pasture management worldwide.

Participants discussed the most promising measures for radical GHG emission reductions in livestock production. Among the most relevant measures were an improved digestion thanks to a healthy microbiome (production efficiency), customized feed (incl. diversity, mixed roughage, swill, seaweed, additives, metabolites, inhibitors), a selection in breeds (good host for microbiome, multitraits), preventive health care, precision livestock farming, carbon and nitrogen conservation (resource use optimization), pasture/crop/soil management (rotation, water and nutrition management,

legumes, biochar), landscape management (e.g. hedgerows, silvopastoral systems), a better manure management with e.g. early separation urine and feces and high quality organic matter, energy savings, a combination with biogas production and the increased use of solar energy.

In the future, policy design should include or call for: quantitative reduction targets for livestock related emissions, an exchange of good practices amongst diverse actors (education), enhanced coordination and cooperation for comprehensive, concerted actions, and transfer of technology (from labs to fields but also between regions).

Main barriers for adoption of such measures were also discussed. These include: lack of investment power (money, labour, technology, data), inertia (past investments, traditions), motivation and cognition (complexity, societal pressures), perverse industrial advices, a lack of incentives (C-tax; rewarding societal services) and reluctant policies regarding leadership and legislation have been discussed as barriers and one major solution could be to raise the trust by stakeholders by enhancing communication.

3.2 Cropland and Rice

With the growing global population, increased and more stable food production is needed. With an increase in agriculture and food production GHG emissions also increase, especially in the basic food provider such as rice and cropland production (cereals, etc.). Especially methane in rice production or nitrate oxide in cropland production contribute in many countries to a large extend to national GHG emissions. New technologies and management practices are



thus decisive for achieving the Paris Agreement targets and for making an ambitious contribution from the agricultural sector.

Key challenges that were identified:

- ◆ Adoption of wider choice of technological mitigation options and engage the private sector in the process.
- ◆ Elaborate, encourage and implement new water management strategies in rice cultivation.
- ◆ Stimulate and enforce measures to increase nitrogen (N) use efficiency in agriculture.
- ◆ Enhance adoption of promising measures in rice and cropland production and evaluate long-term applicability.
- ◆ Provide strong movement and preparation of financial support.
- ◆ Institutional/policy arrangement including Measurement, Reporting and Verification (MRV)

One of the most promising measures that was identified is more efficient water management (e.g. AWD alternate wetting and drying). Here, especially laser leveling, water and electricity pricing (targeted subsidies), water level monitoring, irrigation infrastructure, farmer organization, crop residue management, nutrient balance management versus nitrogen fertilization and nitrogen inhibitors are in the focus. Many practical examples were discussed and as a major barrier to adoption of these measures were a lack of knowledge transfer and sensing water levels identified.

Therefore an improvement and expansion of extension services, workshops and training, more demonstration sites, outcome-based incentive programs, e.g. AgResults, more market instruments and decision support tools (web based tool) and a packaging of services (e.g. providing subsidy, advisory services, incentives), are the main needs to enhance the adoption process in the sector.



3.3 Soil Management

Improved soil management is necessary not only for productive farming systems and climate change mitigation but also for other environmental issues (such as water and biodiversity). With the 4p1000 initiative launched at COP21 the role of agricultural soils in climate mitigation was emphasized and has gained increasing attention since then. However, this includes more than increasing soil organic carbon by 4 per 1000 per year: current carbon losses need to be stopped, conservation of peatlands needs to be implemented, agroforestry needs to be evaluated and incentives developed, soil carbon monitoring needs further refinements – just to name a few. This thematic group discussed options and challenges to realistically and sustainably improve soil management worldwide.

The key messages regarding indicators and climate change impact were to

- ◆ Remember non-CO₂ GHG's and timeline. Soil carbon sequestration is

a time limited, reversible process and cannot be directly compared to changes in continuous fluxes (N₂O, CH₄). Reductions in CH₄/N₂O flux are non-reversible. On longer timeline N₂O/CH₄-fluxes gain importance compared to soil carbon.

- ◆ Per product indicators are needed (beside per hectare indicators) since best practice management is context specific.

Therefore key statements that can be derived from the discussion are:

- ◆ Make other ecosystem services such as biodiversity or clean water bodies accountable in the same units with GHGs. Those may easily get out of focus in the debate on climate-smart agriculture. A holistic view on agricultural systems is complex but required. Farmers and politicians require simple guidance and advice
- ◆ Soil C: Use it or store it? Soil C has other important functions, than storage,

which should be considered ecosystem specifically and when using soil additives for C storage

Regarding implementation barriers it is recognised that farmers would like to produce and sell products, but GHG reduction is difficult in this sense. Therefore, options to enhance and provide support in finding market for “climate-smart” products should be considered. Further Obstacles for the implementation of climate smart soil management are diverse and range from required techniques and knowhow to financial compensation (for production losses, enhances economic risks) and incentives in order to facilitate changes in management.

3.4 Food Consumption

Countries around the globe are faced with the need to produce more food for a growing global population, whilst having to cope

with climate change and reduce their carbon footprint. Ensuring more sustainable and resilient food production and consumption is therefore high on the international agenda. Yet such a change requires important adjustments across entire food supply chains, involving a wide range of stakeholders: farmers, food industry actors, consumers and policymakers.

Adopting a comprehensive and integrated food systems approach (“from farm to fork”) will be important to facilitate coherent and coordinated changes along the entire chain, including to promote more sustainable (and healthy) food consumption habits and a more effective reduction of food waste.

Which demand-side measures related to food consumption, food value chains, and food loss and waste are most promising to reduce GHG emissions while ensuring food security?





- ◆ Not one single measure; it is important to identify a variety of demand-side measures that can bring about short, medium and long-term impact on GHG mitigation
- ◆ A differentiated approach is needed: e.g., in developed countries: main issue is food waste; in developing countries: food loss
- ◆ Reducing food waste: can bring results in the short-term; can be achieved via longer cooling periods for food, longer sell-by dates, sale of “left-over” food from restaurants (e.g., via IT apps), food donations, possibility for the consumer to buy smaller portions/amounts, zero-packaging food stores, awareness-raising campaigns to avoid waste, environmental externalities reflected in food prices
- ◆ Changing diets and consumer demand: will be easier to achieve if health-related concerns are also brought up to consumers; can be achieved via e.g. education and awareness-raising campaigns (esp. for children), labelling of

environmental impacts of food products, information to consumers on the carbon footprint of their shopping basket, changing the way in which sustainable food is presented in supermarkets, introducing a veggie day in school canteens and company restaurants, offering new alternative protein sources to consumers (e.g., fake meat), accompanying livestock producers and retailers in their diversification strategies (technical support, extension services).

Recommendations

- ◆ Need to analyze **trade-offs and costs vs. benefits** of these different measures at country-level and across the value chain (e.g., less packaging can shorten the life span of certain food)
- ◆ Some measures may **take time** to have some effect on consumption (e.g., changing diets; also cultural)
- ◆ Need to better integrate **behavioural science** into research

3.5 Risks and Side-effects of Enhanced and Ambitious Climate Change Mitigation

Besides the positive effects on reducing greenhouse gas emissions, mitigation measures can also have other side-effects, on the one hand of more positive nature such as win-win solutions for soils, agroforestry or water quality improvements due to less fertilizer application. On the other hand also negative risks and impacts on the environment (enlargement of bioenergy and resulting deforestation) or on food security should be taken into account. More extensive agricultural production could lead to lower yields, less food but also less farm income and can therefore impact on rural household income. Due to indirect impacts on prices and supplies agricultural commodities also leakage effects occur that can have adverse effects on mitigation potentials. These different risks and side-effects are difficult to specifically quantify and address in mitigation policies.

The workshop identified several different side-effects on a global scale. Among the

most important need to be considered carbon leakage (import and export of emissions), competition for land – forestry (especially regarding bioenergy as a climate mitigation measure), social effects (impacts on employment, concentration, regional instabilities, incomes), environmental impact (water, soil health, biodiversity), trade-off with a shift in dietary changes (more-less animal protein) as well as co-benefits or trade-offs (adaptation resilience), just to name a few.

An intense discussion focused on how to minimize negative side-effects and at the same time enhancing climate mitigation from agriculture. Here especially, the improvement of diversification at farm level, increase education and extension services, circular or agro/ecological food systems, global access to innovation and technology, regulatory environments to facilitate innovation and remove impediments, climate proofing development, enhanced investment in research and development were discussed as major options to minimize side-effects. On the other hand it was seen that it is necessary to improve international communication in this aspect by improving structures and mechanisms that give farmers more voice, to

mainstream mitigation with food security, adaptation and SDGs. In addition, more assessments of national regulatory frameworks and of international frameworks to support mitigation are needed. Moreover, a further developing socio-economic modelling e.g. multi-criteria analysis considering different metrics is essential. One concrete idea that





could be further elaborated on was to create a global fund for peatlands protection and restoration.

3.6 Food Policy

Climate change has generated a debate around food policies, as it is clear that growing population on one side and the trespassing of planetary boundaries on the other, create a narrow pathway to sustainable food security. It is nevertheless necessary to carry on looking for solutions that increase the productivity – in a sustainable way – in contexts where there is a gap with potential levels, the need to address the multiplicity of food security dimensions, in particular access to food, food losses, and nutrition, is more and more evident. Obesity and non-communicable diseases clearly show that food policies need to address dietary habits and the factors that influence them. Consequently, there is a growing consensus on the need to rethink

food policies with a system approach that consider not only the production phase but also looking at processing, distribution and consumption.

The key messages regarding climate change and its impact on agricultural as well as on food policies:

- ◆ **Climate change is cross-sectoral** – a key challenge is that ministries and other government sectors work in silos – e.g. different ministries for food, environment, health and rural development
- ◆ **Production “paradigm”** – target of doubling production by 2050 is leading to one set of policies, but other choices could lead to different policy outcomes
- ◆ **Need for a truly global view** – continue to have nationalist views

In terms of integrating agricultural and food policies, the following suggestions were made:



- ◆ **Need for international coordination on production and surpluses**
- ◆ **Integration of ministries and agencies** – for example in Brazil, a National Food Security Advisor coordinates across dozens of agencies. Important: The focus should not only be set on agricultural policy, but food and agricultural policy
- ◆ **Labelling integration across health and environment** – opportunities for private sector and policy

Regarding the role of food system actors in the new context of climate change, several policy tools have been discussed which could be useful to address the new challenges. Multiple ideas on pricing and incentive structures came up: Food pricing to include externalities, shifting of subsidies towards climate and health “friendly” measurements as well as a payment for multiple ecosystem services. Furthermore, a recognition that some things are hard to measure, that many metrics exist and that baselines can be hard to establish, is important. A common unification and acceptance are necessary. Policies should balance “stick” or “carrot” – taxes

versus incentives. In addition, education across many realms and with a focus on several target groups, such as policymakers, children and consumers in general, is considered as essential.

3.7 How to Mobilize Public Private Investment (in Mitigation)?

With the Paris-Agreement, the private sector is explicitly asked to participate in enhancing climate action and contribute to achieve the global mitigation target. At the moment, private entities have different options how to engage in climate action. In terms of “Public-Private-Partnerships” they are regarded as an equal partner at all stages of the respective activities. Many of the initiatives targeting agriculture and climate change have incorporated a structure of partnerships including countries, international organizations, science, civil society and the private sector (e.g. GACSA, AAA+, 4p1000, etc.). Another option implies investments in funds that run projects related to agriculture



and climate change (e.g. eco-business-fund, F3 Life, FONTAGRO, Root Capital, Green Climate Fund ...). In both cases the private sector can of course expect revenues from participating, however, these might differ in nature.

Possible incentives for the private sector to participate in PPPs/invest in funds

- ◆ Economic benefits
- ◆ Reputation via Corporate Social Responsibility (CSR);
- ◆ Legal framework and enforcement
- ◆ Technical assistance provided by public actors
- ◆ Capacity building

Challenges and risks that can be faced

- ◆ Priority changes
- ◆ Perception of biases
- ◆ Greenwashing, reputational risk
- ◆ Effects on consumer prices
- ◆ Data availability and quality

Recommendations suggested to promote PPP (in agriculture, mitigation)

Setting up the right structures with stakeholders and along the value chain, e.g.:

- ◆ Clear rules of engagement; government regulations, policies, IPR
- ◆ Technologies

- ◆ Finance, market and clear business case
- ◆ Information exchange and awareness raising and cultural shifts
- ◆ Stakeholder mapping
- ◆ Communicating co-benefits (economic, social & environmental)

3.8 Knowledge and Research Gaps: Where do we Need to Develop Transnational Research?

Transnational research collaboration is particularly important in the area of agricultural GHG mitigation as it can help generate global knowledge and practical solutions to tackle a challenge that is global in nature and that cannot be addressed by one country alone. Such research can (i) help to share, collate and integrate data, e.g. on the effects of climate variability on different crops, farming systems and agricultural landscapes, (ii) help compare the impact of various agricultural practices on GHG mitigation, resilience to climate change and food security across countries and identify best practices for policymakers, farmers and other stakeholders, (iii) facilitate the sharing of national research infrastructures



(e.g., laboratories, observatories, databases and repositories) and research and GHG measurement methods, and (iv) enable networking and knowledge-sharing amongst researchers. However, transnational research collaboration is also challenging, as it requires time for relationship-building and identifying the right partners and topics for collaboration, as well as the introduction of an adequate enabling environment at the national level.

Multiple key issues would warrant additional transnational research collaborations:

- ◆ Standardization of methods, protocols, assessments and reporting
- ◆ Multidisciplinary research
- ◆ Focus on common issues (e.g., reactive nitrogen)
- ◆ Collation and democratization of short and long-term data
- ◆ Research incentives

- ◆ Include social/economic contexts (e.g. behavioral change research)
- ◆ Tradeoffs and synergies
- ◆ Sharing analytical infrastructure
- ◆ Blue sky research and global analysis
- ◆ Capacity building
- ◆ Education and communication (data to knowledge and key information)

Factors promoting the development of trans-national research

- ◆ Funding for communication and valorization of results
- ◆ Identification of key stakeholders
- ◆ Funding for networking and networking of networks
- ◆ Funding educational opportunities, exchange and collaboration young among scientists (e.g. CLIFF-GRADS)
- ◆ Support inter-institutional exchange programs
- ◆ Support Knowledge-Action Networks

„I think we need to pay more attention to how people are eating and not just wealthy people, but the availability and affordability of food for poorer people. Nutritious, good food. Solving that and paying attention to the distribution of food is the key to future food security.“

Sonja Vermeulen



- ◆ Facilitate transnational data sharing (administrative, scientific and political barriers exist)
- ◆ Encourage stakeholder involvement (e.g. local governments)
- ◆ Support better coordination of transnational research (e.g. FACCE-JPI)
- ◆ Showing advantages of international investments to local governments

In addition, it was discussed how transnational research can be aligned to countries' strategic research objectives as well as to wider national and international policy goals on climate change. The suggestions varied from proper governance systems, to forums and workshops with policy makers and other stakeholders over to the support of global and regional initiatives (e.g. Global Research Alliance on Agricultural Greenhouse Gases). Furthermore, the support of actions to promote alignment within governments, regional and national agendas as well as the support of proposals that are aligned with national and regional goals are suggested. Another proposal was to replicate regional platforms – such as the Scientific Committee on Antarctic Research (SCAR). Concerning public relations, an improved communication strategy

with a focus of science to policy and public as well as participative approaches, such as citizen science, are recommended.

4 Conclusion

The conference brought together policy-makers, scientists and other stakeholders from all over the world. The urgency of action was widely mentioned. It is important to intensify the efforts to move to a more “climate smart agriculture” as well as to increase the implementation of climate proof and resilient food systems. Furthermore, the reduction of GHG mitigation per unit is crucial for the years to come.

There are many research results. At this stage, it is essential to move to the implementation of practical solutions for farmers, policymakers and other actors. In order to bridge the gap between science and practice, more knowledge brokerage is needed. At the same time, the needs and ideas of policymakers and farmers should be better integrated into future research projects – into the co-design of research as well as practical solutions. More interdisciplinary research is necessary

„We need to move to a science of implementation.“

Lini Wollenberg





„We have heard a lot of very promising research presented over the last two days of the scientific conference. It is a great opportunity to share that with people from a range of countries and a range of backgrounds.“

Frank O'Mara

in order to take into account socio-economic aspects and changing consumer behavior. An additional positive effect would be the increase in policy coherence with regards to agriculture, health, environment and economic development. Furthermore, a better understanding of the trade-offs and possible synergetic actions across different policies is important. Generally, more specific, regional and local solutions which include all concerned stakeholders are crucial.

Priorities should focus on:

- ◆ Implementation science: incentives, finance, scaling
- ◆ Boldness: large-scale initiatives and learning
- ◆ Co-design with farmers, investors, input suppliers, advisory services to mainstream mitigation
- ◆ MRV: regional data platforms, novel methods, info systems
- ◆ Loss and waste: food and other resources – circularity
- ◆ Policy: correct and coherent
- ◆ Political will: top-down and bottom-up, good governance
- ◆ Koronivia JWA: science and practice to inform policy, all have role to play

5 Annex

5.1 Steering Committee

Hartmut Stalb (BMEL, GRA, FACCE-JPI), Katerina Kotzia (BMEL), Wolfgang Zornbach (BMEL), Hayden Montgomery (GRA), Deborah Knox (GRA), Heather Mckhann (FACCE-JPI), Caroline Lesser (FACCE-JPI), Claudia Heidecke (Thünen Institute)

5.2 Program Committee

Claudia Heidecke (Thünen Institute), Hartmut Stalb (BMEL, GRA, FACCE-JPI), Katerina Kotzia (BMEL), Heather Montgomery (GRA), Deborah Knox (GRA), Caroline Lesser (FACCE-JPI), Lini Wollenberg (CCAFS), Dawit Solomon (CCAFS), Frank O'Mara (FACCE-JPI), Gianluca Brunori (FACCE-JPI), Mellissa Wood (GRA-Australia), Alvaro Roel (GRA-Uruguay), Manju Bura (BBSRC), Jean-Francois Soussana (FACCE-JPI), Kirstin Ohlendorf (Thünen Institute)

5.3 Scientific Committee

Jürgen Augustin (ZALF), Gianluca Brunori (Università di Pisa), Claire Chenu (AgroParisTech), Ngoni Chirinda (CIAT), Todd Crane (ILRI), Jørgen Eivind Olesen (Aarhus University), Frank Ewert, Roland Fuß (University of Bonn), Roland Fuß (Thünen Institute), Maggie Gill (University of Aberdeen), Claudia Heidecke (Thünen Institute), Katharina Helming (ZALF), Mark Howden (Australian National University), Brian Keating (CSIRO), Carolyn Opio (FAO), Dawit Solomon (CGIAR), Mette Termansen (University of Copenhagen), Dirk von Soosten (Friedrich-Loeffler-Institut)

5.4 Keynote Speakers, Session Chairs and Major Contributors

– Scientific Conference –

Plenary Keynote: Andy Reisinger

Session 1. Innovative approaches in GHG monitoring and MRV

Keynote: Werner Kutsch

Discussant and Rapporteur: Heinz Flessa

Session Chairs: Roland Fuss, Bärbel Tiemeyer, Dirk von Soosten, Gianni Bellocchi

Session 2. Mitigation Potential

Keynote: Agustin del Prado

Discussant and Rapporteur: Frank O'Mara

Session Chairs: Frank O'Mara, Lenin Babu Kamepalli, Claus Deblitz, Katharina Helming

Session 3. Cost and implementation

Keynote: Ana Maria Loboguerrero

Discussant and Rapporteur: Bernhard Osterburg

Session Chairs: Bernhard Osterburg, Sven Anders, Alex de Pinto, Gerard Zoundji

Session 4. Global potentials

Keynote: Ben Henderson

Discussant and Rapporteur: Lini Wollenberg

Session Chairs: Claudia Heidecke, Todd Crane, Axel Don, Jonathan Blair

Poster Presentations:

Theme 1. Innovative approaches in GHG monitoring and MRV

Session Chair: Roland Fuss

Theme 2. Mitigation Potential

Session Chair: Viridiana Alcantára Cervantes

Theme 3. Cost and implementation

Session Chair: Bernhard Osterburg

Theme 4. Global challenges and policies

Session Chair: Susanna Hönle

– Stakeholder Conference –

Welcome: Secretary of State Michael Stübgen (Germany), Minister of Agriculture Hon Damien O'Connor (New Zealand), FACCE-JPI-JPI Chair Hartmut Stalb (Germany)

Plenary and Panel Discussion: Jerzy Bogdan Plewa (European Commission), René Castro Salazar (FAO), Theo de Jager (WFO), Sonja Vermeulen (WWF)

Overview and visions by FACCE-JPI, GRA and CCAFS initiatives: Heather McKhann (FACCE-JPI), Hayden Montgomery (GRA), Bruce Campbell (CGIAR- CCAFS)

Best Practice Examples from Research Projects: Liisa Pietola, Ajay Vir Jakhar, Gonzalo Becona

Thematic Working Group 1: Livestock

Session Chairs: Martin Scholten, Bess Tiesnamurti

Thematic Working Group 2: Cropland and Rice

Session Chairs: Le Hoang Anh, Álvaro Roel

Thematic Working Group 3: Soil management

Session Chairs: Axel Don, Hanna Silvennoinen

Thematic Working Group 4: Food Consumption

Session Chairs: Tim Benton, Sébastien Treyer

Thematic Working Group 5: Cross-Cutting Questions: Risks and side-effects

Session Chairs: Walter Oyhantcabal, Chris Carson

Thematic Working Group 6: Cross-Cutting question: Food policy

Session Chairs: Meredith Niles, Heather McKhann

Thematic Working Group 7: Cross-Cutting question: How to mobilize public-private investment (in mitigation)

Session Chairs: Eugenia Saini, NAMA-Facility

Thematic Working Group 8: Knowledge and research gaps: Where do we need to develop transnational research?

Session Chairs: Ngoni Chirinda, Martha Alfaro

Moderator: Karen Coleman

– Excursions –

Excursion 1: Urban farming in Berlin

Organizers: Regine Berges, Kirstin Ohlendorf

Excursion 2: Organic farming versus conventional farming – comparing different emissions of production systems

Organizers: Hans Marten Paulsen

Excursion 3: Peatland management near Berlin

Organizers: Bernhard Osterburg, Jutta Zeitz

Excursion 4: How to achieve the 4 per 1000 goal? – Demonstrations of soil organic matter management in Brandenburg

Organizers: Hubert Wiggering, Axel Don, Viridiana Alcantara Cervantes, Katharina Diehl