Developing science-based policy advice

Report - PhD Summer School 2019

Aída González-Mellado and Veronika Jorch

Braunschweig, 15.12.2019
Dr. Aida González-Mellado
Thünen-Institute of Market Analysis

Veronika Jorch
Thünen-Institute of Climate-Smart Agriculture

The Johann Heinrich von Thünen-Institute
Federal Research Institute for Rural Areas, Forestry and Fisheries
Bundesallee 50
38116 Braunschweig

Tel.: +49 531 596 5316
E-Mail: aida.gonzalez@thuenen.de and veronika.jorch@thuenen.de

All Pictures by: Thünen Institute/Heidi Haavisto-Meier
Outline

1  Background

2  Introducing science-based policy advice - Monday 12th August
   2.1  BMEL’s perspective on Research-based Policy Advice
   2.2  Some theory and practical lessons from 25 years of model-based policy advice by the Thünen Model Network

3  Practical examples of science-based policy advice - Tuesday 13th August
   3.1  The case of model-based policy advice with AGMEMOD
   3.2  The case of climate impacts
   3.3  The case of greenhouse gases

4  How to write policy advisory statements - Wednesday 14th August

5  Developing research questions on the field, feeding into politics and linking back to the field

6  Summer School Project
   6.1  "Lessons Learnt" from the summer school project

7  Summary

Annex 1: Presentations
1 Background

This report reflects the main content as well as the presentations of the Summer-School 2019 on “Science-based policy advice”, organized by the Thünen Institute. The summer school took place at the Thünen Institute in Braunschweig from the 12th to 16th August 2019. The participants of the summer school were PhD stipends of the Federal Office for Agriculture and Food (BLE) from Africa and Iran. The Summer School 2019 was financed by the BLE.

During the summer school the following questions were examined:

- How does science-based policy advice work?
- How does it work in Germany?
- How can it be done in African countries and the Iran?
- What must be considered when writing science-based policy statements?

Aside some soft skills were trained such as:

- capacity to work in an interdisciplinary team
- capacity to work under time pressure
- increase intercultural competences
- practice of rhetorical skills

As one of the institutes under the mandate of the German Federal Ministry of Food and Agriculture (BMEL), the Thünen Institute is often requested to provide science-based policy advice for the ministry, for other governmental institutions, international bodies, NGOs, political parties and farmers unions. Since the institute works in rural areas, fishery and forestry, it can provide information on a large range of different topics and crosscutting areas.

The summer school lecturers are professionals in the field of giving policy advice based on scientific facts. They work as scientists in different Thünen departments, the Thünen overarching coordination unit climate and soil, at the National Meteorological Service of the Federal Republic of Germany (DWD) and also at the Federal Ministry of Food and Agriculture (BMEL). During an excursion to the fields and stables of the Thünen Institute of Organic Agriculture, the participants learnt how research questions are developed in the field and fed into policy advice to follow changes in the agricultural sector.

In the last days of the summer school program, participants developed their own policy statements based on a fictional policy request and presented them during a concluding simulated session with policy makers.
# Summer School 2019: Research-based Policy Advice, How does it work?

Thuenen Institute - Federal Research Institute for Rural Areas, Forestry and Fisheries

Bundesallee 50, 38116 Braunschweig, Germany

**12th August – 16th August 2019**

Summer School location: Forum Thünen Institute

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<td>9:00 – 10:30</td>
<td>How to write policy advisory statements Practical examples</td>
<td>Claus Deblitz</td>
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<td>Presentation of study: “Scientists studying abroad” by the Technical University of Braunschweig</td>
<td>Meike Faflik</td>
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## THURSDAY August 15th

*Visit to Thünen Institute of Organic Farming in Trenthorst*

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## SATURDAY

Departure
2 Introducing science-based policy advice - Monday 12\textsuperscript{th} August

2.1 BMEL’s perspective on Research-based Policy Advice

Lecturer: Dr. Maja Clausen (BMEL)

The BMEL research policy follows four research clusters:

1. Future of Rural Areas
   - High quality of life, strong economic sectors and efficient fostering
2. Sustainable Agriculture
   - Responsible and resource conserving soil management and animal husbandry
3. Healthy Life
   - Health, good nutrition and safe products
4. Global Responsibility
   - Ensuring global food security and responsible resource management
   - This responsibility has been transferred to federal research institutes

The Thünen Institute, is, as are the Friedrich Löffler Institute (FLI), Julius Kühn Institute (JKI), Max Rubner Institute (MRI) and the Federal Institute for Risk Assessment (BfR), federal research institutes under the mandate of the BMEL. They provide scientific input for the policy decisions, such as consumer protection policies and decisions in ad hoc crisis situations.

Internationally the BMEL federal research activities contribute to:

- Engagement in scientific exchange and progress
- Creation of enduring international alliances
- Contribution to capacity building

A core topic is the global food security and nutrition.

2.2 Some theory and practical lessons from 25 years of model-based policy advice by the Thünen Model Network

Lecturer: Dr. Frank Offermann (Thünen Institute of Farm Economics)

The presentation started with some theory on science based policy advice. There are different ways (or ‘models’) of how the two subsystems of science and politics interact. Habermas\textsuperscript{1} developed the Technocratic, the Decisionistic and the Pragmatic model to describe these interactions.

\textsuperscript{1} Habermas, Jürgen (1971): Toward a Rational Society.
According to the *Technocratic model*, science provides recommendations on political goals and the measures necessary to reach these. This model is often criticized since it undermines democratically legitimized processes of political decisions. Value judgements remain hidden and the responsibility for actual outcome remains unclear. In practice, this approach is often observed when new (technically complex) policy issues arise, or in times of widespread distrust in the political establishment.

The *Decisionistic model* is characterised by stronger power of the decision makers. The policy-maker determines the objectives, researchers analyse how these can be reached and the policy makers implement the scientific recommendations. This model is criticized since the division of work between science and policy implicates that facts and value judgements, as well as means and ends, can be clearly separated. However, goals, and their potential conflicts and synergies are subject to constant re-evaluation in the light of intended and unintended outcomes, which requires a continuous dialogue between science and politics.

The third model, *the Pragmatic model*, explicitly includes the public as an important actor. The objectives and means are determined by discourse between researchers, policymakers and the public. The role of research is to provide input, but do not determine objectives or means. The pragmatic model has many variants (e.g., „co-production“, „deliberative“, „co-evolutionary“...).

Edenhofer\(^2\) has developed the "Pragmatic-Enlightened model" to describe science based policy advice. Following this model, goals are set coordinated between science and society. The corresponding policy objectives and their means are evaluated regarding the practical consequences. The policy objectives might need to be reviewed again in a later stage, when new knowledge on secondary effects, side affected or synergies appear\(^3\). Thus the process of policy making needs to be adaptive to new situations.

**Systematic preconditions for science-based policy advice**

For successful science-based policy advice a few preconditions have to be in place. Some indispensable requirements for science-based policy advice between science and society are:

- Objectivity
- Transparency, Public information
- Distance (Independence)
- Plurality

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Objectivity is a basis for scientific policy advice. Objectivity in the sciences is above all a result of a meaningfully organized scientific process and less the consequence of the objectivity of the individual scientists⁴.

The transparency of the overall decision-making process is important, so that society can track and trust the arguments for and the decisions and policies made⁵. This entails that communication between scientists, policy makers and society during the process needs to be accessible and understandable for all.

Independence or a distance between policy and science is crucial. Lack of independence entails the risk that the advice loses its credibility and trustworthiness. This is a frequently discussed issue, since political bodies (such as BMEL in Germany) or companies announce scientific project calls, sometimes with specific topics as background. Moreover the institutes financed by federal ministries are often questioned about their independency. Institutes and scientists in general have to deal with this situation.

Science-based policy advice needs to be diverse and thus plural. This means that the advice needs to be given, depending on the topic, from different perspectives, based on scientific theories, methods and approaches. The plurality of advices from different disciplines and persons increases the confidence in the knowledge needed for decision making.

**Lessons from 25 years of model-based policy advice**

The policy areas relevant to agriculture are subject to constant change. This has led to an increased demand from policy makers and scientists to quantify the consequences of policy changes in advance. To do so requires taking into account numerous interactions. Models help to reduce the complexity of the real world to the essential relationships, and thus contribute to a better understanding.

The Modelling Network of the Thünen Institute uses economic models for different decision levels (e.g., farm, regional or sector). MAGNET simulates developments and policies in the area of world economics in general as well as those of individual countries and regions. The AGMEMOD model deals with the important agricultural markets of the EU Member States as well as interactions between the agricultural and food sectors. RAUMIS presents adjustments of agricultural land use and production at the regional level. FARMIS uses a bottom-up approach to farms and farm groups for its farm modelling and includes a projection of the results at sectoral level.

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The joint application of the models facilitates the consistent consolidation of the different levels. The results of our model-based policy impact assessments support policy makers in identifying potential need for action, in developing negotiation positions, and in designing policy instruments.

The analysis of a particular question starts with a first consultation of the modelling team with representatives of the Federal Ministry. Here, relevant scenarios (e.g., the abolishment of the milk quota) and central assumptions (e.g., the future development of energy prices) are discussed. Depending on the complexity of the problem and the relevant interactions, it is decided which models are required for the analysis and if and how these need to be developed further. In the subsequent analysis, a coordinated, parallel and/or iterative use of the model follows. This facilitates the consolidation of important assumptions, an exchange of results between model, and the mutual monitoring and control of model results. This approach ensures a consistent overall result.

A central element of the work of the modelling network is the regular establishment of a so-called "baseline", that is a projection of expected developments in the agricultural sector under the framework of current (agricultural) policy. The Thünen Baseline is developed in close cooperation with experts German Ministry of Food and Agriculture; it serves as a reference scenario for policy impact assessments.
3 Practical examples of science-based policy advice - Tuesday 13th August

Science-based policy advice is done by all kinds of different fields of science. In the case of the Thünen Institute, frequently requested by the German government topics focus on questions related to natural resources. The scale can be national or global, depending on the topic. Topics at global level are generally related to international agricultural trade, greenhouse gases (GHG) and its impacts on climate. At the national level, the Coordination Unit Climate at Thünen, working mostly as contact point for questions regarding GHG's and inKA (interdisciplinary contact point Agrarmeteorologie), is the German collection point of three agricultural institutes for climate related topics in agriculture.

One example of a partnership focused on the establishment of a science-based policy advice structure with scientific partners in other countries is given by AGMEMOD. The activities under the umbrella of “AGMEMOD goes Africa” enhances regular training activities in African countries or with African scientists visiting Germany. The training activities focus on the market modelling approach AGMEMOD.

In the second day, three examples of policy advice were presented in three different research areas.

3.1 The case of model-based policy advice with AGMEMOD

Lecturer: Dr. Aída González-Mellado (Thünen Institute of Market Analysis)

Characteristics of scientific policy advice with models:

- Prompt
- Independent
- Science-based
- Long-term and future oriented

Model supported policy consultations have a long tradition in the area of economic policy. They go back to the work of Tinbergen who in 1936 developed and used a general equilibrium model to work out projections for the economic development in the Netherlands, on the basis of which multi-annual business plans were prepared by the government.

Generally, model based policy advice involves three main actors: a research institution, the client and the general public. The research institution (e.g., private or public) is most often represented by a research institute based outside or inside a university, but could also be an in-house branch of the client’s institution. The clients comprise politicians (e.g., political administration or actual policy makers) as well as stakeholders, whereas the general public stands for all other research outside the research institution. The relationship between these actors might be a one-time project, but could also be established on a continuous institutional basis. Within the phases of the
policy cycle (problem recognition, agenda setting, policy formulation, decision making, policy implementation, policy evaluation) different combinations of these institutions are possible that influence the interaction and the role models can play within the process. The interaction between the research institution and the general public is marked by an exchange of scientific information. On the one hand, scientific progress developed by the research institution for the prevailing project diffuses into academia. While the scientific progress of academics is, on the other hand, a rich source of knowledge needed for the successful completion of projects. Additionally, academic criticism in the form of scientific committees attached to the research institution, peer reviews of journals.

In the case of AGMEMOD Germany, the model is hosted by the Thünen Institute and is applied to answer questions on price developments for agricultural markets caused by market changes. (For further information see Annex 1)

3.2 The case of climate impacts

Lecturer: Dr. Cathleen Frühauf (National Meteorological Service of the Federal Republic of Germany, inKA)

Farmers and policy makers need to consider various fields of science when trying to grasp the complex nexus of weather - climate impacts on agriculture and forestry. Therefore, in 2018 a central contact point for federal agencies for interdisciplinary questions was founded by the National Meteorological Service of the Federal Republic of Germany (DWD), the Thünen Institute and Julius-Kuehn Institute. This interdisciplinary contact point Agrarmeteorology (inKA) is based at the agro metrological institute of the DWD.

The goal of inKA is to pool the expertise of the institutes, enhance the teamwork, and use synergy effects to avoid the duplication of work.

inKa is following a three-step approach:

1. Collection and storage of relevant data at one place, which permits to requests to be answered more quickly.
2. Answering interdisciplinary questions, in research and for policy makers.
3. Identification of interdisciplinary research needs, which are then fed into the political process.

The contact point is thus a tool to make interdisciplinary research and the connected policy advice for weather and climate-related agricultural issues faster and more effective.
3.3 The case of greenhouse gases

Lecturer: Dipl.-Ing. agr. Bernhard Osterburg (Thünen Institute – Coordination Unit Climate and Soil)

The different departments of the Thünen Institute all work to some extent on topics related to greenhouse gases. The Thünen Institute of Climate-Smart Agriculture even focuses exclusively on measuring, reporting and reducing greenhouse gases in agriculture and land management.

Overall the institute is leading or involved in

- National emission reporting for agriculture and Land-use, Land-use change and forestry (LULUCF)
- Soil monitoring on organic and mineral soils
- Development and evaluation of mitigation measures
- Development and scenarios of future development pathways

Since 2012, the Thünen Institute has established the Coordinating Unit Climate, which is coordinating the policy advice on climate change mitigation, impact and adaptation of the institute. The coordination unit holds regular meetings with different departments which are directly involved in topics related to greenhouse gas. Moreover it is in direct contact to inKA.

The main client of the coordination unit is the Ministry of Food and Agriculture. The unit holds on a regular basis exchange meetings with the ministry. Other clients are the European Commission, the German Ministry of Environment, the Federal Environmental Agency and regional governments. The unit is also participating in governmental meetings and dialogue processes with public institutions and non-governmental organisations.

Based on the results of the different Thünen departments and further results by other institutes which are part of the Thünen network, the coordination unit publishes analysis and proposals on the EU common agricultural policy for the EU commission and for the German ministry. On national level the unit is directly involved to give advice for the national climate action plan and reduction targets.
4 How to write policy advisory statements - Wednesday 14th August

Lecturer: Dr. Claus Deblitz (Thünen Institute of Farm Economics)

The main goal of this presentation was to give a broad overview on which kind of policy advice the Thünen Institute provides. The examples come from the Thünen Institute of Farm Economics and might be handled slightly different in other specialised Institutes. However, they provide a valid guidance for the process. At the Thünen Institute, there is a straightforward pathway for requests on policy advice from the BMEL.

In the first step a department from the ministry requests policy advice for a specific case. This request enters the institute via the president (when more than one institute is involved) or director of the specialised institute (when only one institute is involved). It is then decided which specialised institutes and/or staff members are responsible for the specific request. The specific staff member(s) work(s) within the period given to provide the requested policy advice/position statement.

In specific circumstances the request comes from other customers (e.g., political parties or other ministries). In this case the request could reach the institute via email, telephone call or via post. The president of the Thünen Institute must be informed about this request.

The most important information for the scientist is the timeline and the required format of the output. Often, policy advice is requested on short notice, thus scientists giving policy advice need to be prepared to do so rapidly and ad-hoc as required. If no deadline is given in the first request, it can be worth to call the person who has sent the request and ask. The format for the policy advice can vary, written statements are the standard, but some prefer Power Point presentations.

Information on the target group for the policy advice is also relevant for the scientists giving advice. Such information indicates which language needs to be chosen and which previous knowledge is available on the issue and with the target audience. Avoiding acronyms, abbreviations and technical terms is always a good choice. When writing a policy statement it is wise to focus on what the target audience does not know and not on what the author knows. The message should be as short and concise as possible. The scientist giving advice should structure his/her statements in a written document, easily understandable and with a brief summary of each chapter. When possible, the advice should articulate different options, not only one single optimal solution. If there are scientific uncertainties, these should be communicated.

Policy advisers have to understand the policy making process. Policy makers will, in most cases, ask several institutions and consultants from other fields for advice. Policy decisions are not only a result of rational scientific results, but also the result of several discussions with different lobby groups.
5 Developing research questions on the field, feeding into politics and linking back to the field

The link to the farmers, fields and practical farm work is essential in science-based policy advice in agriculture. Policy advice will and should have influence on the farm work, thus everything advised should be an answer to current or future problems and issues out of real-life agriculture. It should also be proven to be doable. The final target group in agriculture, the farmers, must be a central component for policy advice; therefore scientists need to know the current and future problems in the agricultural sector with consideration of the farmers’ decision-making processes.

The participants drove to Thünen Institute of Organic Agriculture in Trenthorst to get an overview on the applied agricultural research done by this Thünen specialised Institute. In Trenthorst the Thünen Institute owns 600 hectares of testing fields, managed in five different farming systems. This allows scientists to test innovations in farming under scientifically controlled circumstances directly in the field, meaning it is possible to test whether innovations are feasible and to make them practical, understandable, and tangible. Stakeholders visiting Trenthorst are often taken on a tour on a tractor to experience the real agricultural research on live. This is proven to be more effective than indoor presentations. Especially organic agricultural farms are complex system, with different components, such as fields, animal keeping on grasslands, forests etc. These systems are easier to understand for stakeholders if they can visit them. When the focus is on a single part of the system, the influences on or by it, impacts can be seen directly.

Some experiences on the field are shown in the following pictures.
Developing research questions on the field, feeding into politics and linking back to the field
Developing research questions on the field, feeding into politics and linking back to the field
6 Summer School Project

The participants formed four groups starting from the second day and received a scientific paper for evaluation. A fictional governmental request was handed out connected to each paper. The participants were asked to prepare a policy statement and present this statement on the last day to members of the respective government or ministry. The format of the presentation was led by the creativity of the participants.

The public for the presentations were all participants who were currently not presenting and some interested invited Thünen colleagues simulated to be the respective government or ministry. They were allowed to ask questions and to comment.

Afterwards presentations were discussed and lessons learnt were collected.
6.1 "Lessons Learnt" from the summer school project

Some lessons learnt by the summer school project were collected during the summer school by the participants, others were observed by the organizers.

Preparation of the policy advice:

The participants prepared a policy statement over the four days from the summer school. Each day participants had two hours per day allocated to work on the summer school project. This is a similar situation experienced in reality as scientists from Thünen Institute in most of the cases have to prepare statements and presentations for policy advice often parallel to the regular running research activities. Many policy advice requests are given the institutes without previous announcement and also have to be handled in the short term. The participants experienced that the timeframes for policy advice are quite short and tight. In contrast to medium-term research projects, a time extension for the submission of the policy statements can be hardly negotiated. The lack of time as an excuse for handing over a less comprehensive policy advice is not acceptable, since policy makers often need to find quick solutions. Thus, the own time management and group management is essential for good science-based policy advice.

One group received a publication on glyphosate usage for weed control close to water bodies with the request of giving further advisement on this specific study case. Politicians, environmental NGOs, farmers, the industry and the civil society discuss the usage of glyphosate very critically, since there had been studies indicating that herbicides containing glyphosate can cause cancer. The task to prepare the policy statement for this case appeared to be especially difficult, since keeping objectivity can be challenging when topics are hotly discussed. The group decided to present only the clear facts mentioned in the respective publication accompanied by information from other scientific journals. The most important part was to stay focused on the specific request, which helped them to stay neutral. Important was for the group to understand and know the exact objective of the requested policy advice as well as the preparation of the meeting to present their findings. This group managed to give a structured, generally understandable and at the same time fact-based presentation. Even though, at the beginning of the project the team members believed to have one of the most challenging tasks.

Structure of the written policy advice:

After all the presentations, some basic components to achieve a good policy statement were summarized by all the participants. A brief self-introduction and a short summary of the request is a good start. This is important, as in reality, additional ministry officers from departments different from the one requesting the advice, might be also invited or might receive the written policy statement. In the summer school, this situation a similar atmosphere has been simulated, as each group had been working only on their presentation and did not know exactly the details from the other projects. Additionally, colleagues of the Thünen institute were invited to play the ministry
officers. Those colleagues had not read the request and got lost in presentations without a clear introduction.

All participants and organizers pointed out that statements need to be concrete, short and precise. This was experienced as difficult, since scientific results often require lots of background information, which cannot be summarised in short form. Those groups who managed to leave aside too many background information and focused on the topic, rather than giving additional advice, were perceived as the most successful. Helpful as well is to avoid slides with lot of text, it helped more to have graphs and illustrations.

**When presenting the policy advice:**

An important lesson learnt was also the way to approach policy makers. It is necessary to talk with the policy makers as colleagues. Even in the cases where the scientist might consider the policy request to be of minor importance or not well thought out. Policy advisors request support because they are not the scientific experts on the related field of science, but they are the ones who have the overview on the wider circumstances. This entails that scientists should behave professionally, know their public and avoid being arrogant. During the policy advisory exercise it was observed that very small details, such as knowing the names of the ministry officers sitting at the table is an important factor to consider.

A specific challenge for few participants seemed to be to not start being defensive when policy makers asked further questions during the exercise. The scientist has to give objective policy advice, thus explaining scientific findings, theories, he/she has to contribute to a broader knowledge for policy makers. Defending any personal point of view might affect the credibility of the scientist.

Participants mentioned as well that they have learnt that in some cases is required to talk openly. This involves also saying that the scope of knowledge in the specific research field is still not that advanced to answer the question(s). In some cases there is still some need for research on specific policy request or topic to reduce uncertainties. The scientist can only give advice based on the current state of knowledge. If those are simply too few or too scattered, this should be communicated. Same applies for uncertainties. If possible, the uncertainties should be quantified, such as in the Intergovernmental Panel for Climate Change IPCC summaries for policy makers⁶.

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⁶ See also: https://www.ipcc.ch/site/assets/uploads/sites/2/2019/05/SR15_SPM_version_report_LR.pdf
7 Summary

In August 2019, a five-day-summer school on science-based policy advice was held at the Thünen Institute in Braunschweig. The summer school introduced several theories of science-based policy advice, practical examples for science-based policy advice, as well as an exercise on how to write advisory statement. Additionally, an excursion to the fields and stables of the Thünen Institute of Organic Agriculture in Trenthorst was planned. The summer school had also an active part for the participants with a practical exercise of an advisory presentation of science-based policy advice.

The Thünen Institute, as a Federal Research Institute under the BMEL mandate, is responsible for giving science-based policy advice to the BMEL, but also to other ministries, international bodies, regional governments, NGO's, political parties and farmers unions. The institute provides research and collects data for greenhouse gas accounting in forestry and rural areas, for fishery inventories, agricultural trade, etc., on behalf of the BMEL. Those data are the subject of international negotiations such as the UNFCCC, on the EU fish catch quotas, and others.

Policy advice by the Thünen Institute is, when the requests are interdisciplinary such as those on greenhouse gases or climate change, coordinated by the specialized Coordination Unit Climate and Soil or inKA. The Coordination Unit Climate and Soil is based at Thünen Institute, collects the advice predominantly at the Thünen Institute and mainly focuses on greenhouse gases, whereas inKa is based at the Agrometeorological Institute of the DWD, focusses more on adaptation and coordinates advice by several federal research institutes. The advice coordination is required, since the ministries often request advice on short notice, within the running political processes. This is especially difficult when the requests are interdisciplinary.

For timely, accurate and successful advice, the communication with the client requesting advice is indispensable. The language chosen and the format depend on the needs and person sending the request. Thus it is advisable to know the requesters or simply ask them about their specific needs. Moreover the mutual trust between advisor and policy makers, same as for the policy makers to the advisor is important. Therefore the independence of the research and science-based policy advice has to exist. Another point of discussion was the objectivity of advice, which is a central point of science-based policy advice. Even if every person has a position, science-based policy advice needs to be based on evident numbers and clean research practices, which leads into the maximum of objectivity. Further the policy advisors should communicate uncertainties and different opinions, as far as they exist.
**Annex 1: Presentations**

Introduction – Thünen Institute – Germany’s major research institution for the rational use of natural resources (Aída González-Mellado)
Annexes 21

Three main tasks of Thünen Institute:

1. Research and participation in free scientific competition
   - Research of high societal relevance based on institutional budgets
   - Applying for third-party funds on national and international level
   - Collaborating in national and international research consortia

2. Conducting national longterm monitoring
   - National Forest Inventories, National Soil Surveys,
     Greenhouse Gas Inventories, Fish stock assessments etc.

3. Political consulting for German Government, EU etc.
   - Preparing science-based reports, expert’s opinions, options for action
   - Answering rapidly and highly skilled urgent requests from politics
   - Representing Germany in international science & advisory boards

Cooperations – our international network

December 2019

Thünen scientists cooperate with 206 universities / higher schools and 509 further scientific organisations and companies in 82 countries.

Take-home-message: Five features of Thünen Institute

1. Broad range of expertise (economics, ecology, technologies)
2. Scientifically independent, close to politics
3. Embedded in networks (national / international)
4. Sizeable number of highly qualified researchers
5. Latest methods and first hand data to answer key future issues

PhD Summer School 2019

Main objectives and outline

Braunschweig, 12th August, 2019
PhD Summer School 2019 scientific based policy advise

Why this topic?
New scientific novelties are spreading faster, the world is getting more interconnected. Future policies shall take complex developments into account, but how?

With scientific controversies, post-fact politics and societal challenges the use of evidence in public policy, evidence-informed policymaking needs advocates and skilled practitioners, both in scientific and policy bodies.

Objectives
Train future scientists on how to better integrate scientific evidence into policy-making;
Scientists will learn how to better communicate and visualise their results.
New insights on how ‘the other side’ operates;
Enlarged network of likeminded professionals, working on agricultural issues

Let’s move!
International Research Portfolio of the German Federal Ministry of Food and Agriculture (BMEL) (Maja Clausen)
Annexes

German Agricultural Research Alliance

Umbrella organisation of German Agri-food research organisations > 50 members

BMEL Mandate & Core Competence in Food, Nutrition and Agricultural Policy (Part 1)

International and EU:
- Expertise and experience in the spectrum of agriculture (incl. fisheries), rural development, food and nutrition
- Long-term collaboration with FAO and its Committee for World Food Security (CFS)
- Involvement in supranational formats, including G7/G20, UN, OECD

Key Milestones & Events:
- High level agri-food activities within G20 context: e.g. during G7 Presidency 2017, hosting of Meeting of Agricultural Chief Scientists (G20 MACS, Nov. 2017), participation in last MACS in April 2019 hosted by Japan
- Participation in various EU initiatives: 3 Joint Programming Initiatives, 18 ERA-Net, incl. ERA-Net Co-fund _LEAP-Agri_ (EU-Africa Partnership on food and nutrition security and sustainable Agriculture)

Multifaceted role of federal research: bridging science & policy

Research Cooperation for Global Food Security and Nutrition
(main funding instrument)

- 3 calls: 2013, 2016 and 2019 (published in July, still open)
- Since 2013: 20 international consortial projects approved
- Financial volume: approximately 20 Mio €

- Long-term partnerships
- Involvement of relevant partners for sustainability (e.g. SMEs, NGOs)
- Identifying local solutions using competence of Germany’s agriculture and nutrition research
- Knowledge and experience sharing for capacity development
- Contributing to Sustainable Development Goals (SDG)

Coordination mechanisms at national level:
  - High-level Round Table, first cycle = focus on Africa, BMEL lead role in WG on Agriculture, Nutrition & Food Production
- Close dialogue with the German Agricultural Research alliance (DAFA, a network of all relevant German agricultural research institutions)
- Various other multi-stakeholder formats & platforms (e.g. on specific topics or with respect to individual countries/regions)

BMEL International Research: Aims & Instruments

Aims:
1) Engagement in scientific exchange and progress
2) Creation of enduring international alliances
3) Contribution to capacity building

Funding Instruments:
- Bilateral research collaboration with selected partner countries.
  - e.g. Joint projects with Japan, exchange of scientists with China and New Zealand
- PhD programme
  - Research partnerships training for PhD students from developing countries and emerging economies at German agri-food research facilities
    - PhD Programme Sub-Sahara Africa: 3 years, approx. 0.8 Mio €, 8 PhD students
    - PhD Programme Iran: 3 years, approx. 0.8 Mio €, 8 PhD students
- Research Cooperation for Global Food Security and Nutrition
  - Practice-oriented research projects, conducted in cooperation between German agri-food research facilities and corresponding facilities in selected developing countries and emerging economies
Contact details: Maja Clausen, Division 121: Research & Innovation
(Maja.Clausen@bmel.bund.de)

Thank you for your attention!
Some theory - and practical lessons from 25 years of model-based policy advice by the Thünen Model Network (Frank Offermann)
Models of science based policy advice (Habermas) – Pragmatic model

- Objectives and means are determined by discourse between researchers, policymakers and the public.
- Research provide input, but do not determine objectives or means.
- Pragmatic model has many variants: "co-production", "deliberative", "co-evolutionary", ...

Requirements (of science/society) for science-base policy advice (selection) (I)

- Objectivity
- Transparency, Public information
- Distance (Independence)
- Plurality

Requirements (of science/society) for science-base policy advice (selection) (II)

- Objectivity: Objectivity in the sciences is above all a result of a meaningfully organized scientific process and rests the consequence of the objectivity of the individual scientists. (Kichigae, 2013)
- Transparency, Public information: Transparency of advice and decision-making processes ensures traceability of decisions and confidence and trust in decision-making processes as well as the argument that inform them. (Wingen, 2008)
- In order for the consultants to have incentives to make correct statements in their opinions, the process of economic policy advice must be organized in an open and transparent manner. (Kichigae, 2013)
- Openness ensures equal access to all relevant information and is a prerequisite of trust. It refers both to the committees and their advisory processes as well as to the results. (Wingen, 2008)

Requirements for science-base policy advice (selection) (III)

- Distance (Independence): Distance ensures independence of advice, i.e. the mutual independence of politics and science, so that there is no mixing of individual interests and scientific judgements. If independence of the advice is not maintained, it loses its credibility, its authority and legitimacy. (Wingen, 2008)
- Plurality: Plurality refers to the form and diversity of advice. Different disciplines and consultants, who are represented in the advisory process according to the topic, ensure the variety of perspectives, scientific theories and methods. Narrowing jeopardizes factual adequacy and confidence in knowledge. (Wingen, 2008)
Annexes

Preconditions for successful science based policy advice
The researcher

Demands (of policy / policymakers) to scientific policy advice (selection)
- must be prepared to provide rapid ad-hoc input
- must learn to deliver short and concise messages
- avoid being arrogant; do not alienate the policy makers / the public
- should articulate multiple policy options rather than advocating a single „optimal” solution
- communicate scientific uncertainties
- needs to have an improved understanding of how policy making works

What makes agricultural economics research relevant for policy advice?
The key elements for researchers include
- doing high-quality work
- communicating effectively with the right audiences,
- and paying attention to timeliness and windows of opportunity
- understanding the policy-making process

Brink, 2012: Canadian Agricultural Economics Society

What is a model?
A model is a simplified picture of complex reality.
Example: Map

Required characteristics:
- simple
- realistic
- generalizable

Model based policy advice

Model based policy advice

- Models help to structure knowledge and understand reality
- Economic theory alone generally offers no conclusive answers to questions about solving economic policy problems, especially in the case of conflicting income and substitution effects \(\Rightarrow\) empirical analyses are indispensable for the advisory process (Kirchhüser, 2013).
- Models facilitate the analysis of hypothetical situations (with/without: ex-post/ex-ante)
- Models are a research tool for policy relevant science
- Experience from OECD and EU Commission (DG Agri): Models help
  - to „depoliticise” debates
  - to avoid simplistic answers
  - to overcome intra- and/or interministerial barriers
- Models are a communication tool
Annexes

The Thünen Model Network

Motivation

Background:
• Changing (economic) framework/conditions
• Issues in agricultural, energy and trade
  policies becoming increasingly complex

Objective:
• Support decision making of policy and society by providing ex-ante assessments of
  the impacts of potential policy changes
• Reduce complexity of reality to essential relationships
• Assessment of the order of magnitude of potential policy impacts
  • for different groups/actors
  • for a broad spectrum of policy-relevant topics

The models

Application of economic models which address different decision making levels (e.g. farm, regional, sector level)
• MAGNET
• AGMEMOD
• CAPRI
• RAUMIS
• FARMIS
• TIPI-CAL und TYPICROP

Methodology: The Thünen Modelling Network

Examples of research based policy advice by the Thünen Model Network

Contributions to the development of the German negotiating position on the EU agricultural policy
• Model results show to what extent the new options for a national design of direct payments proposed by the EU Commission can lead to competitive distortions between the EU member states

Decision support for the national implementation of new agricultural policies
• For the planned introduction of a national uniform premium in Germany, the extent of changes in farm incomes was estimated in advance and potential cases of hardship were identified.

Identification of need for political action
• Regular projection of the future development of the agricultural sector if current agricultural policy is maintained ("Thünen baseline"). Example: Compliance with the emission targets for ammonia requires further policy measures
Annexes

Selected Studies
- 2002: Mid Term Review proposals
- 2003: Mid Term Review decision
- 2004: National implementation of the Luxembourg reform
- 2005: Sugar market reform
- 2006: Milk market reform
- 2008: Cereal market organisation
- 2010: CAP Health-Check
- 2009: WTO negotiations
- 2012: Sugar market reform
- 2012: CAP after 2013
- 2014: Free Trade Agreements (Mercosur, CETA, TTIP)
- 2017: Brexit

‘Human capital’ / institutional setting

- Thünen Institute:
  - Established 1995
  - 12 researchers on permanent positions involved (but often with only small share of total working time)
  - + changing number of scientists on third-party funds
    - continuity of staff
    - continuous regular long-term maintenance of models
    - broad expertise

- Ministry:
  - single contact point (relative high continuity of staff)

Joint discussion of ‘terms of reference’ for new assignments as a key factor for successful model based policy consulting

- Identification of key questions / results
  - scientific community: impact on welfare, efficiency
  - policy makers: feasibility of reaching political consensus for potential policy alternatives
  - distributional aspects
  - financial viability (budgetary aspects)
  - implementation feasibility
  - negotiating positions of other EU member states
- Joint discussion of assumptions and scenarios; consistent and accepted baseline scenario
- Appropriate and accepted mix of models (including incorporation of ‘non-model’ based analyses and expertise)

Model-based policy and technological impact analysis: The concept of the reference scenario

- Model based policy advice
  - Specific challenges experienced by the Thünen Model Network
    - Establishing an accepted Reference Scenario: The Thünen Baseline
    - Model linkages and communication of results

Annexes

The Thünen-Baseline: Why and how do we do it?
- Existing baseline is precondition for timely response to requests from ministry
- Accepted baseline scenario is precondition for effective and efficient policy consulting
  
  Establishment and publication of a regular Thünen-baseline

Steps in the process of establishing the Thünen Baseline
1. Agreement on assumptions
   Meeting with representatives from different departments of the Federal Agricultural Ministry to discuss and agree on assumptions for (Agricultural) Policy framework and the development of other exogenous variables (e.g., GDP, population, ...)
   - Inclusion of expert information
   - Increased acceptance ("co-produced reference scenario")

2. Establishment of first results
   - Model harmonisation
   - Refining of model results as a basis for further models of the network
   - Consistency and aligning model results to achieve consistency

3. Presentation and discussion of first results
   Meeting with representatives from different departments of the Federal Agricultural Ministry as well as representatives from the Länder ministries

4. Establishment of final Baseline projection
   Adjustment of models or interpretation of results, final Baseline results

The Thünen Baseline
- Agri-Economic projections for Germany
  - Trade - bilateral
  - Prices – farm gate prices for many products
  - Demand – differentiated by use
  - Production - differentiated for many products, regions, farm groups
  - Land use - differentiated for many crops, regions, farm groups
  - Income – sector and farms; taking into account ownership of production factors
  - Environment – nutrient balances, gaseous emissions
- Medium-term (10-year) projection horizon
- Business-as-usual Scenario
  - Continuation of current agricultural policy and specific developments of external variables, e.g., trends

Model based policy advice
Specific challenges experienced by the Thünen Model Network
- Establishing an accepted Reference Scenario - The Thünen Baseline
- Model linkages and communication of results

Model linkage
- Strong increase in development and application of linked model systems in agricultural domain
- Driven by both demand and supply
  - Complex challenges (far-reaching policy reforms, climate change, food and/or energy, globalisation)
  - Technical progress
- Abandonment of quest for ‘single universal model’

How to link models?
- Linking model system
  - Communication between models/systems
  - Interface
- Institutional set-up
  - Financing? property rights? continuity? incentives?
How to link models?

Linked model system

- Communication within model system
- Model A
- Model B
- Model C
- Interface

- Institutional set-up
  - financing? property rights? continuity? incentives?

Communication of model results for policy advice

- Communication of results must be tailored to target group
- Results presentation should be results and not model oriented
- Explain cause-effect relationships for non-modellers
- Embed additional expert-based analyses
- Underpin stability of results with sensitivity analyses
- If necessary, talk beforehand about
- Difference between various models and their results
- Developments of databases and new extensions of model structure
- Attend carefully to divergent results

Do’s and don’ts of presenting results

**Don’t**
- Sequential presentation of divergent results, e.g.,
  - “Impacts on beef production. Model A: +5% Model B: +10%”
- Present divergent results as if their reliability can be clearly ranked, e.g.,
  - “… but model A likely underestimates impacts because of…”

**Do**
- Decide on comparative advantage of models
- Give ranges, e.g.,
  - “Beef production rises by 5-10%…”
- Convey message, e.g.,
  - “Sensitivity area: impacts could be higher. Monitoring is required; compensatory policy measure might be needed”
Practical example of research-based policy advice: Greenhouse gases (Bernhard Osterburg)

Structure
1. Our activities in the field of climate change mitigation
   Thünen Institute and the Coordination Unit Climate
2. International Level: Climate negotiations, networking
3. EU level: Effort sharing and LULUCF regulation, Common Agricultural Policy

Challenge: Interdisciplinary Solutions in 20 Thematic Areas

Research activities related to agriculture and climate change mitigation
- National emission reporting for agriculture and LULUCF
- Soil monitoring on organic and mineral soils
- Development and evaluation of mitigation measures
- Development and scenarios of future development pathways
- Organization of conferences and workshops
- Research based policy advice

The „Coordination Unit Climate“
- Since 2012 (Bernhard Osterburg)
- Directly reporting to the Thünen president
- since 10/2017 with Claudia Heidecke
- Coordination of policy advice on climate change mitigation, impact and adaptation of the Thünen-Institute,
- Contributes to planning of research
- Closed and regular cooperation with specialised institutes (AK, BW, LR, AT, WG, Hf, with others less regular)
- Activities at the interface of science, policy advice and support of the German Ministry of Food and Agriculture (esp. unit 521)

Parameters for the sustainable use of our natural resources!
Scientific, Policy-oriented, Independent
Annexes

Activities of the coordination unit

- Main client: Ministry of Food and Agriculture, further: EU-COM, German Ministry of Environment, Federal Env. Agency, regional governments (Laender)
- Regular exchange with the Ministry unit 521 (each 3 months)
- Participation in governmental meetings and dialogue processes with public institutions and NGOs
- Elaboration of emission projections, assessment and evaluation of mitigation options, evaluation of new instruments (C pricing)
- Presentations at organisation of conferences and workshops
- Networking + own research projects as basis for policy advice

Climate change mitigation goals

- 1.5 degree goal = global GHG reduction by 40 to 70%, until 2050 (basis 2010)
- ... by 40% until 2030 (basis 1990)
- ... by 80 to 95% until 2050
- Germany
- ... by 55% until 2030 (basis 1990)
- ... by 80 to 95% until 2050
- agriculture: by 31-34% until 2030

Activities of Thünen-Institut

- Analysis of negotiations, development of international networks
- Analysis on CAP and GHG mitigation, role of land use
- GHG reporting (agric. + LULUCF), coherent proposals for the German climate policy, impact assessments input to expert report on climate policy of BMEL, scientific advisory boards (2016)
- New research topics

International networking

- Cooperation in the Global Research Alliance on Greenhouse Gas Emissions from Agriculture (GRA), CLIFG-GRADS Scholarship
- International Conference on Agricultural GHG Emissions and Food Security, September 2018, Berlin, with 300 participants
- FAO Knowledge Hub: CL (land climate) hub – advice & ideas
- ICOS: European Integrated Carbon Observation System Research Infrastructure (GHG Fluxes), Thünen-AK coordinates ICOS-DE

Analysing proposals of the EU Commission, e.g. for the integration of LULUCF into EU climate policy

2030 climate and energy framework

ETS
-43% (basis 2005)
- Replacing Kyoto Protocol, including EU climate action
Non-ETS
-30% (basis 2005)
- Transport, buildings, etc., agriculture, LULUCF
ESR
-30%
- Flexibility:
- Max. 280 Mt CO2-eq
- RU debit
LULUCF
-5%

For the EU Commission...

... and for the German Ministry...

Own analysis and proposals on the EU Common Agricultural Policy

Study: "Measuring agricultural policy goal 2016"
### The national level: Climate Action Plan 2050 – reduction targets for 2030

- Introduction of a sectoral reduction target for agriculture
- Reduction by 11 – 14 Mt CO₂-eq. p.a. by 2030 compared to 2014
- LULUCF sector currently a net sink, which shall be safeguarded

<table>
<thead>
<tr>
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<tbody>
<tr>
<td>Energy sector</td>
<td>61-62%</td>
<td>23%</td>
</tr>
<tr>
<td>Buildings</td>
<td>66-47%</td>
<td>43%</td>
</tr>
<tr>
<td>Transport</td>
<td>40-42%</td>
<td>2%</td>
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<tr>
<td>Industry</td>
<td>49-51%</td>
<td>36%</td>
</tr>
<tr>
<td>Agriculture</td>
<td>31-34%</td>
<td>18%</td>
</tr>
<tr>
<td>Total</td>
<td>55%</td>
<td>28%</td>
</tr>
</tbody>
</table>

### GHG emissions of the German farm sector

- **ca. 111 Mio. t CO₂-eq. p.a. = 12.5% of total GHG, NIR 2017 for 2015**

#### Reduction of N surplus in agriculture

- Increasing N use efficiency

#### Activities of Thünen-Institute

- **EU**
  - Effort sharing
  - Renewable Energy Directive
  - Air pollution (NEC-RL)
  - Water protection (WFD, Nitrate Directive)
- **Germany**
  - Climate action plan 2050
  - German Sustainability strategy
  - Water protection
  - Regulation of fertilisation
- **Agricultural water protection**
  - Optimised climate-friendly project component on GHG emissions from agriculture
  - Güllebest – Reduction of NH₄⁺- and GHG emissions from slurry

### Reports on fertiliser policies

- **Fertilisation ordinance and Farm Gate Balance**

### Protection of organic soils and reduction of turf use

- **Integration of LULUCF into EU climate policy**
- **Germany**
  - Climate action plan 2050: protection of organic soils
  - Coalition contract 2018: Strategy for protection of bags and mires, reduction of turf use
- **Aktivitäten des Thünen-Instituts**
  - Joint project on organic soils in emission reporting
  - Protection of organic soils in DE
  - Grassland on organic soils (SWAMPS)
- **Climate Smart Agriculture on Organic Soils (CASO)**
  - Monitoring of farmed organic soils
  - Cultivation of sphagnum moss
  - Reduction of turf use: LCA and economic analysis
  - Support to Bund-Länder-agreement
Results on emissions from organic soils, monitoring, evaluation and options for action
DWD, inKA Practical Example of research-based policy advice: The case of climate impacts
(Cathleen Frühauf)
Annexes

**Software package AMBER**

**AMBER Model Crops**
- Cereals (wheat, rye, barley)
- Maize
- Grassland
- Sugar beet
- Oil seed rape
- Potato

In stage of development:
- Sorghum
- Energy wood (poplar / willows)
- *Sphagneticola trilobata* (crop plant as an energy crop)

- 2019/2019: first measurements for Ricin, Ginger, Millet, Coffee, Peanut

**Model AMBAV**

- E.g. as percentage of plant available water (PAW):%

**Use of AMBAV in Germany**

Routine operation:
- Plant available water
- Irrigation control
- Soil trafficability

Ministry of Agriculture: information about extreme drought and oversaturated soils

On demand/research:
- Analysis of water budget of agricultural crops
- Identification of possible cultivation areas

https://www.weltagrar.de/DE/leistungen/agrarwetter_prognose/agrarwetter.html (screen view, example)
Use of AMBAV in Germany

AMBAV as Impact Model
German adaptation strategy on climate change (DAS):
- with climate projections – future water needs of crops
- studies about extreme weather events for agriculture in the past and future
- German Climate Atlas (www.deutscher-klimaatlas.de)
- Indicator for vulnerability: soil moisture

AMBER and climate projections

21 regional models

measurements 1961-1990
climate predictions 1961-1990
climate predictions 2011-2040 till 2071-2100

- comparison AMBER-results 1961-1990 (input data: measurement and climate prediction)
- assessment of the future
German Climate Atlas: www.deutscher-klimaatlas.de

Beginning of Vegetation Period

AMBAV Low Soil Moisture

number of days with soil moisture < 50% useable field capacity crop: winter grain, light soil period: April - October
Annexes

EXTREM WEATHER: SOIL MOISTURE

BENEFIT

OF AGROMETEOROLOGICAL ADVICE

> achievement of optimal harvest
  - optimal timing of sowing and harvesting
  - optimal timing and amount of irrigation
  - optimal timing of pest control

> environmentally sound cultivation
  - reasonable handling of soil and water resources
    (e.g., concerning the timing of the use of pesticides)

Consultation of the politics concerning:
- Environmental legislation
- Assessment of "extreme weather events" linked to climate change
- Capacity building...

inKA

INTERDISCIPLINARY CONTACT POINT AGRAR METEOROLOGY (inKA)

- central contact point for federal agencies for interdisciplinary questions about weather and climate impacts on agriculture and forestry
- important contribution for research-based policy advice of the 3 institutions Thuenen Institut, Julius-Kuehn Institut, and DWD
- founded 2019

Goal

- Pooling of expertise of the institutes
- Enhancement of teamwork
- Use of synergy effects
- Avoidance of duplication of work
- Reduction of costs and manpower requirements
Annexes

**inKA**

3-stufiger Ansatz
1. Daten vorhalten
   - Auflistung der vorhandenen Daten → schnelle Beantwortung möglich
2. interdisziplinäre Fragestellungen beantworten
   - Neuer Ansatz
   - Kompendium für Relevanz

3. gemeinsamen Forschungsbedarf identifizieren und interdisziplinäre Forschungsprojekte anregen und wichtige Forschungsfragen in den politischen Prozess bringen.

**Agrarmeteorological research and modelling**

- Aktuelle Messdaten des DWD & Ländernetze
- Voraussagen
- Numerische Wettervorhersagen
- Monats-/Jahreszeiten-Vorhersagen
- Klimaprojektionen

**AMBAV – soil moisture**

- agrarmeteorological modelling: z.B. soil moisture in %nFK (1996)
- über 20 Jahre kontinuierliche Verifikation der Modellresultate

*new goal: Use of monthly prediction for estimation of the future trend in soil moisture*

**AMBAV: new crops**

- Phénologie:
- BBCH Code: ex. winter wheat (blé hiver)

**Canopy Height and Root Depth**

- during the vegetation period
- Canopy height: information for aerodynamic resistance $r_a$ and to estimate LAI
- Root depth: information from with soil layers the crops can extract water

**Leaf Area Index (LAI)**

- Leaf area in $m^2$ per $1 m^2$ soil surface
- LAI determined:
  - Transmission of sunlight through the canopy
  - Interception of water
  - Reduction of precipitation, which is reaching the soil surface → influence on soil moisture
Annexes

Canopy Characteristics (First Step)

Distance between Rows (a) and Plants (b):
- Information about:
  - number of plants per 1 m² or 1 ha
during the development of the crops (e.g. weekly)
- canopy height
- photos

AMBAV global / main model characteristics

Penman-Monteith evapotranspiration relationship

\[ \lambda E_c = \left( \frac{\partial q_{tot}}{\partial T} \right)_{T_a} \left( R_p - G \right)_c - \rho c_p \left( q_a - q_{tot} \right)_{T_a} \]

Aerodynamic resistance \( r_s = f(v, h_s, z_0 = f(h_s)) \)
Bulk canopy resistance \( r_c = f(r_s, r_a = f(r_s, LAI), r_a) \)

Stomata Resistance

Parameter Measurements Ambonente 09.03.2018

Objectives of the Cooperation in Madagasgar

- Start of a cooperation between DGM and DWD in the agricultural sector
- Capacity building for national stakeholders in order to:
  - Produce a more realistic forecast about the water availability and water need of agricultural crops
  - Which could enhance the agrometeorological information products in Madagascar

Key results of the Mission

- There are technical and human capacities to run the model AMBAV
- High motivation of the technical experts involved
- We are optimistic based on the first impression, that AMBAV can be adapted and be used in Madagascar
- Constraints encountered:
  - Data transmission and storage
  - Phenological observations
- The agrometeorological products could benefit from the outputs of AMBAV

Thank you for your attention
Writing Policy Advisory Statements – Examples (Claus Deblitz)
Annexes

The start

1. Think about your target group
   - What is their background? Are they ag economists?
   - How does their day look like?
   - What are they going to do with your advice?

2. Form before content
   - Create/use a fixed layout
   - Create/apply an easy-to-use word template

3. Leave your own agenda behind
   - Your opinion as a private person does not count
   - You have to bring facts to an informed decision making

Ethics and funding

1. We aim to be independent and committed to facts and scientific principles

2. Difference between public and private institution
   - Often, public employees can allow themselves more often to say „No“
   - However, we sometimes have to make compromises on the „political“ side such as rephrasing of sensitive sections, postponement of publication

3. However, never „sell“ yourself to produce a pleasing opinion
   - It will damage your (and eventually your client’s) credibility

Structure (I)
- unless you just reply to specific questions

1. Introduction
   - Describe the task and the questions you were given:
     "With a letter from 19.08.2019, BMEL, department IDES, asked the Thünen Institute of Farm Economics to provide a statement on the alternatives of piglet estration without anaesthesia"
   - Provide some contextual background of the issue
     "The castration of piglets without anaesthesia has been a long-time practice in German pig production. Societal pressure through NGOs and media has led to a renaming of these practices and policy is asked to provide solutions. However, it is likely that these changes will create significant costs on farm level."
   - Describe the objective of the following text:
     "Consequently, the objective of this report is to analyse the implications of estration practices in terms of animal performance, farm-level costs and feasibility of their implementation."

Structure (II)

2. Background/situation/approach
3. Methods and data
4. Results
5. Conclusions and recommendations
6. Summary
   - Usually no longer than 1 page
   - Targeting the leadership of the Ministry (Division leaders, Secretaries of State, Minister)
   - Result oriented, advice and conclusions are most important

Other issues

- Do not write what you know, write what the reader does not know!
- Every sentence must make a contribution to the main questions and the topic, otherwise leave it out.
- Write short sentences (and read „The Economist“ for good English).
- Do not use too many technical terms unless no alternative.
- Structure your text with headers, subheaders and bullet points instead of producing „lead deserts“

CD: Summer School 2003 1-98564.docx
Other issues

- **No abbreviations** (only after introduction)
  - carcass weight (CW)
- **No scientific units**: USD 10 kg CW⁻¹
- **Write text instead of units**
  - ”USD 10 per kg carcass weight” instead of ”USD 10 / kg CW”
- **Make conclusions after each chapter** and try to make a transition to the next chapter. Example:
  - “The analysis has shown that the boar fattening and the immunocastration with Imprana can improve animal performance. In contrast, the surgical measures with anaesthesia regularly lead to a reduction of performance. In the next chapter, we analyze their effects on the costs and the profitability.”
  - *If properly done you can copy-paste them as a basis for your summary*