TOWARDS FUTURE CHALLENGES OF AGRICULTURAL RESEARCH IN EUROPE

Brussels, 26th and 27th June 2007

26th June

Afternoon session

José Manuel Silva Rodriguez – Director General DG Research
Good afternoon Ladies and Gentlemen. I am particularly pleased to welcome such a large number of participants from a wide range of backgrounds to this important conference on the forthcoming challenges for agriculture and adequate responses for research and development.

With the complexity of the challenges that European agriculture has to cope with – increasing globalisation, climate change, and unsustainable consumption of natural resources – we think that an appropriate measure is needed for developing a good and coherent European research agenda.

This is the first time ever that a discussion on such a crucial issue has been supported by a wide preparatory Foresight exercise initiated by the Standing Committee on Agricultural Research (SCAR). This led to the formation of possible scenarios for European agriculture over the next 20 years and will help in the prioritisation of agriculture-related research in Europe in the medium to long term.

A large amount of work has been carried out already and has been processed into two major reflection documents, which have been put on the conference website and are available here in the room. The first is a report from an independent high-level group of Foresight experts, called FEG. The other is a discussion paper on possible research needs evolving out of this Foresight analysis following discussions at a preparatory workshop in Stockholm in March of this year.

I have the honour to chair the introductory session in the presence of two of my bosses – my former boss, Mariann Fischer-Boel, and my new boss, Mr Potočnik – and also in the presence of the Secretary of State of the German Federal Ministry of Food and Agriculture, Gert Lindemann.

The invited speakers in the next session today will reflect on the outputs of the Foresight Expert Group and another Foresight exercise, using these to identify key findings and possible gaps.

The invited speakers in tomorrow morning's session will discuss the FEG findings from their view in their role as stakeholders. They are expected to develop a

reflection of research and development priorities and conditions that emerge from an analysis of the material in the scenarios.

Suggestions on potential changes and innovation in the European agricultural research system will then be fed into the panel discussions on the long-term agricultural research knowledgebase in Europe.

I would like to introduce Commissioner Potočnik to give the first speech. Thank you very much and have a very good conference.

Expectations with respect to research

- **Challenges for Research and Foresight**

Janez Potočnik – Commissioner for Science and Research
Ladies and Gentlemen, it is a pleasure to be here today.

Today's theme about the future challenges of agricultural research is truly very broad, so it may be difficult to provide an outline of the research challenges of the next 25 years in just 15 minutes. However, I feel that my colleague, Commissioner Mariann Fischer-Boel, who is speaking after me, probably has an even harder subject – the future of agriculture in Europe. It was one of her compatriots, the Danish scientist Niels Bohr, who famously said once, 'Prediction is very difficult – especially if it is about the future'.

I am pleased that we have a wide range of people here today because agriculture and its research are not isolated – it is in fact a chain. For example, it involves a chain of suppliers, a chain of seasons, and a food chain that passes through supermarket chains. However, agricultural research is about much more than just food. It is about the environment, climate change, globalisation, energy, health, and even security. It is also about jobs and growth. This means that everyone in the agricultural chain – farmers, industry, regulators and consumers – have to work together.

A holistic approach is also needed in research because the kinds of advances we are seeking here need to be approached from many different scientific disciplines. Research and new technologies coupled with increased globalisation have already led to major changes in agriculture.

Take wine as an example. Research advances mean that we can now transfer vines to other parts of the world and successfully cultivate them, bottle and transport the final product to distant markets, even improve and sometimes replace corks to improve taste and reduce waste. This last improvement is thanks to European Union Framework Programme funding.

However, a well-known scientific law is that every action also has a reaction, and that certainly applies in agriculture. Replacing the cork in wine bottles led to some protests from farms that had produced bottle corks for decades, and while improved technologies have helped increase wine production, in some cases this has led to overproduction and so to falling prices. Add to this the increased consumer choice due to globalisation and it is easy to see that what can be advances for some, such as the consumer, can actually hurt others, such as local producers. This is not just a theory. Just last week, the BBC reported that a new group of winegrowers in Languedoc have threatened violence unless the French Government raises the price of wine.

So we have to think carefully about who and what is affected by our agricultural research and whether it is sustainable. This will need input from all sides and especially from the business sector. After all, the European bio-economy, which

includes agriculture, forestry, fisheries, aquaculture, bio-based handling of resources and rural development, has an estimated annual turnover of more than 15 trillion euro and employs over 22 million people.

Research can support and strengthen this European knowledge-based bio-economy. Research can not only improve Europe's economic and employment growth, it can also provide innovation, new applications and products in areas such as novel food, biodegradable plastics, new agricultural products and practices, and sustainable environmentally-friendly biofuels.

Biofuels is the second agricultural-research issue I would like to focus on briefly. Biofuels are so important mostly because the EU is heavily dependant on oil. We import 70% of all we need. With biofuels produced in Europe we can therefore guarantee a better security of supply.

We have the raw materials. For example, biomass and waste in France offers the equivalent of almost 12 million tonnes of oil. Europe has also become the world leader in bio-diesel production, with a market which has grown from 55,000 tonnes in 1992 to more than 3 million tonnes in 2005. Bio-ethanol has had a 15-fold increase from 47,500 tonnes produced in 1993 to over 700,000 tonnes in 2005. Nevertheless, if we want to ensure their full potential to contribute to environmental and competitiveness objectives, it is absolutely imperative that we improve their efficiency and performance. Research and development is instrumental in this respect.

The European Commission, through the European Framework Programmes, has already provided significant financial support to bio-energy and biotechnology research. For example, the EU is supporting several large-scale research projects aiming at converting biomass into biofuels, bio-products, heat and power. The Seventh Framework Programme (FP7) is very much oriented towards speeding up the development of superior-performance biofuels, those of second generation and beyond biofuels. I believe this will be very important if we want to ensure that our security of supply is met is a sustainable manner.

There is already concern that increased dedication of agricultural land to biofuel crops will reduce the amount dedicated to food and that this will reduce the supply of food. So the questions on the research – how much funding to give it, who needs it most, and where to spend it – are very political as well as practical considerations. This applies on the regional, national and especially European Union levels. This question may arise again next year when the review of the European Union's budgets begins.

Europeans are already benefiting from a rise in EU research spending. The new Seventh Framework Programme offers funding of almost 55 million euro for the next seven years and its research results will have a direct bearing on the agricultural area. In FP7, there are specific programmes dedicated to areas key to agriculture. For example, it has a food, agriculture and fisheries bio-technology theme which will receive almost 2 billion euro in research funding. This will look into sustainable production, food and health, and life-sciences, among other areas. FP7 also has an energy theme, which will aim to improve the environmental and energy production of biofuels, make them more cost-competitive, and develop the concept of bio-refinery.

There are many more opportunities for funding and support for agricultural research in the new Framework Programme and I encourage you to take full advantage of these in all areas.

I am pleased that we are discussing developing agricultural research while the European Commission has a public consultation open. Our Green Paper on the European research area, and how we can improve it, is open until the end of August. We want as many ideas as possible on how research can fully improve Europe and how it can also improve your sector. From your perspective, it may be that you feel the researchers are too restricted in their mobility, that they do not have the right research infrastructures, that there are too few partnerships, too little coordination or not enough international cooperation – or you might be thinking of all of these together. Either way, we would welcome your feedback very much.

Research in Europe can only improve our European agro-system. The European research area discussion is about asking questions. By asking them, we can get feedback from everyone, from international experts to those working on the ground, and I think agricultural research could benefit in exactly the same way. At this conference there are several questions we could ask about how European agriculture will advance and what role research will and could play. For example, can the European agricultural system remain competitive in the new international context set out by the Foresight scenarios? Will agricultural research be more focused on food, energy or the environment? How can future research still offer innovations and competitive advantages for the European agro-systems? I hope the deliberations over the next 24 hours will help provide us with some clear answers.

Agriculture and research represent central areas in Europe and also in the world. Many discussions on agriculture focus on output, but today it is about input – your input. We all know that research can give us answers, but first we need to know the right questions – and that is where you can play a vital role. Agriculture and research are all about growth – growth of new products, new ideas, new techniques, and growth of jobs, economies, and also people.

An American actor once said, 'As you grow older, the only things you regret are those you did not do'. I hope we all make the right decisions over the coming days, months and years so that we do not have the same regrets in times to come. Thank you very much.

José Manuel Silva Rodriguez
Thank you very much, Commissioner. Now I would like to introduce Mariann Fischer-Boel, Commissioner for Agriculture and Rural Development.

- The future of agriculture in Europe

Mariann Fischer-Boel – Commissioner for Agriculture and Rural Development
Ladies and Gentlemen, dear Friends, it is a great pleasure for me to have the opportunity of participating in the opening of this conference today.

When I looked at some of the advertising material for this event, I saw that the organisers of this conference were not trying to hide from difficult topics. Among the questions to be asked were how climate change will affect agricultural production, what role biofuels will have in European farming and how it will influence food prices.

Please let me know if you find answers to these questions after your conference because if you do, you will at least halve my workload from now until the end of 2009 at the end of my term! In reality, of course, it will be very difficult to give firm answers at this stage but I think none of us underestimates the importance of these questions.

What I find exciting at this moment is that these issues – and others related to farming, food, and the way we use the land – are actually breaking through into the general public awareness much more powerfully than we have been used to seeing. People want to know about climate change, they want to know what it will do to the world, especially to the beautiful historic landscapes and the valuable farmland that we have specifically in the southern European countries.

They also want to know about the possible impact of bio-energy and biofuels. When I travel, I constantly come across the discussion of food versus fuel. The debate has actually exploded in the media recently with dramatic stories about increasing commodity prices and food riots on the streets of Mexico. People want to know whether energy crops will really be a tool for progress or whether they will create new problems.

I would add that people also want to know about the implications of the expansion of global trade. The European Union is a strong advocate of a more liberal trading system and we have been strongly defending it in the Doha Round. However, the public has questions about what this would mean for the prices of our different agricultural commodities.

These are all big topics and, along with many others, need to be broken down and analysed piece by piece.

The Standing Committee for Agricultural Research Foresight process has made a very strong contribution to this work. It was very impressive both in breadth and in depth, so I offer my congratulations and thanks to all who have been involved in these discussions. The future of European agriculture needs work like this because the future will depend to a large extent on knowledge.

I sometimes meet people who are surprised at the idea that farming can be compared with other knowledge-based economies. They think of farming as being in a completely different sector in which normal economic principles rarely apply – at least in Europe.

It is true that agriculture is different in some ways as it produces a resource that is actually fundamental to life. It is very politically sensitive and is also bound by constraints not felt by other sectors, such as climatic conditions – I am thinking of the recent flooding in the UK.

Nevertheless, it is just as important in farming, as in other sectors, to be open-minded and look at how things could be done differently. Historically, I would say that the plough has done at least as much to change our lives as the petrol engine, and look at what we can do now. Through GPS technology, for example, a satellite can detect which parts of a field of maize are becoming too yellow. It can then guide a robot to apply fertiliser in just the right places. Our ancestors – or even my father – could not have imagined that this would be possible. Likewise, previous generations would have been impressed by what we can do with different integrated farming systems in getting the best possible output but dramatically cutting down the chemical input.

It is also essential in farming to make informed choices. This was true in the past and is all the more true following recent reforms in the Common Agricultural Policy (CAP). The introduction of the decoupling system has essentially ended the influence of direct payments on farmers' decisions on what to produce. It gives them certain financial security and leaves them free to grow what the market wants – as long as they observe certain standards of environmental care, animal welfare and public health.

In this new environment of greater freedom of choice, successful farmers will be those who clearly understand the options open to them, who can make sound decisions on what to do and then find the best way to do it. This means swimming with the tide of technological progress to be as competitive as possible.

That is only one of the ingredients of success, however. Another is a sound understanding of the markets within which farming operates. For example, what are the options if a farmer wants to increase his profits? One option is to stay in the market for basic commodities, but produce larger volumes while cutting production costs. The farmer could focus more on high-quality products, such as high-quality cheese, which could mean investing in quality control or year-round production. He could also decide to produce and market his own brand, but this would need a thorough knowledge of processing and also an idea of what the consumer would buy. In each case, the farmer would have to understand the market potential as well as all the technologies involved.

If we want to see these things happen, see the right choices made and the right technology used, good research is indispensable.

Nevertheless, if we want a successful agricultural sector it is not only farmers who need access to a good level of knowledge, so do the policymakers. Many key decisions have been taken over the past few years about the direction we wanted the CAP to take. The central ideas of decoupling, cross-compliance, modulation and rural development policy have all needed to be based on very thorough analysis, and we will continue to need these analyses in the future – running the CAP should never feel like a series of leaps in the dark.

Having underlined the importance of knowledge for farmers and policymakers, I would like to make two particular requests.

My first request is that we ensure that the fruits of research are transferred as effectively and efficiently as possible in future. Research can unlock huge benefits for farmers and the whole food chain, but the research findings do not always trickle through.

I am not saying anything new when I say that the transfer of knowledge and technology is desperately important, but what are we doing about it – especially in the light of the recent CAP reforms? For example, I know that farmers have taken part in three different technology platforms – Plants for the Future, Food for Life and Global Animal Health. I would be interested to know what value they got out of them and if further participation in technology platforms would be useful.

More generally, does SCAR have ideas for helping farmers obtain new ideas and then turn them into profit?

My second request is that we keep up our research efforts into socio-economic issues as a component to work on technology questions. I have already explained why I think this is so important and so much excellent work of this type has given us good guidance in the past. I am thinking of the research which led to the European dairy industry model, which gave us a very valuable assessment of the possible impact on dairy markets of the 2003 reform, the enlargement of the European Union, and the potential agreement of the Doha Round.

Another example would be the GENEDIC project, which has shone a light on the socio-economic and environmental impact of the decoupling of direct payments.

Under the Sixth Framework Programme, there was a clear commitment to socio-economic research into agriculture and I trust that we can at least maintain that level of emphasis under the Seventh Framework Programme.

I believe that if these two requests can be granted, we will have an even firmer foundation on which to build the future of European agriculture. We have a very strong and diverse base in Europe, so let us make sure that this remains a useful servant to our farmers and policymakers. We will need to ensure that the decisions we may take in our ongoing reform process in agriculture are founded on solid ground.

I hope you have a very good conference. Thank you very much.

José Manuel Silva Rodriguez
Thank you very much, Commissioner. The last speaker I would like to introduce is the German Secretary of State, Mr Lindemann.

- Visions for German agriculture in the European context

Gert Lindemann – Secretary of State, Federal Ministry of Food, Agriculture and Consumer Protection, Germany

Chairman, Commissioners, I will present you with the German position on agricultural research, both at the national and European levels.

Agriculture in Germany and throughout Europe will be facing enormous challenges over the next ten to fifteen years. I think these challenges are the result of a number of factors: the demographic change and the aging of our population, the ongoing liberalisation of world trade, increased consumer expectations for safer and healthier food, scientific progress, and climate and environmental change.

This dynamic and the multiple interrelationship between these factors make it extremely difficult to foresee the future, and these uncertainties are further exacerbated by various dependencies and inter-meshing factors. These complex interrelationships have only been understood in part up to now and this is why unexpected developments may occur in the future which could affect the whole of our economy.

I will mention a few salient points identified by the Foresight experts. With the climate, energy and food crises, the agricultural, forestry, fisheries and food sectors in Europe would all be affected. Because of the complexity and worldwide implications, these challenges have acquired a whole new dimension that is unprecedented in human history. We are now being faced with challenges that will determine the shape of our future. What can agriculture in Germany do to assist agriculture throughout Europe to face up to these challenges?

Ladies and Gentlemen, we are all called upon today to set the course for a competitive agriculture, forestry and fisheries economy. We therefore need long-term and forward-thinking research agendas. Moreover, we are dealing with major challenges, such as emissions reduction and fighting new diseases and pests, needing stronger rationalisation in our research activities.

These are the ways in which we can best deploy the increasingly scarce resources for the benefit of all. National research institutions must be ready to face up to these challenges if they are to be ready to come up with scientifically sound bases for future decisions. Modern agriculture requires a modern interdisciplinary type of research which is able to work together with other disciplines and other partners. Sustainable solutions and new options must be identified to help us improve our international competitiveness.

This is why we in Germany have begun to completely revise our National Research Department in the Ministry of Food, Agriculture and Consumer Protection. We have new areas of attention: land use, climate change, energy, use of bio-mass, sound and safe foods. These areas will all be expanded.

We have 207 staff members and the Research Department will be working in future on plants, animals, food, nutrition, land use and sustainable use of resources. We are in the process of reorganising this Research Department and we hope this new

and interdisciplinary structure will give us a secure broad basis for decisions to enable us to pave the way for a future-orientated agricultural sector and to properly develop our rural areas over the next 20 years.

However, agricultural research in Germany must also face up to new world challenges, and this applies in particular to university academic research. We have to create research clusters that can thereby create effective units that can stand international competition.

Major cross-border problems, such as climate change or animal epidemics, require us to work beyond our borders. All participants will gain if they use the EU research programmes in order to cooperate with our European neighbours and other third countries. It is extremely important to have greater cross-border coordination in programme planning and in the execution of research activities within the EU research programme. This leads to the more rational deployment of resources, which are becoming scarcer in all of our countries.

The new ERA-NET (European Research Area Networks) measures set up in the EU's Sixth Research Programme provide an excellent opportunity. Cooperation between those responsible for these programmes in the ministries and in other research bodies is becoming increasingly important. The need for research is so vast that we really have to work in groups on joint research projects.

Our Ministry is working very intensively on many of the ERA-NET projects. The contacts and exchange of information thereby generated represent a first step towards a common research programme. I very much welcome the fact that these measures are being strengthened and expanded in the Seventh Research Programme and that there will now be project support within ERA-NET.

We need more research that looks into the future, recognises changes, responds flexibly to the new challenges and involves ancillary discipline so as to be able to come up with wide-ranging responses. Only then can we in the European agricultural and food sector manage to produce in a sustainable manner, resist international competition and fully exploit any new opportunities.

I am looking forward to hearing ideas from this conference on how we can jointly tackle the challenges we are facing and I wish you all a very successful conference. Thank you very much.

José Manuel Silva Rodriguez
Thank you very much, Secretary Lindemann.

We will now move on to the Second Panel, the SCAR Foresight Process. Our good friend and Director, Chris Patermann, will chair this meeting.

The SCAR Foresight Process

Christian Patermann – Director DG Research, European Commission
I thank the Commissioner, as my boss, and the Director General for the very interesting introduction they gave us.

We now come to the Foresight process and putting it into the more global context. Then we will see what our stakeholders say in order to put our findings on a robust footing.

SCAR has already been mentioned several times by the Commissioners and the Secretary of State and I would like to start with a few words on what SCAR means. SCAR stands for the Standing Committee on Research. It is the oldest commitology committee in the European Union since 1974. It received a revitalised mandate two and a half years ago from the Ministers of Agriculture and the Commission which has three important points.

The first point is to set a new international European research agenda by better coordinating the work in the Member States with the Commission. As has been said today, it is absolutely necessary to do so because of diminishing resources throughout Europe.

For that reason also, a better knowledge of what we are going to do is necessary, and that is why the second mandate is mapping what we do, which is indispensable when you look at the enlargement process.

The third one, which was reinforced recently by the Council of Agriculture Ministers, was to try to enter a Foresight process. That is why we are here.

The Foresight process is not the one and exclusive part of the Standing Committee on Agricultural Research, but it is a very important one.

We will now present this Foresight process and how it was done. Afterwards, my colleague, John Bensted-Smith, will put this Foresight process with some of the results into a global context. I therefore have the pleasure of starting with SCAR Committee.

Uno Svedin, a professor and the Director of International Affairs in the Swedish Research Council for Environment, Agricultural Sciences and Spatial Planning (Formas), will present an introduction.

Uno Svedin – Swedish Formas Research Council
Good afternoon, Ladies and Gentlemen, Mr Chairman. I am the first of three people who will each bring you up to date with the process, from where we are going with Foresight to the interpretation of long-term RTD priorities, and then onwards.

I would like to talk about the starting points and about the challenges – and I will devote some time to that because it has to do with the motivations for what we are

doing. I will speak about the drivers as a formal follow-up to the challenges, and about the process used in Foresight as the basis for the RTD priority reflection. I will also speak very briefly on the positive frame, and then answer the RTD research priority setting.

The issue we are addressing is the long-term European future in the agro-food and bio-economy sector. If you address this issue, you would also have to discuss what should be highlighted in setting these priorities and the directions of interest. If you say this is the charge, then what are the challenges? What are the socio-economic conditionalities of interest? What is the timeframe, when we are discussing a longer timeframe than the incremental timeframes within which we normally operate – 10 to 30 years? What are the perspectives and the framings? These are concerns.

The challenges are that we have a setting in which agricultural activities in the broadest sense are operating – between the terrestrial and the marine, in the forests, in the crop-production area, urban and rural.

To start with the environmental challenge, the Millennium Ecosystem Assessment made a careful analysis of our situation – and this is really challenging. On the left-hand side of this slide you will recognise the Millennium Ecosystem Assessment remarks on the ecosystem services. Regarding the provisioning, here you find all the things we are speaking about in this conference – food, fresh water, wood, fuel, and so on. You can also move the green part over with the arrows to the constituencies of wellbeing, because this is not produced just for its own sake – it has to do with security, basic materials for a good life, health issues, good social relationships and freedom of choice.

The bottom line of what the Millennium Ecosystem Assessment said – and this is also a charge to us here today because it is so close to our own charge – is that we are spending earth's natural capital and putting such a strain on the natural functions of earth that the ability of the planet's ecosystem to sustain future generations can no longer be taken for granted. That is a really severe charge.

At the same time, the Assessment shows that the future is really in our own hands. We can reverse the degradation of many ecosystem services over the next 50 years, but the changes in policy and practice required are substantial and not currently underway. This alludes strongly to the agriculture system. What alludes also in the way of the charge is that we not only have the global reach of the concerns, we have the regionalisation, the local impacts of globalisation, the complexification of the issues and the diversification of power. This happens not only in the environmental field, it also happens in the economics and trade fields.

The introductory speeches made clear allusions to climate change. This slide shows one of the many scenarios, and we recognise our part of the world where we find the colouring corresponding to the normal mid-set of three or four degrees up. What we should consider here is not only Europe but that Europe is so connected to the rest of the world, and that both temperature and water flows are closely connected to that. The agricultural aspect comes in heavily there, of course.

I would also like to allude to the institutional factors. I have brought an old 18th century map from Sweden. You can see a small village in the middle and small strips of agricultural land. This was before the institutional reforms in the late 18th century when we moved out of the farmhouses and off the land, so there was a major change in the style of how the administration and the legal settings in Sweden handled these issues. Let us take this picture as symbolic and think about it globally. We have to do certain things for sure in Europe and probably also on the global scene.

Regarding the drivers, we had to pick and choose the perceived driving factors at the beginning of the SCAR process, so these were the ones that were fixed at the beginning of the Foresight process: rural economies, economy and trade issues, demographic and societal changes, agricultural and environmental issues, climate change, science technology and innovation drivers, energy and food issues.

We first had to decide the framing, so we had to do some challenge-specification on the choice of the drivers with regard to some of these major challenges. We had to do some systems definitions – which type of geography in the world we focus on – and boundary setting. We had to set the timeframe and set up the Foresight group and its charge.

The next step was getting the Foresight group moving. This was done during last summer and autumn. The background factors were transformed and elaborated and the scenarios would be created based on that. The internal work took until Christmas 2006 with some consultation points in between, but basically the Foresight group was independent from SCAR.

The discussion of the Foresight results then came about in November and December. It was then time to transform the scenarios into RTD directions and structures. This was done in spring and then fed into the preparations for the Stockholm expert priorities translation workshop. So we moved the results from the Foresight group into a process where a full set of 60 or 70 experts met to discuss what it means for the long-term RTD priority setting.

There are all sorts of settings of high-level politics involved in the policy frame, but I think at the general level, if we see the policy side as being on the left side, the image of the future and the emerging problems of concern are part of that. On the right-hand side, there is the matching extraction of the RTD directions and its institutional arrangements to be elaborated by this very process. On both sides, general strong issues are what to look for – how things are connected, the complexity issues, what it means in terms of risk and opportunity, and on which basis and how to act, including setting up the relevant innovation systems related to the responses and answers from the process.

Before you listen to the outcome of the scenario work and, in a broader sense, the Foresight process, bear in mind the entry concerns that kick-started the Foresight group and which things need to be thought about. There is a tension between the general level and the impacts at the specific level of agriculture. Some of these tensions will be addressed later.

It is also about the broadening of Foresight, with a kernel in the Foresight group but also a process of listening to other European and international Foresights and absorbing them, and the mobilisation of a spectrum of factors from more material-oriented ones to more value-oriented ones.

We also have the cascade effect, so it is not only about what is happening in the bio-economy, for example, or in relation to forest use, but what comes next and what it implies – the primary, secondary, tertiary and the counter-loops. The counter-loops are also involved in the policy responses, so there are feedbacks from the policy side when we talk about 20 years from now.

The resilience and collapse features and the bifurcation points were also heavily absorbed by the Foresight group, searching for the fresh and new on that challenging type of venue. The way of posing the problems of sustainable development – food production versus feeding the world population considering demographic factors – and the way of addressing the question is also to be reflected upon.

This brings me to the final summary. The Process set up has involved several steps: designing the overall structure, defining the entry conditions, setting up the Foresight working group, setting up the Stockholm workshop in March 2007 to connect the Foresight insights to the RTD priorities and structures for the long term, and you yourselves at the end point feeding in the preliminary results to this major audience for further scrutiny and discussion. Thank you.

Christian Patermann
Thank you, Uno Svedin, for describing the frame-setting the process.

Now we come to the content, and I am very pleased to introduce Thierry Gaudin, *Ingénieur Général des Mines*. He has spent the most part of his life with respect to innovation and Foresight. I would like to pick out one important event to show you his life-standing in innovation and in Foresight. For five years, from 1988-93, he directed a worldwide prospective synthesis combining approaches from social sciences, ecology and technology – the famous 2001 History of the Next Century exercise. We were very proud of the arranging you did with your team – our Foresight.

- Major findings of the Foresight Expert Group

Thierry Gaudin – Chairman of the Foresight Expert Group
We called this exercise Foresighting Food, Rural and Agri-futures and it was prepared under the direction of Christian Patermann and his team. The eight driving forces identified by SCAR gave rise to the nomination of eight experts.

We met for the first time on 3rd July 2006, when I asked the experts to have their reports ready for a second meeting in September. So on 12th September, we had this report to read and we spent a day and a half listening to the experts and trying to assimilate their knowledge. We started the creativity process to identify a scenario on the second part of the second day.

Reading the experts' report, the very clear point that appeared was that the future will not look like the past. So I asked the experts to write four causes of disruption on four sheets of paper. We put them on the wall: the first list, climate change; the second list, energy crisis; the third list, food crisis. We made three groups in order to build a small scenario regarding these three basic causes of disruption. Doing that, we were going back to the origins of Foresight at the Second World War – the 'what if' scenario. We identified difficulties and put the questions to small groups of experts, each working on a scenario. We then had multiple interactions with the SCAR working group and also with the DG of the European Community. The reports were completed on 31st December.

You have here an edition of the synthesis report, but if you want to go to the experts' report where all the detailed data are, you should go onto Internet, search for 'SCAR' and 'Foresight' in Google, and you will find it.

The first scenario is climate shock, the second is energy crisis, and the third is food crisis. However, the third group said they also wanted an optimistic scenario, so cooperation with nature became the fourth scenario, the third group having produced two.

We then had the presentation discussion and Christian Patermann asked if we did not also have an economic disruption. So we had a business-as-usual scenario with a competitivity disruption – the decline of financial support for agriculture in Europe coupled with new competitors, Brazil particularly, using updated technology, with Europe losing its competitive advantage and having to defend itself against these competitors.

This slide shows the order of magnitude of agricultural exports all over the world, and this is world trade, which has increased enormously in the last 10 years. These are the forecast figures for Brazil. The blue bar is the balance, Brazil's excess exports. It shows a position that has completely changed over the last four years. That is not the case of China, which is in deficit, probably because of agreements with the United States on soya, and it is not the case either of India, which has a small excess. Therefore, China and India could be world players but the big upcoming world player is Brazil. This is important because Brazil is not only a producer of food, it is also a producer of coal as a replacement fuel.

Let us now move on to the scenarios defined by the experts on 12th September. The first one was climate shock and climate change and their acceleration as a driving disruption factor: droughts and storms, climate refugees and species migration, and change in the ecosystem – we know very little about that but it underlines a fundamental challenge.

The IPCC figures show that there is no historical reference for such a climate change. The only reference would be a prehistoric reference 10,000 years ago at the end of the glacial period, when there was a climate change of +6°C over two or three millenniums. Here, you will have +3-6°C in one century and not in two millenniums, so that is very different for species adaptation. Therefore, it can be said that it is a

climate shock for the ecosystem. The future will be very different from the past and from the present.

This slide is an analysis of rains and droughts, and it shows a very unequal distribution over the earth – rains in China and droughts in India, rains in the United States and droughts in Venezuela, rains in Brazil and droughts in South Africa. So the change in climate is very new and unexpected, I would say.

Then there is the ecosystem and the disappearance of some species. This is an analysis by Marie Walls of the diminution of species of butterflies and birds in Europe, and follows the disruption in the Amazon. We are concerned about the Amazon, of course, because this trend knows no frontiers.

Those were some indications for the first scenario and you will find the text in the available booklet.

The energy crisis is quite different because it can only be operated by global energy players. It is not a physical scarcity and although there has been a lot of literature about the oil peak, oil can be replaced by coal. It is not so much a question of natural resources but more a question of global players managing international tension in order to maximise their profits. A scenario is possible where a crisis would be engineered by these global energy players. Energy productivity is increasing, but slowly, and there will be a problem of energy saving anyway. This energy saving relies on consumption at the individual family level.

Here you have a comparison in energy consumption of three ways to do your weekly shopping: peripheral high kilometres, home delivery, and the local supermarket. The consequences on energy consumption are the following: from 4 kilos equivalent petroleum to 251 kilos equivalent petroleum for the same family. So energy consumption relies on individual behaviour much more than on collective or company behaviour. Of course, this has some relation with urban planning and the way our structure is made. There, I would say that the United States and Europe could have some influence.

Let us look at the food crisis – food connected to health and society as a source of disruption. The energy crisis causes a decline in mass food production and a revival of short supply chains. The main priorities relate to quality, safe and functional foods with socially-driven and environmentally-effective products.

The food map shows an excess of food consumption in some parts of the world, particularly in Europe, the United States and developed countries, and a lack of consumption in some other parts, like Central Africa and India. However, it relates to a much deeper relationship between human bodies and consumption. This is the cover of *The Economist* newspaper in November 2004. The question inside the paper is 'What will we sell to this man on the right? What are the new markets?' I think this shows that we have to change the way we look at things. The economic results may be disastrous for health.

More than that, I would add a personal point that was not discussed with the experts, and that is the vulnerability of the human body. The newspaper *Die Welt* in Germany

last May published a very detailed enquiry about children's drawings. There are drawings by children who watch TV for less than one hour a day, and drawings by children who watch TV for more than three hours a day. The TV sequences are shortened in order to attract their attention and this leads to mental zapping. The children's minds zap even without TV, so they have no concentration and cannot finish their drawings. This also shows the vulnerability to advertising messages and if we want a change of behaviour, we probably have to take this into account. Of course, in a liberal economy no one talks about that kind of thing as it is supposed to be totally free, but it has such an important influence on what happens that someone someday will look at that kind of thing.

The consumption of cereals has not changed very much for at least 10 years. Meat consumption is changing because of China, and marine products are changing. The fisheries are stabilising, but aquaculture is rising. Aquaculture consumption is still 8 kilos per person per year worldwide. Meat consumption is something like 32 kilos per person per year, so as it doubles every 10 to 15 years, it might represent a non-negligible part of food. So we have to focus not only on the land but also on the sea.

Scenario five is cooperation with nature – society, symbiotic relationships and technology. The key to addressing this phase is the transition to local small-scale production and a shortened and more transparent food supply chain. This means that the urban implosion is still active in the underdeveloped countries, but there is a movement going the other way in our countries, although in some countries there is also land abandonment.

This relies on some demographic hypotheses. The usual model is for the tendency of 1.7 children per woman in Europe, depending on the country. I would say organic farming is growing, at 4.5% of the agricultural area in Europe.

This leads to an idea we call a planetary garden. This is a house in New Zealand which relies, to my understanding, on the world of Hölderlin saying that we should re-inhabit the earth as a poet. There are examples of people that have tried, as in Freiberg, a German city which is very well-known for its ecological initiatives. Ecological initiatives are not only being taken at the European and State level but also at the local level, and they are possibly more active at the local level than at the upper levels.

Let us go through the expert groups' conclusions on the four major agri-futures drivers. The system is moving slowly, so the first idea is that we should think about increasing the speed of adaptation and that decentralised organisations probably adapt faster than centralised ones.

Farmers are trained to be reactive to incentives – they wait for the EU to decide and set the priorities. However, the farmers themselves need take the initiatives and behave like entrepreneurs to face the challenges ahead. Europe does have a strategic role to play but for that, the systemic failures in knowledge-transfer have to be a repaired. The central concept would be not only research but also knowledge-share. The linkage with the urban economy is also very important.

The main recommendation we have set up in the conclusion of the report is the following. To go from a subsidy-driven agro-food system to a knowledge-driven agro-food system, we have to build a knowledge-transfer system that can reach all decision-makers – we say from global warming to global warning. We have the tools to develop an ecosystem revolution – satellite, image-processing, maritime and ground measurements – but we have not organised this to reach the needs of the basic decision-makers in farming and agro-food systems. If we do that, we should make it freely accessible through Internet because it is a public service.

Of course, some questions remain, such as an elderly demography, unemployment in cities, problems in the relationship between countryside and cities and also competition for land between new immigrants.

May I also raise a delicate question: who will develop the new space made cultivable by global warming, namely Siberia? Seven hundred thousand Chinese a year cross the border into Russia to farm. These are not exactly climate refugees but agricultural entrepreneurs. This is important because Siberia will become something like 10°C warmer, which is an enormous change.

Is agriculture the relevant concept? I think Foresight is also a source of doubt and we have to look at the reality through different glasses.

Is research the relevant concept? Challenge is the effective evolution of the practice of millions of local operators – we have 50 million farmers in Europe.

I will end by putting a personal point, a challenge. If humanity goes to space, it has to build a complete ecosystem in space in order to be able to live on the production of those ecosystems. These are some ideas on ecosystems on artificial planets. (We will build artificial planets because there is the risk of an impact on earth – that is how the dinosaurs were killed.) Some people in Arizona in the 1980s built a biosphere and tried to stabilise an ecosystem with 2,800 different species. Stabilising an ecosystem is a very difficult problem. They can be stabilised by diversity or they can be stabilised by monitoring. To my understanding, a very interesting challenge for research is how we can build and stabilise ecosystems. If we answer this question, we can answer the question on stabilising the earth's ecosystem.

I will end by showing the Unesco children's drawings from five years ago, which reflect that our children are thinking globally. The winner was a young girl from Brazil, and this is her drawing. Thank you.

Christian Patermann
Thank you very much, Professor Gaudin.

After the process we have the content. The SCAR Committee and other small communities are discussing these contents, and we too want to know how to cope with it and what it would mean for farmers, policymakers, citizens and consumers.

I would like to ask Wolfgang Ritter, who currently works at the Federal Agency for Agriculture and Food in Germany and advises the Federal Ministry of Food, Agriculture and Consumer Protection as a member of the SCAR Committee, to introduce us to the way ahead. He will give us some food for thought for the future.

- Follow-up of the SCAR Foresight Process

Wolfgang Ritter – Federal Ministry of Food, Agriculture and Consumer Protection

Ladies and Gentlemen, I am the third in a long sequence – it took us nearly two years to develop this whole process – and I will report to you first on the major outcomes of the Stockholm workshop, which was so kindly hosted by the Swedish Government. This offered us the possibility of digesting all the information we received from the Foresight Group. I will then say a few words on the follow-up process, and in my last slide I will say a few words on SCAR's possible role in this follow-up.

First of all, the Stockholm workshop brought together some 60 to 70 participants from different research organisations and different research disciplines in order to widen the debate and help us in the interpretation of the various Foresight results. We also had some presentations from DG Agriculture on the SCENAR scenario study on agriculture and the rural world. We heard a Foresight presentation within the Millennium Ecosystems Assessment and we heard Foresights from the Institute of Prospective and Technological Studies in Sevilla.

The mode of this workshop was working in groups, so we split down into several working groups in order to have a more intense debate on certain issues. The participants were asked to help us in identifying the key issues for the long-term research agenda setting in Europe.

I will briefly summarise the four categories under which the whole result of the Stockholm workshop can be grouped. You have in your files a paper giving a much more detailed description of what happened at this workshop.

The first category relates to the big challenges ahead of us in the European agricultural research system. We have already heard from several speakers that the world is changing quickly – more quickly than we have ever experienced in history. We also heard that we have a complex mix of driving forces which increase the uncertainty about the future.

It is clear that research has to widen its perspective and we need to go well beyond the traditional understanding of agricultural research if we want to cope with these problems ahead of us. It is clear that the agricultural world is changing slowly and that we have to further evolve into a bio-economy, bringing biology into the service of humans.

However, when we discussed these issues a number of questions were raised. One crucial question was: is our present research system as we have it in our Member States really capable of adapting sufficiently rapidly to these changing

circumstances? Is it able to function as an engine to provide innovations and knowledge to generate competitive advantages to the benefit of the European agricultural system?

The second group of conclusions relates to the building of a European agricultural research agenda. When we consider this wider agenda, it is obvious that it can be covered only with a full range of relevant disciplines to tackle these different problems. So we have to make sure that we see much more multidisciplinary and interdisciplinary research in future and that we take a much longer-term perspective in order to allow the early identification of emerging problems and the swift development of sound intervention strategies so that research really delivers what is demanded by society and policy.

However, we also heard some words of caution at our workshop that we have to take a lot of different aspects into account, we have to strike the right balance – be it between food or fuel, between basic or applied research, between natural and social sciences. You will find more details in our report.

Furthermore, it was mentioned that the predominant short-term approach in research needs to be complemented by much longer-term strategic aspects in order to prepare ourselves for these future challenges.

When we look at the European situation, we are confronted with a great diversity of research systems, which is good on one hand. However, on the other hand, we are losing on critical mass and we have to think about integrating and rationalising the European research effort, especially on these big issues facing the agricultural sector.

We heard that the public should not be forgotten if we do not want problems later on with the acceptance of research results, so we have to pay more attention to confidence issues and public trust.

Another weakness that came up in our discussion concerns a European strength. The strength is that we are good at producing research results. However, we are not as good at utilising these research results and transferring them into innovative products. Innovative products are important if we think about our global competitiveness in Europe.

A final point that came out very strongly concerns the shrinking resources in many parts of Europe – be it due to soil erosion, water scarcity or genetic erosion. We are at risk of passing critical thresholds. Therefore it was considered necessary to give much more attention in research to the provision of these goods or services on which we all depend.

The third category relates to the necessary adaptation within the agricultural-knowledge generation and dissemination system. We have already heard that these new challenges demand a convergence of knowledge from different disciplines in order to improve our understanding of these complex problems ahead of us.

I have already mentioned that we need more interdisciplinary research for long-term monitoring of the changes ahead of us, and we need the analysis of this data and also the outreach and dialogue issues if we really want a swift adaptation of the research results by the public.

Looking at the agricultural profession, it is clear that these new challenges ahead demand additional skills, and these additional skills have to be considered in our education and training programmes so that we prepare future professionals for these changes.

We have seen that the timeframes between research and policy and between research and industry are quite different and we have to reflect on this issue of how to make a better inter-linkage between these different groups.

Finally, when we speak about these complex challenges ahead, it is clear that we need the research capacity in its full range so that we can really handle them. At the same time, we also need enough flexibility to allow the formation of local competence clusters to handle certain of these problems on a more limited scale.

The final category is under the heading of further Foresight exercises. When we started this whole process, it was clear that we could not have just a one-shot picture. If this process is to be meaningful to us, it has to have continuity. We need constant monitoring and we need a close analysis of these changes in order to allow a swift reaction to emerging problems.

Forward thinking in times of great uncertainty is a must. Therefore, the suggestion came up to establish an early-warning system based on regular Foresight. The objective of such an early-warning system is to be better prepared for such forthcoming changes, allowing early preventive interventions to influence a future direction of development and shaping European agriculture towards a knowledge-based bio-economy and sustainable society.

That, in short, was the outcome of the Stockholm workshop. Now I come to the follow-up process after this conference, and there we have three main tasks.

The first task is the preparation of a conference report, taking all the process that Uno Svedin explained to you into account.

The second task is laid down in the regulation on the coordination of research. This is related to the SCAR setting and the Commission has to report regularly to the Council and the Parliament. This report is expected for the first half of 2008.

The third task relates to the establishment of an early-warning system based on regular Foresight, whereby we understand Foresight as a unifying cross-boundary concept to agree on priority research areas between the Member States.

My last slide relates to the possible role of the Standing Committee on Agricultural Research in such an early-warning system. First we have to look at whether SCAR's mandate covers this function. I had a look at the new SCAR concept and it clearly says that the monitoring of important European and international trends in the agro-

food sector and the effect of the research implications thereof is an integral part of SCAR's mandate in its analytical function.

We propose that the SCAR plenary should have an oversight function in directing and guiding regular Foresights. It is clear that the necessary means have to be put in place to permit process continuity and we suggest that the SCAR working group is requested to develop a mechanism that will enable us to better coordinate the ongoing and planned Foresights, be it at the Member States or European level, in order to use all sorts of useful input for the strategic analysis and scanning of this information. Here we can also draw on the rich information in the strategic research agendas, which have already been developed in the technology platforms. We will also have some ERA-NETs or some collaborative working groups under SCAR.

Finally, we propose that we link this Foresight process to the regular reporting duties of the Commission to the Council and the European Parliament.

That is all I have to present to you. Thank you for your attention.

Christian Patermann
Thank you very much, Herr Ritter.

After the coffee break, we will see what other organisations in other parts of the world are doing in processing, where Europe's position is and whether we can validate our position in the exchange of use with their results.

European agriculture in the global context – future scenarios

John Bensted-Smith – Director DG Agriculture, European Commission
Welcome to this afternoon's second session. My name is John Bensted-Smith, I am a Director in DG Agriculture in the European Commission, and I deal with the directorate that handles economic analysis and evaluations. I am your chair this afternoon.

You have heard earlier about the process and the way it was set up in terms of the Foresight Expert Group, and you have heard something about the drivers, some different scenarios and some initial conclusions and recommendations.

In this session we have five eminent experts who have been involved in different ways with scenario research and they will give their views on what they have heard. After the presentations, we will open the session to you to ask whatever questions and make whatever comments you like to the members of the panel.

I find myself in a position where if I gave a proper introduction to the members of the panel it would take me an enormous amount of time because they are all very distinguished and all have extremely long curriculum vitae, so I will give you the brief version.

I will start with Peter Nowicki, who is a senior researcher responsible for investigations on the bio-based economy as well as the impact of the evolution of agriculture on rural land use. He was involved in the SCENAR 2020 project, which we in DG Agriculture were involved in as well. I will ask Peter to make his presentation.

- SCENAR 2020 – baseline and scenarios based on the future of the Common Agricultural Policy

Peter Nowicki – Project Coordinator, European Centre for Nature Conservation (ECNC)
Colleagues, I am very pleased to be here. I want to use SCENAR as a backdrop for making certain comments which apply both to the Foresight study we have looked at in the preceding session as well as Foresight studies in general.

I will look quickly at the SCENAR objectives and make a very brief comparison with the Foresight study. Then I will make some remarks about Foresight studies, which are illustrated through SCENAR, followed by some reflections going beyond SCENAR and finally, conclusions about research needs and orientations.

To start with our objectives, we first of all had to know what has been happening. That means we had to identify the trends and drivers and imagine the important perspectives and any challenges for agriculture. That required an enormous amount of data to be gathered to make a proper basis for looking forward. That is exactly what we did.

We looked forward to understand particularly policy impact, and so our focus was quite limited to three possibilities. One is the famous Doha Round, if it goes through, and what it would give in the future in the programming period up to 2013 and in the second programming period up to 2020. Then we looked at what happens if it does not go through, which is maybe getting a bit too likely. The second possibility is regionalisation, where we pull up the planks and everyone keeps to themselves as much as possible. The third possibility is liberalisation, and what happens when you cut off all support of all sorts.

Finally, we wanted to demonstrate how the effects of policy are distributed geographically, through the SWOT analysis among others.

I will make a very quick comparison between SCENAR 2020 and the Foresight study. There are some keywords and for me, there is the idea that at SCENAR we are very focused and so a little restricted in what we can do. We are working with probabilities, whereas the Foresight study is really open to possibilities and has a much larger horizon.

As for method, we are very quantitative in our way of working, at least where the future is concerned, compared to the Foresight study, where I felt the future was more conceptual. Our starting point is clearly in the past and we have to know what is going on very clearly in order to make the models work. I have the feeling that the starting point for the Foresight study was really looking to the future, and that had a freedom in a sense, which I think they have worked with very well.

The policy structure for us was given. We had these three policy scenarios plus a few other activity analyses. I felt there was much more freedom for the Foresight study to invent what the policy structure might be – they talk about decentralisation, for instance.

Regarding the issues, we identified the issues and I feel it was much more suggestive in the Foresight study and that they were trying to resolve the issues in a way that we were not doing.

In our policy outcomes, we were contrasting particular scenarios. In the Foresight study, they were in fact designing the possible outcomes. For that reason, I talk about the policy response, which I feel for SCENAR was very much remedial in the sense that you can do something if you know what might happen and you can see it coming. The foresight study was much more innovative in that sense.

How do we use Foresight studies? First of all, I think the Foresight studies can be used to describe and understand reality over time. In our experience, as no model really adequately covers all the territorial levels and all the interactions between the sectors, you have to use several models at the same time. This is a multidimensional approach that is fraught with difficulties of adjustments between models. I sometimes wonder whether it would be advisable to keep all the modelling in the same house, because it requires an enormous amount of interaction to get it working correctly.

The other thing we felt is really important is to work within a geographical framework. This way, you can identify a long-term development of certain processes. Here, the question is of the social reality linked to population trends, there is migration as well as natural population renewal or the lack of it, out migration and a population decrease. So that is important to understand because it has long-term bearings. Again, you have to have multiple perspectives and that is why regional employment growth was for us also extremely important.

Another way of using Foresight studies is to understand the different elements of a system – and here I will talk very quickly about the agro-price structure. There are complex dynamics here and our priority is to isolate and show one of these.

Basically, compared to 2002, prices in real terms in 2020 are going to go down across the board – for some products less than others, but the trend is clearly down. If you regionalise, the situation might be a bit better. If you have a fully liberal economy, the effects in some cases might be much worse, but not in all.

If you compare beef, for which there is very strong competition at world level that could be effectively reducing our need for beef production in Europe, with pork, which is not a controlled market in the European Union right now, there will be very little difference whether you regionalise or whether you liberalise. So Doha has no real importance for the pork industry, for instance. These are the types of consequences you can get through a modelling approach.

You can also anticipate effects, and you can understand where things will happen and to whom they will happen. This goes on with beef production, where we can actually look in real terms at the drop in production. On the other hand, you can also be prepared to encourage or reinforce the positive potential. Madame Fisher-Boel was talking about cheese, and if cheese if something that would be successful on the world market in a liberalised economy, it means that you can begin adapting to that possibility right now.

If we are doing a sensitivity study, we can use this to understand policy implications. For example, if we were to look at a production now and compare it across the board for 2020, you would see that production would go up. However, surprisingly enough, in many cases the area required would go down. That is simply because of productivity increases.

Right now, our baseline is independent of the biofuels directive, so what happens if you throw the biofuels directive into this? For the energy crops, which are often taken by substitution – a little from weeds, a little from maize, a little from oilseeds, and a little from other crops such as sugar and potatoes – you can see there would certainly be an increase in that category and a significant decrease in other crops. That is not only because of substitution but because of co-production. If you are producing oilseed cake, then you simply do not need so much fodder or pastureland any more. So this type of interaction is very important to understand. In terms of hectares, it is clear there is quite a significant substitution and transfer happening.

You can also distinguish between the trends and policies. The trends are clearly downward. Our baseline scenario is an approximation of what has happened in the

past with the policy additions. You can see that there will be fewer farms in 2020 across the board. However, the important thing is the policy dimension. When you have a decision, such as to liberalise, then you can see there being a much more substantial number of farms. If you look at that geographically, you will see that in the baseline scenario, which is more or less what has been going on anyway for the last 40 years, you will have a continuous decline in the number of farms.

A SWOT analysis enables you to take a number of factors into account all at the same time, and that is what we are doing here with the economic, agricultural and population factors. You can see it is very much in line with the slides I showed at the beginning in that there are certain areas in Europe where there will be problems. We can look ahead to that and anticipate it, we can make structural adjustments now and a new structural policy may be called for. On the other hand, you might find that areas which are looking favourable might also become problem areas: if you are in Spain and you have a very strong tourism industry and you are also irrigating heavily, that shows you that you might have a conflict between agriculture coming up. This is simply looking at agricultural impressions and for some of us, this type of potential shift in production according to the policy structure in the future is very important. These are the types of things you can look at.

Going beyond SCENAR, I would hazard that the most important things we did not handle fully are the social and institutional issues. First of all, we did not fully look at the implications. We understood that there was a migration issue involved from east to west and from urban to rural but we do not fully understand what that means. If you understand a little about demography and the social reality behind these types of massive shifts in population, you can imagine that this requires much more work essentially to understand what the future might mean.

Coping with shifts in agricultural production, are the farmers today prepared for the type of production process required tomorrow? Maybe they are, but that is the question.

Finally, on adaptation of decision-making, why are we not doing more work on decision-making and what has to change? Are we afraid? Is it taboo? We can look at everything else but what are the implications of temperature rise in the future? How do you cope in decision-making terms if Brazil dries up all of a sudden and cannot produce as much ethanol as it does now? What happens to the European market if Canada warms up and produces lots of cereals? What happens if you have a 3°C rise in temperature across the board in Europe? Let us look at that question quickly.

If you are growing maize in northern Europe, how do you get production to change and what are all the other production processes for other crops that have to change throughout Europe? I have already given you the potential difficulty of having lots of horticulture and lots of permanent crops that need irrigation, having no water and having tourism. Basically, because of the significant social changes linked to climate change, you will have an exodus from the south and no longer from the east.

By way of conclusions, I think these are the points to retain from our own experience. Why were we successful? I think that your policy trends have to be plausible and

have to be based on the past – anyone who ignores the past is going to mess up the future. Also, if you are going to be working with models then you had better be able to update along the way, because you find surprises when you ask new questions. Finally, if you are working with policymakers, work very closely – it is really a great help for everybody concerned.

Where would I go from here? I think that if you are concerned about agriculture in the rural world, you need to investigate a number of issues in greater depth, which we certainly were not able to do. We always say there is never enough data but how true it is. Maybe this requires more public money and it may have a long-term spin-off rather quickly. Also, how do you make environment and technology-change work together? Sometimes we can cure things and sometimes we can mess them up even more.

This has been a very quick backdrop for you to launch your discussion. If you want to explore SCENAR further, Google 'SCENAR 2020' and you will come to the DG Agriculture website, where you will find the full study as well as the technical documents. We hope that what we have done is useful for researchers everywhere as we are trying to create a research future together. Thank you.

John Bensted-Smith
Thank you very much indeed, that was very interesting.

I will move straight on to the next intervention from Jørgen Olesen, who has participated on a fairly large number of government committees on questions of reduction of greenhouse gas emissions from agriculture, integrated crop management and the like. He was involved in initiating Danish research on agro-meteorology, and since 2003 has had the research professorship in adaptation to climate change and mitigation of climate change in agriculture at the University of Aarhus.

- IPCC views and prospects

Jørgen Olesen – Danish Institute of Agricultural Sciences
Thank you very much for the introduction. I am here because I also participated as a lead author of the Fourth IPCC Assessment Report. I am not totally independent of this whole process because I was also on board for the Foresight analysis, and I cannot even speak on behalf of the IPCC because there are a lot of scientists there who all have independent opinions.

However, I will draw on some of the conclusions. I will also mention some of the thinking that goes into them in terms of scenario studies, because when we move into climate change and what might happen in future, we are heavily reliant on scenarios and also reliant on how we interpret them.

The Fourth IPCC Assessment Report is currently being published and some of it is being edited at the moment. You can find it on the website indicated. If we look at some of the conclusions – and quite a lot has already been mentioned in terms of

what climate change might mean – a very strong point coming out of the Fourth Assessment report is that we are already seeing climate change. We are not just observing it in terms of changes in temperature, rainfall, we are also observing it in the physical and biological systems of the earth. There is a very high confidence that this is caused by anthropogenic greenhouse-gas emissions.

When looking into the impacts and into the future using the scenario work and the modelling, we see a huge range of impacts. Perhaps some of the more important ones are threats to ecosystems and to biodiversity in the number of species. A 2°C warming might threaten 30-40% of world species because some of the ecosystems become very vulnerable. There are also impacts on humanity, particularly with respect to access to fresh water.

Things are not equal everywhere and there are large regional and continental differences in terms of the impacts, concerns and responses to climate change. I think we in Europe should also take this on board as a key message when trying to develop the research agenda as I do not think we can apply one research agenda across the board, even in Europe.

We have a vulnerability to climate change but it is exacerbated by other stresses, both stresses to our ecosystems and also s tresses within our human society and the availability of various sorts of resources.

There are a lot of barriers to adaptation that we are only starting to understand. On the other hand, we also have considerable scope to deal with climate change in terms of reducing and mitigating it and cutting greenhouse gas emissions if we only do the job right.

This slide shows the increasing observed global mean temperature, particularly over the past 20 or 30 years, increasing sea levels in millimetres and less snow-cover in the northern hemisphere. What perhaps is more interesting is that we are seeing some of the secondary effects as well. We are seeing changes across the board in rainfall intensity, mostly increases in rainfall intensity, which also has an impact on agriculture. There are erosion processes that threaten soils in many parts of the world, for example.

At the same time as rainfall intensity is increasing, we are generally seeing increasing droughts throughout the world. There are places in the world where this is more prominent, for instance in southern Europe. This is caused by the same factors that affect rainfall intensity – an enhancement of the hydrological cycle. Most of the drying out is occurring in the subtropical climates.

If we are looking at observed changes, what can we observe? In southern Scandinavia and the United Kingdom, we are seeing an expansion of silage maize. In many parts it has totally replaced other types of forage production systems, which is a rapid adaptation by farmers. In many cases this is not really being recognised as a result of climate change but just as innovative farmers adapting quickly.

In France, we are seeing changes in wine production. In Alsace, for instance, there has been a 2% increase in the alcohol content of the wine over the past 20 years.

There are changes in flowering in Germany, generally across the northern latitudes, increasing growing seasons, which has implications for grazing animals. In southern Europe, we are seeing increases in droughts, as I mentioned.

You might think the response would be to invest more in irrigation, but that is not what we see across the board. In southern France, for instance, you see a reduction in the irrigated area because the water is not there.

What will the future be like? The yellow line at the bottom of this graph shows a large inertia in the climate system. It shows that if you keep greenhouse gas concentrations in the atmosphere constant at the 2000 level – not the emissions but the concentrations – you will still have a warming over this century of 0.6°C, due to the time it takes to heat up the oceans. However, we will continue to increase our greenhouse gas emissions and even if we start developing technologies to reduce emissions, they will not have immediate impact – it may take up to 60 years to have an impact.

For the scenarios that I can see as developed, some of them incorporate really drastic reductions in emissions, but they will have virtually no effect on climate until after 2050. There is a positive side-effect to this because it means that we almost know what the climate is going to be for the next 40 years. We should take account of that.

We know the general climate trends but the problem is climatic variability. I think the 2003 heatwave came as an eye-opener to many of what climatic variability actually means. We had a drought that started in winter and continued into a heatwave that caused large agricultural production losses in the order of 13 billion euro. We had fires and low water levels in many of the major rivers in Europe. There were a lot of mostly negative consequences. This heatwave was never expected because it was so far out of our current climate. Still, it occurred.

If you look at climatic projections for the end of this century, you will see a much larger spread of summer temperatures towards the end of the century, indicating variability. The challenge here for farmers and for the agro-industry is how to adapt to this. It is one thing to adapt to a gradually changing mean, it is a completely different thing to adapt to changed variability. We have too little knowledge on this.

At the same time, we need to worry about the changes in water supply, particularly in southern Europe – northern Europe might be worried about too much water for parts of the year! There are also changing seasonal cycles, for instance in river flow – the Rhine might have much more water during winter and much less during summer.

There are a lot of factors affecting vulnerability and adaptive capacity that we need to look into, because if we want to develop agriculture under climate change, we should be certain that there is sufficient adaptive capacity. That depends on a lot of factors, including biophysical ones, meaning the reliability and predictability of the climate. There are also other pressures affecting soils and our infrastructures in society.

When it comes to research, it depends on whether we are doing research in this area and also on the extent to which we have this disseminated land transformed into an innovative agricultural sector that will be able to deal with these changes.

If we look at adaptation, we have climate affecting both soils and water availability. It also indirectly affects other things, like weeds, pests and diseases, which have a knock-on effect on the factors affecting crop growth and yield. Eventually you have some consequences, positive or negative depending on your site.

So what can you do? In southern Europe it might be relevant to look into microclimate modification. You might change crops and varieties but here, farmers are perhaps more at a loss because you need the help of the breeders and they also need to be aware of what to look into. For irrigation, we certainly need more effective water use and maybe use types of water other than the clean ones we are using at the moment. For soils, we need to look into soil management. Again, how you would deal with it depends on your current climate and soils and whether you have too much or too little water. We need to look at cropping system diversification so that we reduce the vulnerability.

We should not forget, however, that it is not just about production. We have environmental side-effects that we need to be concerned with. We have landscape issues. We have other types of land use as well as agriculture. There are a lot of interlinkages here that we certainly should be concerned about.

When we are talking about adaptation, we should also think that there are two types. One is autonomous adaptation, where the farmer or agro-industry adapts on its own. Effective adaptation in that sense depends on whether the resources, skills, research and so on are doing a proper job of providing innovation to the farmer.

Another is planned adaptation, where society has an interest in avoiding negative effects both of the impact of climate change and possibly of the adaptation that might not be occurring in the autonomous sector. This involves legislation or regulation or changing incentive structures on various scales. Here I think we need knowledge on various scales in order to analyse this better and tools that also incorporate stakeholders in the process.

Agriculture is a major contributor to climate change – it accounts for about 20% of global emissions. The last part of the mitigation potential is connected to soils and soil carbon. We need to be worried about how we deal with the soils in terms of maintaining soil carbon, not just for mitigating climate change but also for preserving fertility. Soil carbon is vulnerable to land management and also to the climate change as such – increasing temperature will result in an increased loss of soil carbon in many regions.

We also have other greenhouse gas emissions – methane, nitrous oxide – which also contribute greatly to global warming. There are a large number of ways you can reduce them, although not many of them are cost-effective at the moment. In fact, there is no universal list because what might be the most appropriate thing to do in one farming system or one region might not work in another. So again, we need a regional view on this.

Bio-energy has come quite high on the agenda recently, but I think we need some caution when looking towards bio-energy. We need to be careful in looking at the side-effects, both in terms of how effective it actually is in reducing greenhouse gas emissions or if we are we producing more greenhouse gases in the process than we are gaining in the substitution of fossil fuels. Are there other negative effects, like effects on food prices or effects on landscapes? There is a wide range of issues that need to be addressed.

We have the potential to develop technologies to reduce emissions, but I think we need to integrate knowledge from different disciplines – biological, engineering and social sciences disciplines – in order to properly implement this.

For my final slide on the research gaps, if we are looking at the monitoring aspect, we have problems. These problems are not necessarily so much in Europe in looking at what is actually going on, although there are also parts of Europe that we have less knowledge on, but we have too little knowledge throughout the globe, particularly in developing countries. I also think Europe needs to invest.

We need a better understanding of the secondary effects of climate change – this could be through diseases, extreme events or environmental side-effects. There is a long list that is worthwhile looking into much more.

I mentioned the management methods and technologies for mitigation in agriculture, because agriculture is a major contributor and that should also be recognised. We also need to better understand and exploit links between adaptation and mitigation. If you care to look into the IPCC report, you will see there is a chapter on that issue but it actually says very little, so there is certainly scope for developing those issues because we should be concerned that they link together and not oppose each other. We need to include that in our ongoing technological development.

Finally, I think it is imperative that we look at issues on regional scales, where we can probably implement the changes. Thank you.

John Bensted-Smith
Thank you very much indeed, that was extremely interesting.

Let us press on with our next speaker, Bertrand Hervieu, who was President of INRA from 1999 to 2003, since when he has been Secretary General of the *Centre International de Hautes Etudes Agronomiques Méditerranéennes* (CIHEAM) and was involved in the Mediterra 2008 project.

- Mediterra 2008

Bertrand Hervieu – Secrétaire Général, CIHEAM
Thank you, Mr Chairman. I would like to thank the Commission and the organisers for having invited the Mediterranean to this twofold debate on agricultural policy and research.

It is not always easy to integrate the Mediterranean into research or into the thinking related to the profound changes being made to the CAP. Nevertheless, the International Centre for Advanced Studies in the Mediterranean has begun a forward-thinking study stretching to 2020, which will be published next year in our annual report. This year's report is on the quality of Mediterranean products, but next year, we will be looking at the future approach. The work is not yet finalised but it is an educational tool to help the 13 countries of the Mediterranean basin who are members of our organisation. They are asking us to undertake this thinking and action and are being invited to consider these agricultural, food and environmental issues.

I would like to present to you exactly where we stand at the moment. There are first of all six assertions which we think are vital for the Mediterranean, then five challenges which we have identified. Then I will conclude by mentioning three scenarios we are working on.

The six assertions are demographic trends, trade, changes in distribution and consumption patterns, problems of food safety and diet – these issues are emerging quite strongly in the Mediterranean – rural development, and then the whole issue of the environment and water resources above all.

On demography, let me stress one point. We are not dealing with a phenomenon of rural exodus in the south and east of the Mediterranean. In fact there is a trend towards a relative increase in the rural and farming population. In 2020, we will have 120 million inhabitants in the rural areas of the south and east of the Mediterranean out of a population of about 450 million inhabitants.

This is important for a number of reasons. Let me just mention two. The first is that everything we have in mind about developing rural and agricultural policies is assuming a working farming population of about 5-10% and an aging and diminishing rural population. In the Mediterranean, however, at least in the south and east, the situation is actually the opposite. It is important to understand that if we are talking about a Euro-Mediterranean cooperation because all of the rural development policies that have been implemented in Europe over the last 30 years have been drawn up on those assumptions, which are wrong for those particular areas of the Mediterranean. So we need to reconsider our approach.

Another point is the trade between the north and south banks. Again, I think we need to move away from the preconceived idea that the Mediterranean is in a sort of north/south conflict. The Mediterranean is very much a part of the world and it trades with the rest of the world – even before Europe – and the countries in the south and east Mediterranean do not trade between themselves when it comes to agriculture and food. Again, these are assumptions that have to be qualified in that we are in a situation where everyone is worried about liberalisation. The countries in the north are worried about the possible invasion of products from the south, and the countries in the south are worried about the collapse of their remaining production. The situation is far more complex, particularly if you consider that more than half of exports from the Mediterranean countries actually come from Turkey, which is the biggest agricultural power in the Mediterranean basin.

Another demonstration of this asymmetry is that relatively recently, 30 years ago, the agricultural food balance of the Mediterranean completely changed. Countries that had self-sufficiency, and some experts in a political context, had a very large food sector which made food safety and security of food supplies a matter of considerable importance for these countries. This is increasing, given the spectacular rise in cereal and food prices on the international markets, and is having a huge effect upon the countries in the south and east. So this collapse, which is continuing, is generating very serious and paradoxical effects. We have countries with very large agricultural and rural populations and yet a deficit in their balance of trade which is continuing to increase.

A third point we are looking at and which is raising new challenges is the changes in our modes of distribution and consumption patterns in the south and east, and even in the north of the Mediterranean. Again, this idea that the Mediterranean is a place for the Mediterranean or Cretan diet is a bit of a fallacy. That diet is probably applied more in the Scandinavian countries than in the Mediterranean countries.

In the last few years there has been an extraordinary expansion of large distribution circuits in the urban areas. This is only exacerbating two other major gaps because these large distribution chains get their supplies from standardised international markets, so there are no local supplies. This again is exacerbating the gap between the littoral urban markets and the possible emergence of an agricultural food market inland. So it is not a north/south split but a rural/urban split.

Inland farmers in the south and east Mediterranean countries can no longer turn to a national market that is not emerging or establishing itself. They are reliant on a local market which is becoming poorer and poorer and is therefore generating this spiral of poverty. This is poverty of the increasing inland population.

Together with this south/south split, there is another split within this general impoverishment process – the urban populations. They too are affected by the problems of overweight and obesity. Again, this is a fact in the Mediterranean area and is creating public health problems for which these countries are ill-prepared.

Then there is rural poverty, which is the counterpart of all the other points I have just made. Again there are some preconceived ideas that need qualifying. The poor people apparently are those in the city suburbs and it is better to be poor in the city than poor in the country. If you are poor in the city you at least have water, schools and basic health. If you are poor in the Atlas area you do not have water, dispensaries or schools. So rural poverty is rapidly increasing in the whole of the area, with one or two exceptions – even in a country such as Tunisia, or Algeria, which is even more striking. So you have a higher proportion of poor people with an increase in illiteracy, with the exception of Tunisia, among the young farming population in the rural population of the Mediterranean area.

One of the indicators of poverty is access to drinking water. Of all the people in the world who have difficulties in accessing water or are deprived of running water, 60% are in the Mediterranean.

Those are the six assertions we focused on because they are basically related to agriculture and the environment. There are not many institutions that focus on these issues and so we feel it is our duty to examine them, particularly for the local authorities. On the basis of these six points, we have identified five challenges or recommendations which we use also for our three scenarios.

The first objective is the management of natural resources. Obviously, here we fully endorse everything that has been said about climate change by previous speakers. This area of the globe will be particularly affected by climate change.

Secondly, we stress the strengthening of training and research capacity to be done on a mutual basis. The research capacity that has been established in the Mediterranean – not just in the south but also in the north and east – in the 1960s and 1970s has really come to the end of its effective life. There has been no renewal in terms of people and there has been no internationalisation of this research, so we have agronomic research structures in the Mediterranean where everybody is trying to do a little bit of everything everywhere.

You also have research scientists of my generation rather than of the next generation. This is a major difficulty and is leading to a very serious phenomenon, namely that when it comes to issues of agronomy or food safety, these countries in the Mediterranean are not creating their own national experts and expertise and they have to rely on others to provide national expertise. This is a major political problem that lies at the crossroads of relations between society and science.

Food safety is now perceived as a new type of non-tariff barrier in the Mediterranean, given the imbalance in the relations between countries, so it is becoming urgent to build up expertise. It has to be expertise of the international scientific community so it is important that the research bodies are linked to the European research area so that they can build up their own national expertise, so ensuring quantitative and qualitative food safety. This is a major challenge to take us up to 2020.

Everyone is now looking at the whole issue of comparative advantage, but that is difficult to reconcile with national pride and the objectives of food safety.

The fourth point is a very difficult one. European countries have worked a great deal on this but it is still relatively neglected by other countries, and that is the marketing of products. It is a very serious problem. There is a real difficulty in local producers being able to supply local markets. For example, the tourism market is served by the international market rather than by local suppliers. Again, this is a big difficulty.

Finally, how do we imagine and build rural policies specific to the requirements of the country and that are not just a copy and paste of the 1960s policies from the north of the Mediterranean?

This leads us on to three scenarios. One scenario, which is quite an easy one but also a fairly catastrophic one, is related to water. In this scenario, we would see not only confirmation of the gap between north and south but also a consolidation of the gap between urban and rural populations, where some people are part of

globalisation and others are rejected and dismissed by globalisation and left to one side by modern trends.

A second scenario is a rapid globalisation rather like Western Europe, moving from a farming population of 35% to 5-10% within 30 years. Someone from the World Bank said, 'Life is a lot easier if you only have a 5% farming population.' Things might be a lot easier but what do you do with the other 30% who will be cast aside by this modernisation process?

A third scenario is based on considering new national and regional agricultural and rural development policies and new approaches to trade liberalisation. Where do we establish protection, for how long, and under what conditions to consolidate agriculture? In terms of social sciences, I think a lot of research needs to be done. This is not something just for the Mediterranean, it would also affect China, a large part of Latin America and some parts of Africa.

What sort of model or approach can we sketch out for farmers outside of the family farm concept? Labour units per year has been the standard format for agriculture. We have always thought that the family farm was a recipe for success but I think we have seen that this is not the case, so we will have to invent a new model. I must say in all honesty that I do not yet see the shape of this new model but we will have to invent it because there is no other solution for these people. Thank you.

John Bensted-Smith
Thank you very much indeed. Does anybody have any questions or comments they want to direct to Mr Hervieu?

I concluded that there were a number of challenges and objectives that had a good deal in common with some of the drivers and influences identified earlier, although one or two were not exactly the same.

Peter Nowicki – Project Coordinator, European Centre for Nature Conservation (ECNC)
Thinking about your presentation, and particularly the last two points about adapting the offer of the products and also about strategies for rural development, I come back to the question I raised about institutional Foresight studies. If the problem goes back 30 years, maybe the question of developing a new strategy will not actually work unless it also has a part of institutional change. Without saying there is any one model that works well that should be applied, would there not be room here, and even an urgency, to engage in institutional Foresight studies? What if you were to change this type of political structure? If we ignore these problems, are we never going to come to a real solution?

Bertrand Hervieu – Secrétaire Général, CIHEAM
In order to move forward on that front, I think we would need to look at Foresight beyond Europe, or at least in parallel with Europe.

I must admit that in the social sciences community in Western Europe, which is where I come from, we are unable to change our thought patterns and the way we think about this problem because it is a model that works, and therefore there are intellectual limits to our imagination. Perhaps future generations will be better able to do so. However, we really need to change mindsets on this.

The problem is that our colleagues in the Mediterranean region are so fascinated by the success of these models and approaches that they find it just as difficult as we do to change mentalities. So we need to change generations and change approaches in order to think differently. However, I agree that we do need to change the way we think, but perhaps there would need to be different types of research programmes. I doubt it is something that we could do between ourselves and I doubt that we could come up with something particularly new.

Christian Patermann – Director DG Research, European Commission
What strikes me very much is that you take as possible a potential reduction in the agricultural labour force in the Mediterranean countries, particularly northern Africa, but you do not say why. In Europe we have this reduction in the industrial labour force. If I take Jørgen Olesen's report and his predictions and modelling, it might be that this reduction in the labour force in northern Africa is more or less inevitable because of the climate changes. That is a completely different scenario which you need to cope with completely differently because you might not be able to change it if the water table is lowering or if the precipitation patterns are completely changing. So what are you going to do? The only solution is to try to find arable land to make it arable with new drought-resistant crops. So how do you think that we can take the different contributions together, how do you react to that and do you foresee that as a scenario as well?

Marta Perez-Soba – Alterra Wur, the Netherlands
I am very intrigued by two statements you made. You said that the demographic trend is uneven and that people will stay in the rural areas, but you also said that you might better off being poor in the city than in the country. Would you not expect that people will move from the rural areas to the cities?

Bertrand Hervieu – Secrétaire Général, CIHEAM
I acknowledge the contradiction, but I wanted to stress that you are even poorer in the country than in the city. The situation is so dramatic that despite this, rural poverty is increasing. I wanted to stress that rural exodus is not slowed down because it is easier to be poor in rural areas, but I note that we are poorer in the country than we are in cities and there is certainly an exodus, people are leaving. Nevertheless, despite that, the rural population continues to increase. I was just pointing out the fact that the rural exodus will not resolve the issue as the situation is so complex.

In response to Christian Patermann, I think here too we lack imagination and the ability to interpret. It is difficult to absorb the agricultural population in the secondary and tertiary sectors. To a great extent they are outside minimum economic circuits.

The striking thing is that globalisation is pushing people more and more to the local level. We see this in the Mediterranean area where you have an urban population caught in the process of information, consumption, migration and so forth, whereas populations in the interior are operating in a local micro-economy and are not experiencing the same kinds of transitions. This creates problems in the relationships between agriculture, family structures, the land and the local economy. I am not saying that this situation is fixed, it is evolving, but the situation is not preparing people in a gradual way and it is leading to a kind of rupture and exclusion of these people. This is having an effect in the Mediterranean, particularly as far as agriculture is concerned.

John Bensted-Smith
I thank Bertrand Hervieu very much for his presentation and participation.

We now pass on to our next speaker, Joachim von Braun, who is Director General of the International Food Policy Research Institute in Washington DC in the United States. He has yet another long and distinguished curriculum vitae, which I will not go into in detail. Suffice to say that he was active in a number of universities in Germany, most recently at the University of Bonn at the Centre for Development Research.

- IFPRI scenario analysis

Joachim von Braun – Director General, International Food Policy Research Institute (IFPRI)
Ladies and Gentlemen, world agriculture is currently showing us two very different faces. One face is bullish. Asia's economies are growing at 8%, Africa's economy is growing at 6%, and that creates a lot of demand for agriculture. The other face is stressed and irritated. The structure transformation is putting pressure on millions of small farms, which dominate world agriculture. Gains from the green revolution will probably be eaten up by global climate change before 2020, with water stress and the uncertainties around market developments. I will elaborate on these two faces of world agriculture, mostly from the perspective of the poor.

What is clear is that world agriculture today is driven by demand, it is a consumer-driven sector of the economy. The nature of the demand is very different around the world, as these families in Africa, North America, Latin America and Asia show, but it is clearly a consumer-driven sector. World food consumption is more than 4,000 billion … and it is catered for by a very fast-growing retail industry. The retail industry in the developing world is growing at a rate of between 20 and 30% per annum. That retail industry is catered for by the food-processing industry. In between the agricultural input supply industries and the food-processing and trading sectors is the traditionally understood sector of agriculture – the farms.

The world has about 450 million farms and about 350 million farms are less than two hectares. That is a normal farm – the European farm structure is unusual compared to the norm in the world. Farm sizes in south Asia are getting smaller – below 1.5 hectares – and China may have reached the bottom of shrinking farm size due to its

fast economic development. Seventy percent of farm managers in China today are women – a feminisation demographic trend of small-farm agriculture.

However, let there be absolutely no doubt that the small farms of the world will be with us for at least another 2 to 3 generations. If you artificially calculate how long it takes to transform a two-hectare farm sector into a ten-hectare farm sector, and apply a 5% rate of giving up farming, it takes 45 years. No hemisphere has ever seen a continuous 5% shrinkage of agricultural transformation.

This is background information for the type of scenario-building we do at the International Food Policy Research Institute. We look at the future of demands and needs and supply and risks but our scenario exercises are very much driven by policy changes that impact on the future of food, agriculture and livelihoods. Policies regarding agricultural knowledge, science and innovations are critical in that context. Policies regarding trade, markets, infrastructure and small-farm transformations are also quite relevant. However, what really matters most for the long term is what the world does and what each country does to its innovation system.

We have a structured modelling approach around which we build our scenarios. You can find the impact model on our website and there is a core model that you can play with on your own – you can build your own future with that model – but the more complex models, which include water systems and the like, are not on the website. The results I am presenting are built on the more complex model.

The model generates projections in these scenarios for crop area, water use, yield production, demand for food and feed, and outcomes for poverty and hunger. It covers 43 blocks of countries – the whole world – and more than 30 crops and animal products, and all these world regions and commodity markets are linked. The outcome of our analysis is what happens to production and productivity if we invest in innovation and research, and what happens to prices. So we can call Commissioner Fischer-Boel, as she requested, and tell her what the outcome of biofuels will be on the world food situation and on prices.

The scenarios are up to 2020 and up to 2050 and there are three of them. One is an aggressive policy action scenario with a new focus on agricultural growth and rural development, more investment in science, technology and knowledge, and more careful management of water resources in the world river basin by river basin. These are very detailed modelling exercises but I will only give you the comprehensive story as there are books behind each of these scenarios.

A policy failure scenario looks at what would happen if the world continued to be, or got even more, protectionist, shutting each other off from market opportunities, and with political conflicts prevailing in major regions of the world undermining innovation capacity and blocking off opportunities for the rural economy.

A third scenario is a technology and resource management failure, where, at worst, investment in agricultural science and knowledge systems is down, where the natural resource management around water and soil, for instance, continues to be as flawed as currently, or worse, and the interactions of these are demonstrated.

It matters hugely for people which of these scenarios countries take. Scenario one, the progressive policy action scenario, shows major productivity and output increases, whereas the other two remain more or less flat up to 2050. The assumptions behind the scenarios in the policy theory and technology and resource management fields are quite realistic. They are based on how the world has behaved over the last 20 years and are not particularly drastic.

In matters of food availability (these are curves of calorie consumption per capita) the food supply situation still matters for a large part of the world. For about 2 billion people in developing countries, the supply side, not just the access and purchasing power side, still really matters. It matters for child nutrition outcomes, as you can see on this curve for sub-Saharan Africa – compare the green curve with the red curve, which are the two most divergent scenarios.

The green scenario brings us close to the Millennium Development goals, but not quite. The public investment behind has a large investment component needed for innovation and research.

What will happen if current plans to move rapidly into the bio-energy sector occur worldwide? We energised our impact model and fed current worldwide plans around biofuel investments into the model and made three sub-scenarios: conventionally, just stocking the model with the plans in North America, Brazil, Africa, Europe and so on, which for many parts of the world means moving from a 3% to a 20% use of agricultural resources for biofuel production; the second generation approach, where cellulosic technology comes along; and the third approach is an attempt at trying to search for harmony, investing heavily in agricultural yield and productivity-increasing and water-saving technologies in order to mitigate the push for biofuels.

In this slide, scenario one, the conventional one, gives you maize price increases of about 40% and wheat price increases of about 30% until 2020, but look at oilseed and sugar cane prices – oilseed prices are up almost 80%.

The mitigation effect of cellulosic technology, about which the experts in that field seem to be much more pessimistic than policymakers and investors, is shown in this second generation scenario.

What does this mean for agricultural research and for scenario-building, which I find a very convincing and useful exercise? In agricultural research, a fundamental change has happened over the past two or three decades. In 2000, the world spent about 23 billion dollars of public money on agricultural research. In 1981, it was about 15 billion dollars. That is public money. As you can see in the blue part of these columns, which includes the industrialised world, that share is down – it is now less than 50%. So the developing world spends more public money on agricultural research than the industrial world – which is what they should do because agriculture matters a lot more for their livelihood and prosperity than it does in the industrialised world. However, it is an interesting structural change. The key drivers here have been China and India, the orange and yellow figures.

What are the implications for agricultural research and policy? Let me comment briefly with this last slide on the four Foresight scenarios against a backdrop from a global perspective.

For the climate shock scenario, I very much agree with my colleagues Peter Nowicki and Jørgen Olesen that climate change has to be factored into the European Union's research agenda in the context of agriculture. There has to be adaptation and mitigation research in agriculture. The world and agricultural world affected by climate change will trade more, not less, because of the changing comparative and absolute advantages within Europe and beyond.

Secondly, the energy crisis scenario is pushed towards a research agenda for innovation for efficiency in the whole biofuel sector in order to reduce the food/fuel competition.

Thirdly, the food crisis scenario calls for a new boost for sustainability of output within Europe and beyond. The whole food-value chain, however, needs to be in perspective here – energy efficiency and overall economic efficiency over the whole value chain, and not just a research agenda hooked on the farm, is what is needed here. I very much agree with the implication spelt out in that scenario for a new and careful look at the agriculture/health research agenda – after all, investment in agricultural research is about people in the end.

Fourthly, the cooperation with nature scenario requires a strong focus on water and biodiversity, but also an accelerated use of technology, including biotechnology. The options portfolio to address the challenges and risks for agriculture requires a broader technology portfolio.

We have to be conscious of the European Union's global role in sharing and partnering for proper agricultural research. Yes, it is right that the developing world is now investing more in agricultural research and has more self-contained larger agricultural research systems. However, in view of the second phase of agriculture, the troubled and scared one that I started out describing, the total volume of investment in innovation knowledge, research and science in agriculture is far too low. It may be alright for maintaining competitiveness currently, but it is far too low for a prudent economically-sound insurance approach for agriculture.

We also have to have two different conceptual frameworks to address the issues beforehand, which I feel have not been clearly distinguished in the scenario-building so far. There is a cost-benefit rate-of-return approach in order to address the competitiveness issues, which is legitimate for the European Union and for any nation, and a risk and insurance-related framework which needs to address the global public good issues and the European public good issues around agriculture.

I suggest that the EU waits and that agricultural research must have the Doha strategy: firstly, to contribute to the global public good of research, with investment in the agricultural research systems at home and internationally, and to scale those up, including in the Consultative Group for International Agricultural Research and other global bodies where the European Commission is a partner; and secondly, the business-oriented role in agricultural research, which to a large extent is already

covered by the private sector, but that is where public/private partnership approaches are called for.

Let me thank you again for the invitation and I look forward to the discussion.

John Bensted-Smith
Thank you very much indeed.

Our final speaker, Eduardo Trigo, is an agricultural economist and scientific advisor to the International Relations Directorate of the Science, Technology and Innovations Secretariat of Argentina. He is also a member of the Academic Council of the Agronomy Faculty of the University of Buenos Aires.

- Global competition – a view from South America

Eduardo Trigo – Director of Gruppo CEO
Let me begin by thanking the organisers for inviting me to talk about this topic: global competition from the South American point of view.

You could say that South America is one of the major competitors but I would prefer to put it in other terms. South America and Europe are major trading partners and when you look at it from that point of view, I would say it is cooperation rather than competition. I will make my comments looking at the cooperation opportunities coming out of the exercise.

I will talk about two issues: the Foresight process and the effort to generate the RTD response, and the challenges and proposed research strategy.

In coming to the Foresight process, one of the things that really struck me and that I wanted to share with you is the similarities of the challenges and problems when thinking about the future of agricultural research we are confronted with in regions like South America and Europe. Some of the statements made about the knowledge failure and the sense that the agricultural research system is not delivering the goods that the end-users are expecting, and the decline in support, both politically and otherwise, that the system seems to be having to face exactly describe the situation in general on the other side of the South Atlantic.

With the exception of Brazil, most of the agricultural research in South America is confronting a turning-point situation. I think this is extremely interesting because it tells of a failure on our side of the research system and probably of not going deeply enough into the discussion of the other determinants acting on the agricultural innovation system. There are policy determinants acting on the agricultural innovation system other than the research system. We tend to look at the system in a fairly restricted way and I think that much of what I have read in the Foresight exercise has a sense of that. It is a sense of the agricultural research system looking at the world from an almost supply-driven idea.

I think we need to start looking at innovation in a broader sense. What are the policies that affect innovation, and what is the role, the potential and the limitations of research?

In South America we have been trying to solve poverty through agricultural research. Unfortunately, it is not a good instrument. The research has resulted in a loss of faith on behalf the policymakers and loss of opportunities in terms of the effectiveness of our investments. I sense a similarity in the direction of much of the discussion and it is a point I wanted to highlight.

The second issue is methodological. I have a sense that the changes in international trade over the last decade or so, with the eruption of India, China and Brazil, have not been fully incorporated in the scenario-building. I think it is too European-centred. Having to comment from the point of view of global competition, I found too little to get my hands on in order to develop my comments. I do understand that it is an exercise for finding a direction for Europe, but I think Europe is too important to think only from a European point of view in terms of the global research agenda.

I would now like to move to the scenarios and the RTD strategy, and I will not make a difference between the long term and the short term. Obviously, the business-as-usual scenario leads us to a potential conflict. We are talking about free trade, and free trade will definitely lead to a realigning of trade laws and the competitive advantage of South America in the major commodities – it is evident.

I put question marks because I am not sure what the product mix would be if Europe moves into a so-called knowledge-driven rather than subsidy-driven policy, and whether we have a conflict or whether we have the basis for further cooperation will depend essentially on what path Europe takes as it moves into a knowledge-driven policy alternative replacing the present system's emphasis on subsidies.

In all the other scenarios, I see a very strong base for competition. Climate change, sustainability, food and energy crises are all convergent and there are great opportunities for cooperation. I would like to touch on some of them.

I will not dwell on climate change as it has been extensively described by people in a far better position than myself. However, I think it is a common issue. The development of better observation instruments monitoring anticipatory elements is essential. It is a critical issue.

The analysis of the secondary effects of climate change is another point where we do have converging interests in terms of developing a cooperation agenda.

Although mitigation alternatives are tremendously important, I see them as being too much of a local nature to be part of the overall global effort. However, I think that the biodiversity issue, which is a big issue from the South American point of view, comes as a major element to include in the long-term agenda as mitigation and adaptation in many cases come from going out of the present product mix, and that is where the biodiversity potential of a region comes into the picture.

The partnership is even clearer in the energy-crisis scenario. Here we are talking about a major provider and a deficit region. Cooperation is already underway in commercial investments, where most of the major investments in biofuel development in Latin America are joint ventures with European partners. Here I see the logic of increasing efficiency and increasing supply.

However, we are also talking about alternative uses of one of the major sources of foodstuffs in the world. Here again, if we look at the long-term agenda, the issue of biodiversity and alternative sources of energy, and increasing efficiency of the whole agricultural chain through biotechnology and other applications, comes into common issues.

In the food-crisis scenario, we are talking about global food chains. Many of the South American producers have the same needs from science and technology efforts on the real needs and concerns of the consumers. There are whole issues of food safety in general – the anticipation of emerging risks in the food chain, issues of traceability – for the better management of the food chain which I think are common issues and there is a lot to be gained from cooperation in decisions.

The tapping of this potential is already underway. There was a fairly substantial increase in cooperation between Latin American and other countries during FP6, and as we come into FP7 there are already initiatives calling for a better organised cooperation. I think the issue here is trying to make it more targeted in finding ways in which, from the initiatives the Commission can undertake, the issue of cooperation can be better integrated into the long-term agenda.

To close, I would like to bring out a point about the institutional dimension. I think the future challenge for agricultural research is more than the sustainability, security, knowledge and competitiveness challenges that have been put forward in these scenarios. We are at a time when the production function of technology is changing. Biotechnology, nanotechnology, information and communications technologies are not just mere lineal continuations of the so-called green revolution scientific base of agricultural innovations. Through the scientific base of technology development today, we are able to undertake challenges that were not in the book just a few years ago. Unfortunately, for that to be fully expressed, the green revolution institutions will not do.

We need institutions that are very able to bring the diversity of actors and the diversity of conflicts, such as intellectual property rights, into the agricultural research framework. It is not just about adding biotechnology, information technologies or nanotechnologies over the old model. I do not think that will work.

The efforts we in South America have made to bring biotechnology into traditional agricultural research institutions have been tremendous failures –molecular biologists do not have the same way of looking at the problems. The public institutions are not used to handling the level of investment, the complexities of interdisciplinary approaches, the public/private interface, and the fact that we are talking about prophetical technologies in many cases. All of a sudden, we found ourselves in a much more institutional environment of high investment, complex technology, science-based technology, highly regulatory systems, high regulations, consumer

protection and so on than the old agricultural research systems of public good, low regulatory systems, low investment processes and so on. I think this is a common challenge because I think we are not discussing these issues.

If we are going to use conversion technologies for the challenges that we have put in front of ourselves – and that is valid for both Europe and South America – we have to reinvent agricultural research institutions and how they fit into the agricultural innovation process. Thank you.

John Bensted-Smith
Thank you very much indeed, that was most interesting.

I think you have heard five extremely interesting contributions this afternoon covering a very wide range of ground, geographically ranging from South America to the Mediterranean to Europe to developing countries to the world, and also a range of different methodologies, different ways of looking at different scenarios and a range of different comments on drivers and the different scenarios that the Foresight Expert Group came up with.

It is now your chance to make any comments and put any questions to members of the panel.

A speaker
My question is addressed to Joachim von Braun. He mentioned in his speech that it is very important to look at the agricultural research system and give more importance there. However, we know that a lot of other supporting policies have to be in line if we want to really make the system as a whole much more efficient.

How do you see these other policies related to the agricultural research policy, what role should it play, and how can we give more importance there to make the systems more congruent?

Joachim von Braun – Director General, International Food Policy Research Institute (IFPRI)
The major challenge is to strengthen the transformation of relevant new knowledge out of the research and science systems and other elements of the innovation system, and the key constraint there is rural services. I think we need a massive change in the rural service infrastructure. That is happening.

Secretly and parallel to globalisation, the world is decentralising. Governing structures and government structures at local and state level are becoming stronger. They are the key elements of the rural service system, including the education system, the infrastructure system, and the market information systems. If you look how markets function today, communities and local government, local business associations related to farming and agricultural followers play a much stronger role in India, for instance – even in Ethiopia there has been a sea change over the last 10 years.

Fons Werrij – Wageningen University and Euragri
I have two questions for Mr Trigo. I have a lot of sympathy for your proposal to reinvent the agricultural research system and institutions. Do you already have some kind of a design in mind and if so, how will you do it?

What is the difference between Brazil and the rest of South America? You made that distinction very prominently but you did not explain why Brazil is so different from the rest of South America.

Eduardo Trigo – Director of Gruppo CEO
Unfortunately, I do not have a recipe. I think the starting point is to recognise the need for a different system. When we start looking at these new technologies that we know we want bring into the agricultural innovation toolkits, one of the elements we do not have in the present traditional agricultural research system is intellectual property rights, and that is an issue that needs to be dealt with. Another is bio-safety considerations and consumer protection issues that have appeared and continue to appear. Even with traditional technologies, every day consumer protection is a bigger issue in the food chain. The traditional agricultural research systems are not really structured but it is not part of the agenda. I think we need to start identifying what we need to have in the systems.

On how Brazil is different from the rest of South America, if you look at the numbers that have been put in the table, Brazil represents about 50% of investment in Latin America. I would say that Brazil is the only country that has kept a permanent policy in agricultural research and technology development, and it is the only country in the developing world over the last 25 years that has had a significantly coherent and constant policy of supporting and improving investments in agricultural research. We saw in the figures presented what has happened to Brazilian agribusiness in terms of net trade. Today, Brazilian net trade in agricultural products is equal to Argentina's total exports, while 15 years ago the situation was completely the reverse.

Fons Werrij – Wageningen University and Euragri
Concerning Brazil, do you think that having a consistent policy oriented to growth is a precondition for sound and growing investment in public agricultural research?

Concerning the new agricultural research systems, there is a tendency in European countries to shift agricultural research from institutes to universities. In your vision, would that trend be helpful in inventing the new system or detrimental?

Eduardo Trigo – Director of Gruppo CEO
On the first question, I do not know enough about Brazilian politics to really answer. I technically think that if you compare Brazil with the other countries, I see a consistency that the other countries do not have.

To answer the second question, I think you would have much more flexibility of the kind needed to deal with the new technologies within the context of a university

system, but mainly within the vertically focused agricultural institutes. Latin America has been organised around the agricultural research institutes and I can certainly say that that model is facing a crisis situation. It is very difficult to diversify horizontally in terms of a disciplinary brief as universities are much more flexible. I would not necessarily say that is the model to go with but intuitively, I think that the university system could be a more appropriate one.

Claudia Neubauer – Fondation Services Citoyennes, France
I am very grateful for this morning's presentations and I think we can all agree to a kind of consensus that we are faced with big challenges in agriculture and agricultural research. We spoke about soil erosion, water scarcities, loss of biodiversity, questions of rural development and poverty, food quality, limited resources, climate change, health and so on. One of the main approaches to this was sustainability.

However, listening to the Foresight exercises represented today, I have the impression that more attention is being put on high technology scenarios to find solutions to all these problems – biotechnology, nanotechnology, information technologies, and GPS were mentioned. As a former molecular biologist, I know that research and sciences are extremely open so we try to go everywhere looking for a solution.

What about alternatives? Can we really envisage only high-technology solutions to face the problems, or are there any low-technology or even no-technology solutions that we can envisage, because less can sometimes be more?

In that context, what part is European research playing – in FP7, for instance – in research for low-input agriculture, small-scale farming or organic agriculture? We talked this morning about fewer pesticides, reduced water use, less energy use, less pollution, and also about the relationship between small-scale farming and multinational companies. A lot of emphasis was put on high-technology approaches and much less on low-technology approaches. FP7 is very clear on this.

My second point concerns knowledge sharing and knowledge transfer. Thierry Gaudin spoke about knowledge sharing and I think we should go in this direction because the problems we are faced with are very complex. Scientific knowledge should not be the only knowledge available for finding solutions to these problems. We have to integrate farmers' local knowledge. It is clear that we are creating a lot of very important knowledge with our current research and innovation system, but we are also losing precious knowledge because we do not care about it. This is a very great loss.

That brings us to the considerations already proposed this morning on decentralisation: the importance of localised research under local and regional conditions and adapting research and innovation to local conditions to work with local stakeholders and farmers. We are speaking about agriculture and I doubt that today, here in this room, we have one active farmer among us.

We were also speaking about research partnerships with policy in the sense of policy advice and about research partnerships with industry. However, much less attention has been paid to research partnerships with farmers, consumer organisations and wider civil society organisations. All this is to say that innovation is not just about high technology and research is not just about competitiveness and markets. Thank you.

Peter Nowicki – Project Coordinator, European Centre for Nature Conservation (ECNC)
I think there is some merit to what you are saying. Agriculture will probably go in various directions in the future, driven not just by some of the drivers we have seen here but also by the consumer side and by environmental concerns. Part of that way will be in the direction of increased need for organic products, for instance.

However, I would be a bit hesitant in actually making a strong link between the small-scale and low-input or more traditional way of farming. I think we will see much of this farming activity also being based on quite high knowledge and knowledgeable farmers and based on research that is not just traditional research but also research that makes use of the newest technologies in understanding the biological systems we are working with so that we can make them as efficient and as benign to nature as possible. This will also happen within the organic farming system, because we not only need to develop conventional high-technology farming systems and make them benign, we also need to do the same with other farming systems.

We have a challenge here to develop these systems to adapt to all of these changes, but perhaps we could see those various approaches to farming systems as an advantage because they will also challenge each other's in trying to solve some of these issues.

I certainly also agree with you that we should not just see things from a research perspective. We also need to involve the knowledge of the farmers who manage the land. However, I think we should not base this only on traditional knowledge because that traditional knowledge may not hold in the future as we have other pressures on our farming community from both environmental and social changes. So we need to interact from the research and innovation side with the local stakeholders, which will benefit both sides in the end.

Joachim von Braun – Director General, International Food Policy Research Institute (IFPRI)
Let me add two comments. My institute works and talks directly with farmers. For example, 90% of small farmers in the eastern part of southern Africa know how climate is changing and has changed over the last 20 years. How do they know? There are farmers' radios and information systems in place and they interact with a research and extension system. A group of 800 farmers in Ethiopia, in a region similarly affected by climate change and drought, do not know – only 40% know compared to the 90% in a similar setting in southern Africa. This is because information systems do not work and there are no farmer's radios. So inclusiveness

between a research and extension system and farmers requires information flows and a functioning system, and isolated research systems do not work.

I think it is central that the European agricultural research system fosters the freedom of choice for technology. Many African small farmers operate in low-technology regimes – not by choice but because of lack of access to the most basic knowledge. In southern Africa we can predict the outcome of harvests with a 70% probability by the occurrence of the El Niña effect nine months before on the coast of South America. That is global knowledge which needs to be available at local level. I think it would be a disgrace if high-tech information is not made available to the low-tech farmer. What the farmer then does with that knowledge is his or her choice.

Eduardo Trigo – Director of Gruppo CEO
I do not know if it is right to talk about a high-technology environment because we have the same criteria. If we go back 50 years, we were probably talking about quantitative genetics as high technology and it is not any more. I think it is the technology of the time and it would be a mistake to separate farming systems on the basis of technology. I can foresee a number of applications for advanced genomics or marketing knowledge in organic agriculture, and many other new technologies that would increase the efficiency of resources used in all sorts of different farming systems.

I get the feeling that we continuously end up indiscriminately bringing together research and innovation. I think we have to separate research and innovation. Research is the generation of new knowledge and innovation is a different and much more complex process involving a completely different set of actors and 'environmental' aspects. That is where I see the mixture between research input and knowledge sharing in a process of permanent hybridisation of the new perspectives into what is already entrenched in everyday practices. I think the innovation process takes place in a much more complex environment than research. Research is one component of innovation but not the only one by far.

A speaker – France
I have two questions for our speakers from North and South America.

As a former economist, I always considered that the economic success of the United States is worryingly due to antitrust legislation. In the description Mr von Braun offered, we have a very large concentration of power on the supply side for genomics, with five companies worldwide, and in distribution, with Wal-Mart and Carrefour having a big handle on the distribution system. Conversely, we know that in the United States you have movements, like the Environment Defence Fund, that campaign for and get reductions in excesses of power and also nature protection. The Environment Defence Fund has 500,000 militants. Could you tell us more about both forces in your country – productivity on one side and the resistance and protection of the environment on the other?

I think a similar question is raised with regard to South America. You have very big agricultural properties over there. Is the research devoted only to increasing

productivity or is it also devoted to knowledge of nature? I have always been struck by the fact that we estimate the number of different species in the ecosystem as between 5 and 30 million, but only 108 million are known and have been referenced. So we do not make much of an effort at knowing nature, all we do is make a big effort at making money, which is for a completely different purpose.

Joachim von Braun – Director General, International Food Policy Research Institute (IFPRI)
The issue is a complex one. First of all, if it is from the farmers' perspective, what is the point of reference? Are you a free-market operator in a local market or in an inter-regionally connected one? Exploitation, market dominance and market control are rampant in small-farm agriculture at the local level, so just looking at market shares of the big globally-operating companies does not tell us much about the dependency of small farmers in the market place.

The liberalising effect for small farmers due to the new commodity exchanges and spot exchanges in India, in which thousands of small traders interact locally with farmers – unlike the Chicago Commodity Exchange, where you only get 50 – is a very interesting example currently being copied in east Africa. Freedom to operate has local constraints but it also has global ones.

I feel a global antitrust legislation or regulator is missing in the world, although it does actually already exist in a rudimentary way through a cooperating network of national antitrust organisations. However, in my opinion, it is not strong enough.

The companies I listed are almost all on the Stock Exchange and they compete with each other. The least successful on the International Stock Exchange has been the fastest-growing one – the retail industry. The most successful, with the highest return, highest dividends, and highest gains, was all the way to the left of the chain – the agricultural input industry. So competitiveness is a complex story. Market transparency, information and the organisation of farmers is the answer in addition to a global antitrust policy.

Cécile Levret – Euromontana
I would like to come back to what the penultimate speaker was saying about agricultural research.

Earlier on, the Commissioner pointed out that agriculture was really quite special, and we heard that one of the new tools we have to focus on is agricultural renewal. We believe that in fragile zones, such as mountain and hillside areas, agriculture has to be fully integrated into the local social and environmental fabric to sustain local resources. So we need research that is far more integrated and ties together all of the local dynamic forces so that we can work on an agriculture which is sustainable, except at an economic level because it is difficult for it to be viable, but it has to be sustained nonetheless to maintain something which society wants. We talk about traditional agriculture, because these are things that have been done for generations, but it has to be modern as well. These are not necessarily contradictions in terms. We also have to have new approaches appropriate to the type of agriculture.

Among the scenarios proposed, I think the concept of cooperating with nature is interesting, but there should also be cooperation with society at large. You need to be able to explain better to society why this agriculture in vulnerable areas has a role to play in the economy. The question of the public good and positive externalities is very important for us. It is a question of the relationship between man and nature, man and animals. Society should not be cut off from this type of agriculture, so we have to get the message across to society.

Peter Nowicki – Project Coordinator, European Centre for Nature Conservation (ECNC)
What is interesting about your statement, and I think it is valid, is that you talk about agriculture that might be sustainable, except economically. Then you look at the contrast between traditional and modern, and at the end you make a point about social awareness.

I think you are right that there are certain types of agriculture that have a social and an ecological function which is more important than their economic function. I believe that current policy recognises this by trying to encourage the maintenance of these systems in the second pillar of the CAP.

In terms of this dichotomy between traditional and modern, in reply to an earlier question I was thinking of a unit of goat's cheese production that I visited in Sologne a year ago. The goats were basically living indoors in a beautiful stable with some access outdoors. They were in good health, the quality of production was very high, and they were selling as a registered mark and as a traditional mark. Was that traditional or modern? It was a highly modern unit producing excellent-quality cheese in a very safe food-secure environment. It was also basically biological because everything coming in was organic. So what is traditional and what is modern? There were about 200 goats under very good but very modern conditions, and they were selling a traditional product recognised on the market.

Moving on to the question of social awareness, I think people are aware. There are enormous amounts of campaigns for different labels, so the situation is probably fairly good in Europe on that scale.

Marta Perez-Soba – Alterra Wur, the Netherlands
I would like to come back to the discussion with Eduardo Trigo about the division of funds between the two main agricultural research institutions – the universities and the research institutes.

The main goal mentioned this morning by Mariann Fischer-Boel was to have an efficient transfer of research results. Universities deal with fundamental research and research institutions with applied research. I do not think it should be a competition between South America and Europe but a cooperation, so the challenge is to combine both universities and research institutions.

There are a few exchange posts in Europe now in which we work together on projects and we are even using the same corridors or offices, so there is a very good flow of communication about what is happening in fundamental research and in applied research.

Elie Faroult – DG RTD, European Commission
I think Mrs Neubauer and the lady on the left hit the nail on the head. They made a fundamental point. When we want a policy we need to look at who is defining the policy and how they are doing it. This afternoon we have heard an emphasis on reforming European research structures, but the question is who is going to reform them, for whom, and on whose behalf? I think it is important to talk about the various partners in this debate.

Secondly, Mr Nowicki showed us a table on the 2020 scenario and on the FFRAF scenario. I would agree with the various FFRAF scenarios. These scenarios are outside the box and that is how we need to think. There is a difficulty with that, however, and that is that we have certain indicators to help us think about strategic change but very often, these indicators do not include the environmental, socio-economic or human dimensions – they ignore those dimensions. If we want to have a real reform and a real change in the way institutions work, then we need to look at the indicators and the tools we use to understand reality, as they are essential. Thank you.

Eduardo Trigo – Director of Gruppo CEO
I am sorry if I gave the impression that it was either/or. I think the universities are an essential component in bringing the new disciplines into the picture. I am probably emphasising that point because I think that in the South American context, the universities are lagging behind. I am not saying that the dedicated agricultural research institutes should not exist any more, what I am saying is that for many of the new avenues that have to be incorporated, a greater role of the universities is needed.

Peter Nowicki – Project Coordinator, European Centre for Nature Conservation (ECNC)
With regard to the questions about the difference of the indicators, one of the points I strongly feel is that there needs to be research combining the environmental knowledge we have of how the earth operates with the effects of agricultural technology. That is being done but it is one of the things I feel are extremely important.

In terms of who is deciding on the future of research, you are right. I believe there should be more interaction with the different elements of the farming community but I suppose that is also occurring through social research. However, what is really important for me is that farmers themselves probably need access to knowledge more than anything else. There was a point made about radio contact to knowledge of some sort, I think that farmers are not really interested as much in designing

research programmes as they are in getting as much knowledge as they can from different sources.

John Bensted-Smith
Thank you very much indeed. We have come to the end of an extremely interesting afternoon. You have all earned a drink, and I believe there is one outside.

I would like to thank the interpreters for their efforts this afternoon, and finally and particularly, I would like to thank our panellists for the time and effort they have contributed this afternoon in preparing and making their presentations and in contributing to the discussion. Thank you very much indeed.

27th June

Morning session

The Future of Agricultural Research – Expectations from Stakeholders

Timothy Hall – Head of Unit DG Research, European Commission
The first part of this morning will follow on from yesterday, so we will not repeat what has been said before. We would like to see what the expectations from specific stakeholders will be so we have tried to get a good cross-section of different stakeholders. It will not be absolutely exhaustive, of course, but I hope you will agree that we have a reasonable range of people representing different groups who will give their views on what they think should be happening.

Before we start, I would like to remind the SCAR working group people that at 2 o'clock this afternoon, there will be a meeting to follow up on this meeting. Your memories will be fresh from this meeting and we need to take the conclusions forward.

We were reminded yesterday of the importance of agricultural research for development and international cooperation in general beyond the European boundaries. In this connection, particularly in the context of agricultural research for development, there is another conference that is back-to-back with this one, which starts tomorrow lunchtime and goes on until Friday afternoon, concerning specifically agricultural research for development. This is organised by an ERA-NET, which is one of our coordination mechanisms. They have also undertaken a Foresight exercise so it will be extremely interesting to profit from that exercise too when we take a wider view of Foresight for the activities of this conference later on.

Let us proceed. I would like to introduce Christof Walter, who is a research manager in Unilever's Sustainable Agriculture programme. He will give an industry view of how he sees Foresight on behalf of his company.

- Managing the Food Chain and research challenges of the food industry

Christof Walter – Unilever
Thank you, Tim, and thanks to the organisers for giving us the opportunity to give our input to this very engaging and important meeting. I will start with a few words on who we are and why we are interested in agriculture and sustainability.

Unilever buys about two thirds of its raw materials from agricultural sources so sustainable agriculture is very much about securing our supply chain. However, it is also securing our markets because our customers – retailers and consumers – are becoming increasingly aware of sustainability issues and questions. They are also becoming increasingly demanding in terms of corporate social citizenship that they stipulate when they buy our products.

Unilever has a long track record of sustainability engagements. We have had initiatives on foods and fisheries and water running for about 10 years. You can find more information on our website.

I would like to share with you some of our fundamental beliefs on farming. We believe that farmers should farm for markets and not for subsidies, although what a market is could be relatively wide and could include environmental services as well.

We also believe there is a large benefit globally in having a very interdependent and specialised global agricultural system in which people farm as best they can in the area where they are, using the assets and endowments the best they have in a particular location to produce what can be best produced there. Trade and trust are very important in securing not only peace but also in warranting development and wealth globally.

Finally, we believe that sustainable intensification is absolutely key in increasing agricultural outputs.

The benefit of having stakeholder consultations is normally that you get lots of controversial views, and in that respect we are probably very boring stakeholders because we largely concur with the findings of the Foresight Expert Group's review. I congratulate the staff for having put together an excellent group. I think they are all drawing the right conclusions. The five challenges identified are exactly the challenges we are facing as well.

We would like to emphasis some of the practical conclusions, and the only area where we disagree slightly is that I think the report becomes a bit weak at the end when it comes to actually drawing conclusions of what-should-be-done factors and what the research agenda should be.

I would very quickly like to run through the five challenges and our take on them.

Mitigating and adapting to climate change is a big challenge for the food industry and is very much talked about. There is a small danger of forgetting all the other important things about sustainability – it is not all about climate change – and there are very important issues and questions to be answered in the area of living with nature and farming in an environmentally sound way. Rural development and economics are also important in farming.

Interest in biomass has increased dramatically and it is becoming a new commodity in an entirely new sector. The potentials in markets for biomass are manifold and that is a very great challenge for us because we suddenly have to face not only increasing prices but also genuine scarcity, at least in some locations and at some times.

The security challenge for us was very easy. We believe that in a trade-based and trust-based world there is going to be development. We also believe it is a world in which we can survive as a multinational company, and we believe that agriculture

should be globalised in the respect that people produce what can be best produced where they are.

We saw some very encouraging examples in Joachim von Braun's presentation yesterday, where he was running a scenario of lower protectionism and stronger globalisation of strong trade. You could see that not only was productivity much higher than in a more protectionist world, but also that we were getting much closer to reaching a number of the Millennium Development goals in that scenario. Closing the yield gap between potential and actual yields is key because it is about providing enough biomass and the right resources that we need to achieve these goals.

For the knowledge challenge, we would primarily like research to help farmers to be successful in the market they farm in. We need a much better and quicker understanding of what the knowledge needs are, and Foresighting is probably a very good way of achieving a quick feedback between what is actually required and what we do in R&D. There is always a time lag between detecting what is required and delivering it and shortening that time lag is absolutely key.

Another vitally important field, and one that does not really come out in the expert group's report, is that we need to integrate knowledge generation and dissemination much better. R&D in agriculture has shifted to universities and academia, which are not well designed for delivering something in practice in the field. I think the gap between what technology and science can do and what we do in the innovation field and what the broad majority of the farming community are doing in the field is in danger of widening. We should strike a balance between being innovative and actually bringing knowledge that has been generated back into the mainstream.

We believe that farmers should farm for markets. We do not see the competitive advantage of EU farming so much in its ability to generate new technology, we see it more in the human capital, so it is about the ability of farmers to use technology and information, to be successful and adaptive in changing environments, to understand the challenges and how they can best do that. It is about empowerment and enabling farmers to be successful entrepreneurs in a changing environment. It needs very well-educated and clever farmers to tackle only half the challenges that were identified in this report. It is probably not all about technology, other innovation is important.

The policy and institution challenges follow on from the ones before. Obviously we need an institutional set up that is able to deliver the input we need to address these challenges.

Our main priority for an R&D agenda in agriculture is to increase productivity in a sustainable way. For us, that means going away from intensifying material inputs and going into intensifying knowledge inputs, getting knowledge into the farming system and relying more on knowledge to increase production and productivity, designing clever rotation and farming systems and cascading uses of biomass and bio-products within the farming system. We are a long way from that. R&D certainly has a role to play in helping to balance the uses of food versus non-food in biomass in general. There will be an increasing strain on that resource and we need to manage it as efficiently as we can.

Linking markets in farming was the point I made about understanding better what is actually required in practice and generating knowledge and taking it back to where it can be used. Finally, R&D should be able to empower farmers to be successful entrepreneurs in a changing market and environment. Thank you.

Timothy Hall
Thank you very much indeed, Mr Walter.

We will move on to Mr Kees de Winter, who will represent the European consumer organisation and give us their views on Foresight.

- High quality products – expectations of European consumers

Kees de Winter – BEUC
I would like to thank the European Commission for inviting me to speak here to give our views on agricultural research and its priorities.

I have read the Foresight group's very interesting report but I was somewhat surprised when I saw the statements and the picture outlined on the state and effectiveness of European Agricultural research.

It is very good that such a report that clearly analyses the current position has been produced. However, I was mainly surprised by the statement that European agricultural research is not delivering what it ideally should to serve the sector, and also to see that there was not a good linkage between the research done and knowledge produced and the actual needs perceived by the farming community and other stakeholders in the sector.

It is clear that agriculture needs precisions on changes such as climate change, the energy problem and the need for lower inputs in order to adapt to the coming changes and to move towards sustainability. Indeed, the entire sector should be more knowledge-based to cope with these challenges.

A few of the Foresight Expert Group's conclusions pointed these problems out, but we think they need to be better addressed to cope with the challenges. For example, the knowledge produced is not properly connected with the needs, social relevance is not very well studied, and there is a lack of input from NGOs who study the research agenda needs.

The relevance of the knowledge produced is discussed and a lot of high-quality knowledge is produced, but in the end, the links to the practical application of this knowledge are not perfect.

There is also a need to engage stakeholders in the formulation of the questions – as society has to deal with these things, society has to have some awareness of what is going on in agriculture, otherwise there is no basis for change. The political

environment should also be better aware of what is going on in agriculture in order to make proper decisions.

The report speaks of two things about the focus of agricultural research that I found very remarkable. On the one hand, it says that academia work is focused on the scientific community: I think their peer-reviewed articles need to be published more widely. On the other hand, there is the business-driven research, which is really very much determined by commercial interests and benefits. I quote from the Foresight Expert Group's report, 'The real knowledge needs of rural communities have been relegated to secondary priority, with the result that the knowledge being produced is remote from practical utility and application'.

Very generally, I concluded from the Foresight report that the current research lacks relevance and also that the results are not freely available, so the dissemination of information is not good. Key users are insufficiently connected to the research agenda. Therefore, the research that is needed to match the future challenges, like the energy crisis, climate shock and the food supply, could be better focused to produce knowledge that helps to overcome these problems in the future. Dissemination must be improved. As the previous speaker said, the extension services have been reduced and I do not think that is a very good development.

I think the challenges for agricultural research over the next decades will be to redress the balance to the real needs of the end-users, and also to strengthen public research and public/private cooperation to produce more knowledge that can be used generally and that is not exactly linked to business interests. I think it is important that the extension services are strengthened together with the availability and accessibility of the extension services for farmers and end-users to use. This will lead to an improvement in the involvement of the end-users and stakeholders and also lead to more awareness of the politicians and the public at large.

Agriculture was in its own world in the past, but now it is much more interlinked with other areas, such as rural development and food quality. I think there should be more links between typical agricultural research and other fields, such as life sciences, to produce research and knowledge that is useful for the users.

If research is not really seen as useful by society, the consumer or the citizen in general or by the politicians, it is a recipe for problems. Therefore, I think an open line to society is needed to inform society about what is happening in research, what one is trying to achieve, and why it is very important to move to a much more knowledge-intensive farming. Thank you.

Timothy Hall
Thank you very much indeed, Mr de Winter.

The next speaker is Dr Steffan Daebeler from the Agency for Renewable Resources in Germany. His organisation is primarily responsible for promoting research and development projects for the German Government, but related to non-food.

- Biomass for Energy and Industry

Steffan Daebeler – FNR
I come from Germany and I would like to talk about our goals and what we believe is necessary for R&D work regarding energy from the point of view of biomass for energy and industry.

As you probably know, we grow about 1.5 million hectares of non-food crops in Germany. Most of that is rapeseed, followed by starch plants such as wheat, maize and potatoes. One and a half million hectares is quite a lot: it represents about 50% of arable land in Germany and is more than the acreage of potatoes and sugar beet combined.

We heard a lot yesterday about the main drivers for agriculture calculated by the SCAR report. You can see the eight main drivers for the agricultural future on the left of this chart. There is another serious study by A. T. Kearney which is based on industry rather than on agriculture. If you look at the main drivers for industry, you find globalisation, legislation influence, demographic change, as in the SCAR report, consumer demand change, which is important for the agricultural future, and you also find one main driver for the future of industry – raw material change. That blends very well with the left side of this chart, where you see the non-food renewables, including bio-energy.

When talking about R&D, I conclude that it would be necessary for the future to combine the research for industry with the research for agriculture over the whole chain, starting from farmers growing the plants, through the refinery and bioconversion process, to industrial plants and on to the NGOs.

Here are some main conclusions from trends contained in the SCAR report. The first three points on this chart are that there will be an increase in employment in non-food production, increased consumption of alternative and renewable energy and a transition to the bio-economy, and massive restructuring of agriculture based on a growing demand for bio-energy.

As I am talking about biomass for industrial energy use, and that is why I think it is necessary to increase R&D for the non-food industry and for energy crops. I am talking about crop management in relation to climate change for R&D that involves systemic complexities, and implementing joint R&D along the complete value chain focused on lead markets for industrial purposes and also for energy purposes, industrial polymers or fibre-reinforced materials.

We also need to talk about special R&D needs. I still believe that if we talk about biomass for industrial energy use, one of the most important items is that we get high net yield per acreage. We also need to talk about plant security, and we need to consider and research new cultivation schemes and new plants for the new cultivation schemes.

Exploration of plants as a factory would also be important, and linking agriculture and industry would be the next item for bio-products and bio-energy. We need to improve technology for bio-energy production and bio-products. We need to think and talk

about the development of certification schemes – something is happening at the European level and quite a lot of work has already started in Germany for certification schemes to produce biomass for food and for non-food.

I would like to say a few words on bio-energy. The SCAR report says that the 'Prime immediate options for the next hundred years are biofuels and other renewable sources, which are much more feasible commercially than hydrogen'. That is why it is important to focus energy RTD on bio-energy. Another point is to use all kinds of biomass and not just to grow special plants for biomass or industrial energy use. We need to consider ways of using animal residues.

This is the last chart I would like to show you. The SCAR report says, 'The attempts of the Seventh Framework Programme are a start, but not enough to link new R&D quickly to agriculture'. To make the conclusion for us, that means increasing and focusing financial support for non-food biomass. It is necessary. If you look back at the past few years, you can see that the money expended for agriculture was increasing between 1998 and 2002 up to FP5, but then decreased with FP6. I am still optimistic that with the new FP7, much more money will be available for agricultural research and that it should also be spent on biomass for industrial energy use. Thank you.

Timothy Hall
Thank you very much indeed.

We now move on to Mr Pekka Pesonen, who in the last couple of months has taken over the COPA-COGECA organisation. He will give the farmer and cooperative view of what is happening in Foresight.

- The Farm of Tomorrow

Pekka Pesonen – Secretary General of COPA-COGECA
My background is of agricultural policy and I have been working in Brussels for a while. I have worked in the Finnish Ministry of Agriculture as an administrator and policymaker, and then I was also involved with the food business in the Finnish dairy industry, so I have a fairly broad view myself and I would certainly like to reflect on some of the experiences that I have gathered myself this morning.

I have taken note of some of the points raised by the earlier speakers and perhaps we could discuss those points further, but generally speaking, I can relate to most of the issues raised. From the agricultural point of view, however, I would like to highlight three points.

First, I would like to abstract the disruption scenarios developed by the Foresight Expert Group – climate shock, energy crisis, food crisis and cooperation with nature – to focus on new policies with agriculture.

Secondly, market orientation will clearly be the tool for European agriculture in combating new challenges. The 2003 CAP reform helps us to further develop a

more consumer-driven approach. In addition to this, we all have to rethink the role of European farmers in society.

Thirdly, I will point out the fact that in general, agricultural innovation does not automatically lead to advanced agricultural products. Complexities and the interaction of various factors emphasise the need for cooperation between man and nature.

First, it has been stressed by the Foresight Expert Group that agricultural research does not deliver the type of knowledge that is needed by end-users in rural communities, and that research results are not sufficiently disseminated. The reason for this might be that the role of agriculture has not been understood correctly.

Agriculture is not only the production of milk, meat or cereals. Agriculture, in a broad sense, is a highly complex system that involves sustainable management of natural resources, local ecosystems, environment, health aspects and energy policies in addition to conventional food production.

Society has become aware of the provisions of public goods provided by agriculture, hence increasing the budget of agricultural research projects. In a long-term perspective, with a growing world population and increasing pressures on natural resources, these public goods will hopefully become marketable goods and price labels will be put on them.

Meanwhile, European farmers certainly hope that the discussion on agricultural research is conducted in a reasonable and scientific manner. There is too much at stake to treat this topic with polemic. I certainly know that this is also a challenge to us as a farm lobby.

Secondly, on market orientation, worldwide competition is already our economic framework. Nevertheless, this cannot hinder the approach I have described. Advanced agricultural products manufactured with the help of redesigned research policies will result in higher market returns and higher income for European farmers. That is a priority for us.

By definition, European farmers could only produce food in a sustainable way, clearly demanded by society and lately promoted by the single farm payment system. We feel quite strongly that the concept of sustainability is fairly unknown to our trading partners, such as the South Americans. I am not saying that we ourselves are perfect yet in this sense but at least we have a regulatory framework already in place to support the sustainability approach. It will certainly be interesting to see how the WTO will deal with these matters.

Thirdly, on developing a European agricultural research agenda, one can certainly claim that the way towards a knowledge-based bio-economy is difficult. I can assure you, however, that the European farmers will deliver. We will seek cooperation with politicians, lawmakers and researchers to create a strategic framework to integrate research into rural areas. European farmers are convinced of the need for agricultural research. In the past, European farmers have perhaps not been fully

regarded as a part of this team play. As European farmers implement research results, they demand an equitable partnership.

The role of agriculture will be to close the gap between applied and basic research and foster better synergies. As agriculture is solely governed in a European framework – the CAP – we would very much favour a European regime in agricultural research to avoid the misallocation of resources. In saying this, I fully realise the political consequences and resistance that such a European agricultural research agenda could cause.

Agricultural research involves issues related to the whole rural economy. It even has a democratic dimension in terms of employment, education and age structures. To give an additional challenge, should we not study farming families and their role in future policies? What sort of issues do our farming families consider? This is a matter of relevance, especially to marginal rural areas.

Finally, the farm of tomorrow will be managed as more of an enterprise. Ideally, the agri-business of tomorrow will operate on environmentally-friendly production methods, producing food and services of high quality. Hopefully, this contribution will also be reflected in market prices and in the long-term agricultural rural policy framework. Thank you.

Timothy Hall
Thank you very much indeed, Mr Pesonen.

I will now move on to the next speaker. Yesterday, somebody made the comment that there was not a real farmer in the room. Well, we did have a real farmer in the room and he is going to talk to us now. He is Giacomo Ballari, who is the President of the European Young Farmers. He will talk to us about the young farmers' view. He currently practices farming as a honey producer in northern Italy.

- The Farmers of Tomorrow

Giacomo Ballari – President of the European Young Farmers
As you have heard, I am a farmer, I produce honey and fruit in the north of Italy, and I am President of the European Young Farmers Association.

It is extremely interesting for us to be here today because over the last few years, young farmers have started attaching a lot of importance to research and to agricultural research in particular. This is why it is important for us to set out our priorities.

I would like to focus my comments on two separate axes: first, the basic conditions for successful agricultural research in the future; and secondly, what kind of research young farmers actually need.

Yesterday and this morning, a lot of people asked me: What do young farmers have to say about research, what is your position on this? I think the situation is quite

particular at the moment. A lot of changes are taking place and there are different reasons for young people to stay in agriculture. Production techniques are changing and consumers have high demands of farmers now.

That is why we are particularly interested in creating conditions so that young farmers can now take advantage of all this to develop their businesses, and research plays an essential role for us. Knowledge is a vital tool in ensuring that young people can develop their farms so as to deal with these new opportunities. This is why we need exactly what other businesses need. We need the results of research to be transferred to the farms. It is very different from the situation we had in the past, when research, agriculture and young farmers were kept extremely separate from each other.

Research is an essential tool in increasing the competitiveness of European farms and we need a joint alliance with research. We need to develop a shared platform where research and young farmers should meet. We need an office for the transfer of agricultural know-how linking farms, research bodies and universities.

How can we make research useful to young farmers? Most agricultural research needs a market outlet – research cannot be done just for the sake of research. We always need tangible and useful results – useful for the young farmers but also useful for society and the environment. How can you achieve this at a national and European level? That is the key question.

We have been discussing this in the Young Farmers Association and we feel that the SCAR Committee really could be a leading organisation in all this. It will mean getting agricultural stakeholders involved in your work. However, here is a suggestion: what would you say to the suggestion of a stakeholder advisory group for agricultural research, to comment on the content of research projects being proposed over the next seven years and to provide researchers with regular evaluation of what they are doing? At a national level, I think it would mean that young farmers would become actively involved in the National Research Councils. So researchers and farmers should work hand in glove helping each other.

Let us focus on what kind of research young farmers need. Let us look first at specific priorities and the kind of research that young farmers will want in the future.

The clear idea has to be research focusing on the competitiveness of European farming. I am sure you will not be surprised by that particular suggestion. This is a direct consequence of more alert and more open markets, changes taking place in the market place and consumers being more demanding. I do not think we need to discuss that anymore, it is quite clear, that is the situation on the ground. If researchers and young farmers can agree on that principle, then I think we have won half the battle.

How can research reinforce the competitiveness of European agriculture? There are two fundamental elements here. I have just spoken about how research needs to be focused on the end-user – the farmer – but in the future, research must be practical and must look for ways to help farmers convert themselves into agri-businesses based on knowledge and ready to face up to increased competition. In order to do

this, we will need to develop research and find the right tools for farmers in order to understand how we can develop agri-businesses. However, without the appropriate tools we will not be able to develop our agri-businesses. So we are talking here about lifelong learning and ongoing training to help young farmers to face up to the requirements of consumers and to deal with new technologies.

Then there is the whole question of the quality of the product in the agri-business sector in Europe. I think it is extremely important to see how we can beef up the link between the agri-business and research sectors and develop new products or improve old products, so as to be able to deal with what society requires of us in terms of food safety, market transparency and so on.

Which new technologies can be used to achieve this? Climate change, of course, is also an important issue and there is a lot of discussion on that at the moment, but I think precisely now is the time that farmers need to think about how they can deal with climate change. The seasons are changing and we all feel that the climate is going to change even more. This is going to have an impact on the farm so we really do need to see how we can develop crops for drier and hotter conditions.

However, we also need to think about how we can develop positive practices which will produce positive results in fighting climate change and reducing emissions. Renewable energy is an extremely important issue and everyone is researching that.

My final point, which is crucial for me and for young farmers in general, is that you should consider the position of young people in agriculture. There has been a huge decrease in the number of young farmers over the last few years, but as I said at the start, there is a new interest among young people in agriculture.

I think research can do a lot in providing more information to young people so that they can work out how to run their farms and how to produce really sustainable and competitive farming businesses. So research needs to be carried out to see if agriculture in Europe is going to be sustainable over the coming decades. If it is going to be sustainable, how can we improve it in the long term?

I hope you now understand better why we insist upon the commercial practicality of research and greater work in cooperation and networking. We want to keep farmers on the land and provide them with new technologies, new tools, and more knowledge to allow them to develop competitive and sustainable farming businesses.

Are the research bodies here prepared to work with the young farmers in producing sustainable farming? If there are any centres interested in this, the young farmers and all the national Young Farmers bodies are prepared to work with you on this for the sake of the future of our agriculture and the sustainability of our rural zones. Thank you very much.

Timothy Hall
I would now like to introduce Michel Dodet, who is the President Delegate of INRA and is certainly well-placed to take the position of the agricultural researcher in this complex process of Foresight.

- The Agricultural Researcher Tomorrow

Michel Dodet – INRA, France
I will try to give some ideas about the role of the research institution in agricultural research for the future.

First of all, are research institutions stakeholders or shareholders? If we are looking at history, at the beginning of agricultural research just after the Second World War, we were certainly stakeholders. That means we were working very closely with farmers' organisations and with the Ministry of Agriculture. There was a close complex of activities where the objective was to obtain an increase in production for the self-sufficiency of European nations. Agricultural research moved into life sciences and environmental sciences in the 1980s, and there has probably been a weakening of links between research and agriculture – farming organisations and the like.

We are now entering into a new period precisely because of the changes in agriculture. We are now becoming one of the stakeholders of agricultural research. That means that agricultural research today is at the crossroads of the research self-move, the evolution of research, what research can bring to agriculture and the needs of society, which is wider than just agriculture. At this crossroads, we have to organise the confrontation between what research can bring and the needs for agricultural research at large.

Agricultural research is strategic research, more oriented to problem-solving than driven by curiosity. To fulfil its mission, it must interact with other stakeholders in the priority-setting process. That is what I meant when I said we are at the crossroads of what research can bring and society's needs. In this process, agricultural research shares a vision with other stakeholders through their involvement in the Foresight process. We have to link the organisation of discussions with other stakeholders in the Foresight process in order not to be too close to the contingency questions, but to have a wider vision of the future and to share this vision of the future with other stakeholders to set priorities in a proper way.

Agricultural research has changed in scale through the development of new concepts in the development of tools and methods in life sciences and environmental sciences that are part of agricultural research today. Agricultural research is becoming more systemic. That is important because we are now able to address complex questions that we were not able to address 20 or 30 years ago. In our changing relationship with stakeholders, this ability to address complex questions with new tools is fundamental because we are now able to propose answers to questions we were not able to propose answers to a few years ago.

Agricultural research has also changed in scope. It is agriculture, but as a component of sustainable development it is more than sustainable agriculture. It is agriculture as a part of the more global question of sustainable development. It is food and nutrition, it is the management of natural resources and biodiversity, it is rural development, it is non-food production and it is health. This move of agricultural research to enlarge the topics it has to address is probably not at its end. It is a growing movement and more and more, agricultural research organisations will

become brokers. That means that they have to organise the cooperation of their own skills with those of other fields of research and intransient organisations in order to address those complex questions of society.

If agricultural research has changed, its stakeholders have also changed. They are farmers, the agro-industry and agro-food industry, consumers, environmentalists, regulatory agencies and health organisations. When I say that we are at the crossroads of what research can bring and what our stakeholders want and what they are expecting from us, all these stakeholders have to be taken into consideration.

Research institutions need better understanding of the trends, uncertainties and disruptions that could shape the future in orderto organise their priority-setting properly. I stress uncertainties after feeling that in our discussion yesterday afternoon, we may not have stressed the question of uncertainties enough. We need to better understand the challenges that agriculture is facing and to translate those challenges into questions of research. It is not so easy, in fact, and that is why we have to organise these confrontations between our stakeholders and research because we have to understand in depth the needs of society, agriculture, the agro-food industry and other stakeholders. This in-depth understanding is absolutely necessary to properly identify the difficult and integrative questions of research, integrating biology, the environment, social sciences and so on, in order to set our priorities and generate appropriate new knowledge.

Agricultural research is not solely defined by the areas it covers, it is also defined by the challenges it faces in terms of the importance to society, establishing priorities and modes of action. It is important to push prospective studies beyond scientific themes so that all dimensions of research can be taken into account.

The question of dissemination is an important one. One of the major roles of our institution is not only to generate knowledge but also to organise access to and dissemination of knowledge. For this, we also have to build new links with our stakeholders. Thank you.

Timothy Hall
Thank you very much, Mr Dodet.

The floor is open for questions.

Fons Werrij – Wageningen University and Euragri
I have a question for Mr Pesonen and Mr Ballari about the dissemination of research and I would like to formulate the question the other way round. Rather than talking about dissemination of research, I would like to talk about having access to research organisations by the clientele. I use the word clientele because research is much more market-oriented. That means there should be a financially powerful customer to buy the resource. Young or old, are the farmers rich enough or, politically speaking, powerful enough to ensure access to the research organisations? If that is not the case, how would you like to have it organised?

Pekka Pesonen – Secretary General of COPA-COGECA
It is clear to everyone here that the individual farmer cannot do too much. However, this is an issue that has already been tackled by the farming community by cooperation through agricultural businesses, cooperative farming business and farmers' unions. I know that several European national farmers' unions have been active in promoting various research projects.

When we are talking about food chains, for example, it is clear that the farmers are already within the food chain as operators in terms of cooperating with the research society. Clearly, this has to be emphasised in future. For example, in food chain issues, it is important to both farmers and researchers to have a global view, and what could be better than the individual food businesses seeking cooperation with other stakeholders within the chain?

I have personally already been contacted by several stakeholders in the food chain from the input side – the farmers – seeking cooperation in organising research, so I do not see this as a problem. We already have a framework in place to support that, but clearly, the individual farmer cannot cope with the challenges alone.

A speaker
I would like to follow on from that, as someone who has actually worked in extension services originally run by Defra, the Ministry for Agriculture Fisheries and Food in the UK, which then went on to be privatised. This is an issue that I think is recognised well throughout northern Europe in the way that a lot of extension services that we did have, which were doing a lot of what people on the panel here were talking about earlier in terms of making sure advice got out to the farmers, those structures in a lot of cases have now been dismantled and we are now relying on others coming into the fore to try and take that role over.

The experience in the UK has been that farmers are not able to buy in and fill that gap. It has been a problem. Farmers have not come up and commissioned the work for themselves, so we have had to have other bodies come in and do that.

You may be aware of other organisations – what we in the UK call levy bodies – that levy tax on sales of things like cereals and potatoes though the British Potato Council and the Home-grown Cereals Authority. These levy bodies have now taken over that role and the monies that are raised directly from farmers are put into marketing and are also then used for funding research. The advantage is that, given that the money is raised from farmers, they also involve stakeholders in determining the research priorities. It is a useful way of getting farmers to help to shape research priorities.

The problem, as always, is that the monies raised are always small (researchers always want more money), but it does mean that money raised by those organisations can perhaps be of help in leaving additional funding from governments and others for areas of particular need.

Pekka Pesonen – Secretary General of COPA-COGECA
It is a sad development that traditional extension services have been sidelined. I do not know exactly the situation in the UK but I know that this trend has been quite visible in some Member States.

I think there is a clear need for a global view in terms of food chain development, better operation in terms of responding to consumer needs and at the same time, for more horizontal matters in terms of the environment and sustainability in terms of what science is looking for. I think the traditional extension services have perhaps been the best placed in between these two directions. This is my own opinion on the matter, we do not have a specific position in COPA-COGECA on this issue.

However, we clearly need to have a global view to assist farmers in terms of combining the challenges within the food chain and to society at large. The need is there and it is only a matter of how we should organise it.

Timothy Hall
I think this question of restructuring the extension services, knowledge-transfer arrangements and feedback mechanisms is one of the key challenges that will come out of this meeting. We highlighted this in previous discussions and there are references to this in the discussion paper. It goes beyond what individuals in this room can do but I think there is certainly a strong message emerging that the knowledge transfer system, feedback between the stakeholders and the researchers and the policymakers who design research programmes certainly needs to be heavily reviewed.

It may be that we have to be more imaginative in the current climate, knowing that some of the public sector extension services are being privatised, and perhaps we need to look at that and at least point out the advantages and disadvantages. With the help of the farmers' organisations represented here, perhaps a collective view could be gathered on this and recommendations could at least be made.

What is clear is that we do have to make sure that the researchers generate the right sort of knowledge and that it gets back in the right form, particularly to the farmers who are going to use it – we are talking about farming in the broadest possible sense – so that it really gets back to the rural community who are exploiting the land.

Liam Downey – University College, Dublin and National University of Ireland
I was one of the people engaged in doing the Foresight report. However, I would like to comment more particularly on the fact that for the best part of 10 years, I was Director General in Ireland of a relatively unique organisation in this context. We did agriculture and food research, we have a very big extension service, and we are responsible for all the vocational and third-level education of young farmers.

I think what is happening here today – that we are beginning to give adequate emphasis to knowledge utilisation as distinct from knowledge generation – is very important. I have for a long time stressed that there is a systemic failure in this whole issue, and I mentioned this in the section of the report that I wrote. We genuinely

continue to believe that if we generate more knowledge, we are going to help the farmer. That definitively is not so. Knowledge is important but there are disconnectivities in the whole system.

I think that what we have done in the last decade of moving agriculture and food research more into a university context, where peer publication is the main driver and science faculties and science becomes the main driver, has isolated agricultural and food research from the needs, and it is very encouraging that that deficiency is being recognised.

I honestly believe that we have more than sufficient knowledge to drive innovation and agriculture and food for a very long time if we only became obsessed with its utilisation.

In that regard, I think we have to recognise that farmers have a very poor technological absorptive capacity. Therefore, dissemination per se is not sufficient. I think we need knowledge brokers, I think we need intermediaries, a new form of extension service in that regard. So it is more than dissemination. We need to look again at the need for extension services. However, just as the old agricultural research systems set up in the 1960s will not meet future needs, the old extension services will not meet future needs either. There needs to be a fundamental look at the restructuring of extension services.

Janneke Hoekstra – Ministry of Agriculture, Nature and Food Quality, the Netherlands
This topic is apparently important to us all and I too would like to follow it up. I too do not believe that the extension services as we have had them in the past are the answer now.

In the Netherlands and also some in other countries, I see new forms of networking to connect farmers with each other and with researchers. An example in the Netherlands is something called an academy for farmers, which is not an academy in the traditional sense but a network of farmers learning from each other, posing research questions, giving these questions back to research institutes, and interactions with young farmers and students.

As a government, we try to support the forming of these kinds of networks as a new form of lifelong learning of farmers. We have additional instruments, such as innovation vouchers, with which farmers can buy small input from knowledge brokers. Perhaps we are all experimenting with these kinds of instruments and I think it would be very useful to learn from other countries what kind of instruments really help.

Christof Walter – Unilever
I think these comments are absolutely spot on. I think it is about empowering farmers and not about showering them with information. Extension services are possibly a means to achieve that but they are probably not the only one and there might be more effective ones. I think the EU would do very well in finding out what

the most effective means are and investigating how to genuinely have an interaction with farmers to empower them to be successful.

Timothy Hall
I will just take one more question. However, if there are others points that need to be raised or if you have any strong points you feel have not been covered in this particular session on stakeholder feedback and stakeholder interaction, please jot them down and give them to one of our organisers and we will take note of them in our future reflections.

A speaker
I would like to congratulate President Ballari of the European Young Farmers for his very passionate speech.

I am one of the young and when I go to meetings, people ask what the difference is between the old farmer and the young farmer. There is a difference because we are the future, so we want to know what will happen in the future.

I very much appreciate the comment by the ministry official from the Netherlands about helping to set up networks between young farmers, students, the universities and researchers. I think this is very important and is one of the ways by which partnership is influenced and through which farmers of the future can discuss the question of how we want to move forward.

It is not about today's farmers – we have to learn from their experience but we also have to see and decide for ourselves how we, the young generation, have to move forward and your help is needed.

Timothy Hall
Thank you very much. That was behind our idea, to make sure that the young farmers who were representing the future were actively involved in our Foresight discussion, and we are very grateful for having Mr Ballari here.

We will now break for coffee.

The long-term agricultural research knowledge base for the future

- The 2020 agricultural research agenda

Christian Patermann – Director DG Research, European Commission
My name is Christian Patermann and I have the privilege of chairing the last-but-one session entitled 'The long-term agricultural research knowledge base for the future'. I am supposed to give you a short introduction on the 2020 agricultural research agenda based on what you heard yesterday and what you have heard today.

After that, we will have a panel discussion with eminent people from the areas of plants, animals, agriculture technologies, biofuels, rural development, forest and wood, and aquaculture, so that in the course of this morning, with respect to stakeholders and shareholders, we will cover everything we might have under the notion of bio-economies.

One of our main topics is the research agenda. Listening to you and to the Foresight exercise and those who did it, my impression is that a change in this research agenda is indeed underway. There is wide recognition that this research agenda must be multidisciplinary, it must integrate many technologies, and that it is not the distinction between high and low technologies, but those technologies that produce the knowledge that we use. That was very clearly outlined yesterday in our meetings.

It is clear that this agenda must take into account the emerging multi-functionalities in agriculture, and it is also clear that there is a trend towards agro-business. It is for us not to forget that there are knowledge areas that we might lose if we are not attentive enough.

Last, but not least, I also understand that social economics will become more relevant than before. So the further development of the research agenda is underway.

The second point that came up yesterday very clearly is cycles and chains: we need to act more and be more attentive to chains and cycles in the future.

The third area was complexities and the fact that they are all linked to the research agenda content. They are composed of different drivers and challenges with different relevance and impact, and I have found large agreement in the analysis on the drivers, on the challenges and also on the impact.

There is perhaps one point which, at least for me individually and subjectively, became clearer yesterday: with all the disruption scenarios we were discussing, we probably need to pay even more attention to the disruption scenario on climate and global change. It might turn out to be predominant and we will have to see what that means.

I am also glad to hear that it is not only mitigation but also adaptation that has been put into the book for us.

Lastly, I think that the four Fs with respect to multi-functionality as answers to the different drivers are also more or less confirmed here: food, feed, fibre and fuel.

One point that has become much clearer to me is the need for more regionalisation. This is very closely linked to the role Europe has to play. What are the specificities and strengths and what are the weaknesses of Europe? Here I would also like to mention that the public-good discussion has to be stimulated, and I found it interesting that the global level was mentioned. This is the way of the agenda development and this is also the way Europe will have to play its particular role, with more emphasis on the regional aspects. We have found that in the Mediterranean area, for example, the question of aging is not as relevant as in central or northern Europe and there might be other factors to take into account.

The next point I was very impressed with this morning was that the different addressees – policymakers and farmers – and the different repercussions stemming from these discussions have to be seen. Here I think there is a lot of room for further thinking. Is there are farmer of the future? Is there a European farmer of the future? Is there a European farm of the future? Is there a one-size-fits-all European research agenda? There are a lot of questions.

If we are starting to talk about the knowledge-based bio-economy, it came out very clearly today that we need to do much more to make the knowledge accessible or available in new ways. Here, I think that education, training and communication will play a more important role as 'soft' accompanying elements in the research agenda.

Commissioner Potočnik put three elements to us. Can the European agro-system adapt and remain competitive in the new international context set out by the Foresight scenarios? Will agricultural research be more focused on food, energy or the environment? How can future research still offer innovations and competitive advantages for the European agro-system?

I would like to repeat these three questions when I now give the floor to our panel speakers, who come from different corners of interest in the wider agro-business scene.

I would first like to give the floor to Michiel van Lookeren-Campagne on the area of plant biology. Michiel has a lot of working experience in plant biotechnology, he has diplomas from various international universities, and he is known to be an excellent expert in the area of biosciences.

Michiel van Lookeren-Campagne – Plant Biology

I would like to comment first on the SCAR process and the strategic research agenda for the future. I think it has identified very important societal needs and Dr Patermann also mentioned that in our four Fs scenario – food, feed, fibre and fuel – we will have great unmet needs for the future of agriculture.

I felt it was a pity that the process was held at the same time as the Plants for the Future technology platform and there was really relatively little interaction between

those two processes. However, you can find information on Plants for the Future on our website.

I am active in the plant biotech area and we are working on plant biotechnology, mostly doing research for crops and technology outside of Europe, so I would like to look at where plants and plant biotechnology will have an impact.

In the 2020 agricultural research agenda, we see that we will need more and better agricultural output. That is because there is a rapid demand in food, feed, fibre and fuel, with less land and less water, and this will drive the need for radical efficiency gains in agriculture. What has been conspicuously absent in the whole discussion here is the role that biotechnology can play.

I would comment that plant biotechnology is not always GM, it can also be non-GM. Knowledge of metabolic pathways and biology is now in its infancy. We will be standing at the forefront of a revolution in agriculture in bringing this technology and new insight into this biology and giving new opportunities for meeting this radically increased demand for food, feed, fibre and fuel. I think ignoring that has come at the expense of the competitiveness of Europe. We really need a radical change in Europe in the acceptance of technology and new things, and a radical change in investment in basic research and plant sciences.

Plant breeding and biotechnology will no longer serve only the farmer and there will be new demands for new raw materials in this bio-based knowledge-based economy. We are already seeing that crops are not commodities anymore. We now have speciality oils that we are launching in Canada next year that have a different chain, creating value in those economies. That means you need links with partners and that they are open innovation links across the farm gate. So we need to team up with the processors and we need to create these open innovation systems.

The big challenge there is how to orchestrate this knowledge. In plant biotechnology, the development time for breeding a new variety with new technology is 10-15 years, whereas the processors and downstream industries have much shorter R&D cycles and want a development time of 3-5 years. So the challenge now in a region like Europe is how to orchestrate the knowledge-based development between these different value-chain partners. That is the challenge and that is where Europe can take a lead role.

As knowledge creation and the development of wealth creation are regional, the EU and the national governments, and not industry, are the key stakeholders. Industry will basically go where that bridge is built – and that bridge at the moment is being built in the US and Latin America and in Asia. I just wanted to make that clear in order to have a broader look at biotechnology. I had the feeling this morning that we were all nice and cosy in our European world, but life around is changing very fast indeed.

What does the new research agenda bring in that respect, what are the new technology ways? On this slide you can see plant biotechnology driving some input traits – herbicide tolerance, insect control – replacing classical chemistry in

agriculture. That has already had a big impact on agriculture in the US and Latin America.

The knowledge that we in our research group are now working on is very much focused on molecular markers and advanced breeding. That is changing the art of breeding into the science of breeding, and that is happening very quickly at the moment. That will allow for a different shaping of output. The yield gains we have had in the last few years are rapidly accelerating – we normally have about 1% yield gain per year but we can now move that to a 2-3% yield gain in the next few years due to new technologies.

The gene knowledge we are now getting out of the biological sciences will then drive the new products – we see the first examples of those already with speciality oils – and there is much more to come in this general wave of decommoditisation I referred to earlier. In the end, when we know how these pathways work and how this all links together, we can also tackle yield, because yield itself is very much more complicated than just changing one metabolic pathway and we have a big yield gap of at least twofold between what the genetics are capable of and the yields we can achieve on the farm.

Those are the trends that will actually revolutionise the industry and change the whole industry structure. It will drive the consolidation of breeding, as is happening already at a very fast pace, because small breeding companies cannot sustain those kinds of R&D costs and the industry collaborations across the farm gate and these open innovation partnerships can only happen between large parties. That is happening now and will continue to happen. Europe can close its eyes to that but it will continue despite what Europe does. However, Europe is missing a big economic opportunity there by not addressing this in a positive way.

What are the key success factors for us now in Europe? They are low entry barriers for new technology, one set of rules across the whole of Europe, and a science-based approval of technologies.

As an analogy, we are now saying that GMOs are defined by the process. So you would say, for example, I have a glass of milk, I heat it in a pan on the stove, that is alright, but if I heat it with a microwave, it is not alright – but the end result is the same.

We should look at what the Canadians have done. They look at the plants you have made and decide on that, irrespective of the technology used or whether it meets this or that regulation. I think those are lessons learnt from others that we should also apply in Europe. Also, in research, it is going to be extremely difficult in the future to see the difference between what is GM and what is non-GM.

Europe also needs to align with the strategic research agenda, decide where we want to differentiate as EU and where we want to cooperate with others outside the EU. We need to secure competitive effort in basic science, which has been neglected in the last couple of years, and create lead markets – and I think there is a new EU initiative that could be very powerful to do that.

The lead market is calling for focus on innovation through legislation. You can see what has been done for innovation in California, for example, with the fuel economy legislation. The biggest hurdle for us as an industry is to overcome these links between the downstream industry and ourselves, so there is a possibility there for the EU to do the type of funding they do in the US, where you try to fund the link between those value chain partners out of the EU and try to bring them together. Thank you.

Christian Patermann
Thank you very much. We now leave the plants and come to something that is frequently neglected – animals.

I am very happy to present to you Jim Scudamore. He is currently Professor of Livestock at Veterinary Public Health, Faculty of Veterinary Science at Liverpool University, and also Visiting Professor at the Veterinary School at Bristol University. He has had very many different posts in the UK and abroad and, among many things, he was the UK Chief Veterinary Officer in April 1997.

Jim Scudamore – Animal Science
I am going to tackle this in a slightly different way. May of the technology platforms have exactly the same method of working and a lot of the outcomes are very similar, but I want to describe what we have done with the technology platform on animal health.

There is no doubt that all the disruptive scenarios we have discussed are going to impact on animal science, animal husbandry, animal production, diseases and vectors, and all of that in turn is going to impact on human health.

The challenges you have identified are also very relevant to animal science. I enjoyed the talk by Kees de Winter because the points he raised about lack of relevance, current results not available, and key users not sufficiently involved were all very relevant when we started to establish the technology platform for global animal health.

I want to describe the technology platform and give you some idea of the issues that arose, some of which are very relevant to agricultural research in general.

First of all, we developed a vision document, and that involved all the stakeholders, from academia and research through to small and medium-sized enterprises to large industry right through regulators and through to consumers and users. I think one of the critical factors is that if we are looking at research for 2020, all those groups have to be involved. They all have interests and they all participate in developing the vision for the future.

The vision document produced in 2005 tells us where we want to be. We want to facilitate and accelerate development and distribution of the most effective tools for controlling animal diseases. So that is where we want to get to in 2015 or 2020. There are a lot of problems, even in a very small area like animal health. Climate

change, globalisation and competitiveness all impact on our vision, and there are many problems with animal science, animal disease and animal production.

Where we want to get to is clearly laid out in the vision document, and that document was endorsed by all the stakeholders I mentioned, from academia and research right through to the consumers.

We recognised that each group has a vested interest – and I remember very clearly going to a meeting where a research worker said that the reason for doing research is research. Well, that is quite an interesting concept, but I think there are other reasons for doing research. One is to identify innovation and new ideas and the second is to turn those ideas into practical products.

The second stage is how you turn your vision into a method of delivering that vision. So the first question is where do we want to be? The second question is how do we get there? To do that, we produced a strategic research agenda that had two objectives. One was to produce new tools for diseases and the second one was to set a framework in an environment in which you could produce those tools for new diseases. We divided it up into six major themes.

If we are going to do this work, how do we prioritise it? Listening to the complexity of agricultural research and the huge area, there is not going to be enough money to do all that work, so how do you prioritise which ones you are going to put the money into?

The second area is gap analysis. Where are the gaps in research capacity, in research and products, in technology, and are we using all that technology properly? So we need to look at all the analyses to identify the gaps and then make sure we use them properly.

Fundamental research is critical to the development of ideas and innovation. There have been deficiencies in my particular area, and in some of the fundamental sciences there is not enough capacity to deal with issues that are arising.

We need to look at the enabling factors. It is all well and good producing lots of ideas but they never turn into products. I can well remember when I was funding research that we put a lot of money into research, but the products we had at the end of that research were not very many and I am not so sure we got what we needed.

We need to look at regulation and societal issues. I think the societal issues are particularly important. What affects society? What makes them decide to use a product or not to use it? We heard this morning about dissemination and passing information on to farmers. One of the questions is what are the factors that influence farmers to take advice? We are developing research projects to look into that.

Finally, animal health and agriculture cannot be divorced from the global situation, so we do not do the work on our own, it has to be dealt with with international bodies.

So we have decided where we want to be. We have looked at how we get there. Finally, we have the action plan – what do we actually need to do? So often, I have

been to meetings where we have wonderful visions, we thought wonderful things about what we ought to do, but nobody has actually done anything. So I think action plans are absolutely critical and they define the actions necessary to make the vision a reality. I have listed four of the particular actions – emerging disease, gap analysis, fundamental science and regulatory issues.

I am not going to go into detail because there are a huge number of them, but on emerging diseases, the type of research we need is risk analysis, development of methodologies to identify emerging diseases, mechanisms for surveillance for emerging diseases, and research capacity to deal with emerging diseases. In these sorts of areas we need to decide what actions we need, what projects we need to put in place and what we expect from them.

I think that gives a rough idea of what the technology platform is aiming to do.

Finally, I will just mention the strategic objectives that the platform considers necessary to meet these challenges.

First of all, we need a research environment that stimulates innovation. We need a critical mass of research capacity, which is an important area in animal health. We need the infrastructure to do the research, and we need the capacity to react to new and emerging problems. I think that whatever we do, we cannot say what the future is going to bring, and even next year we do not know what the future will bring – even though we have developed a lot of nice scenarios – and we need to have the capacity to react to new and emerging problems that will come on us from nowhere.

We need to facilitate the efficient and rapid transfer of discoveries into practical applications. So often when I was funding research, I would have wonderful papers produced from the university but nothing ever came of them. Somehow we have to develop mechanisms for turning those discoveries into products.

We need to improve education and training throughout the whole chain, from academia, so they understand intellectual property proof of concept, right through to users, so they understand the benefit of the products.

We need to mobilise public and private funding. Money is available from the public, private and charity sectors. Money is available from the EU and national governments. For example, in animal health, 10% of the funding is from the EU and 90% is from Member States. So it is very important that we coordinate and utilise all the funds available.

We need a competitive industry – I am talking particularly of the pharmaceutical industry in this case – where all the stakeholders, from academia through to those regulators who are involved.

We need a supportive and harmonised regulatory framework – there is no point producing wonderful new products if they will not pass the regulatory barriers or rules.

Finally, we need to establish ongoing communication and dialogue with the public to build confidence in the new technologies.

This is all the work we have built into the action plan concerning how we get those objectives delivered and what actions we need to take.

On that note, I will finish. However, if you need to see any of the documents, they are all on the platform and you can pick them up on the website. Thank you.

Christian Patermann
Thank you very much.

After plants and animals, we need to look at the conventional and advanced technologies that you need on today's farm and on tomorrow's farm. I am very happy to give the floor the Mr Svend Christensen, who will speak about these visions for tomorrow's farm based on technologies.

Svend Christensen – Agricultural Technologies
I will give you some examples on why are we talking about ICT and robotics in agriculture, because I know you have questions.

I represent a collaborative working group. We have been working for a couple of years trying to identify the main topics in this area related to agriculture. During that time, the question of why talk about this has been raised several times, because a lot of industries are working with ICT and why should it be a special topic for this area. I will try to answer that question during my presentation.

First, I would like to show you some examples. You are all familiar with these technology leaps over the last few centuries. The tractor succeeded the horse and it changed agriculture completely 50 years ago. Now we have GPS-steered tractors, as you see in the upper left corner of this slide. The farmer is not driving the tractor, it drives itself. At the bottom, you see the milking machine, which also changed agriculture 50 years ago. Now we have milking robots. So what is next?

If you think that technology development has stopped, I disagree. I believe there will be further development in the future. I believe we have a window of opportunity to integrate with the industries developing these technologies. We have the opportunity to embed a lot of the knowledge created in agricultural research into technologies.

If you are thinking of traditional dissemination of knowledge created in agricultural research through pieces of paper and talks, I disagree. We have talked a lot about this in the group and we believe that this is where technology is really important and we can embed this knowledge in future technologies.

I will show you some photos that may provoke you a little. This is state-of-the-art weeding on a lot of organic farms in Europe. I believe this is not sustainable. If we are talking about competitive agriculture in the future, we need new technologies that can handle weeding in organic farming, for example.

Another example is the cleaning of pig-houses in Denmark. It is a full-time job, seven hours a day, five days a week. I do not believe this is sustainable. There is a great need for new technology here.

Those were just two examples. The group we are running at the moment came up with these statements. The first statement is that we really think that ICT and robotics are a precondition to achieving competitive European agriculture and food production without subsidies. I think history has shown that the new technologies are a driver for competitiveness.

We also make the statement that we think that innovative ICT and robotics are a precondition to improving the quality and traceability of food, feed and bio-energy from farm to fork. You must understand that ICT is a key technology to trace all things and databases are a condition for real improvement.

Finally, it is essential for entrepreneurships in rural areas, and these technologies can create a lot of activities and business.

Innovative ICT and robotics can also solve the problem of hard and onerous repetitive work. It can be used to minimise the negative effects of agriculture and food industries on the surroundings. One of the drivers mentioned in this conference is global changes and we should think of how we can use these technologies in that context as they could be a part of the solution.

These technologies can support standard precisions regarding food safety, animal welfare, environmental and efficient technologies. I think we should focus on that and talk about efficient technologies when we are talking about global alternatives.

We finally came up with this long-term research agenda. Automated agricultural machinery is an area that has a strong opportunity to solve a lot of problems and to make European agriculture competitive.

Precision agriculture and precision livestock farming are also two very important themes that could be future farming systems. Precision agriculture would take the spatial and temporal variability into their technologies, and the same applies to precision livestock farming. You would develop the technologies based on the individual animal's nutritional needs, for example.

Environmental monitoring of agriculture is an area where there is not very much going on. I would like to emphasis that there is a great need to monitor what is happening. There has been a lot of modelling but monitoring in this area is not a big research issue.

Agricultural information, communication and management systems are self-explanatory. When you create a lot of data there is a demand to make them efficient to implement these results in practice. We heard this morning that the farmers argue that there should be stronger implementation of the results from agricultural research. I also see a strong need for these management systems.

Agricultural product quality sensing and documentation is a big issue, and I believe this is a part of the research agenda where ICT and robotics can be an important part of that. Thank you.

Christian Patermann
Thank you very much. After this troika of plants, animals and technologies on the farm of tomorrow, we will now have a more targeted short talk on biofuels. We have already heard about biomass and how multifunctional its use can be, but we would now like to have a more targeted view on the biofuels.

I would like to inform you that all the presentations from yesterday and today will be put on our website next week. This is the procedure by which we want to make the knowledge produced here available to all of you.

I am very happy to have Calliope Panoutsou from Greece here with us.

Calliope Panoutsou – Biofuels
I am here to represent the European Biofuels Technology Platform and to present the part that links our platform with the future challenges for agriculture as it has been presented here over the last couple of days.

The Biofuels Technology Platform was based on a vision report that came out a year ago in June 2006. This vision report has to do with biofuels in the European Union for 2030 and onwards.

This vision is that by 2030, the European Union will cover one quarter of its road transport needs by clean and carbon-efficient biofuels. A substantial part of that is foreseen to be provided by competitive European industry in both the production and the conversion of raw materials, and the biofuels produced will use sustainable and innovative technologies concerning the production, reproduction and consumption of the automotive industry.

This slide shows the vision report, and on the bottom line you can see the www.biofuelstp.eu website address, where you can download it.

The vision report recommendations are that technology should be left to compete in an open environment; research is needed for further progress in conventional biofuels; effort should be put into advanced conversion technologies and bio-refineries for the future, with the main aim of increasing the conversion efficiency of existing plant and animal feedstocks; and the most relevant to this conference is to develop sustainable biomass supply by including a land strategy, use of whole crops, energy crops and the utilisation of biotechnology.

The platform was formed into working groups, and the main group relating to the supply issues is the working group on biomass availability and supply. There is a group on conversion processes, a distribution of energies group, a sustainability group and a markets and regulations group.

Feedstocks for biofuels exist in the EU with an increase in demand trends. In 2005, energy crops covered about 3% of the EU arable area. It was mentioned just this morning that 1.5 million hectares have been cultivated in Germany, which is 15% of arable land in Germany, so it is an increasing trend within the EU.

When we say current energy crops, we are talking about rapeseed mainly, with almost 60% of the share of total production. Cereals, sugar beet and, at the moment, wine alcohol are also being directed towards biofuel production.

If the 5.75% target of the EU Directive for biofuels is to be reached, that means we will have an energy value of approximately 24 million tonnes of biofuels replacing 18.6 million tonnes of fossil fuels. This relates to approximately 18 million hectares of EU agricultural land if all the crops for the biofuels are produced within the EU agricultural area. With a total EU-25 arable area accounting for 104 million hectares, this means that almost 20% of that would be dedicated to biofuels.

Because this is a very high figure to aim for in 2010, the vision report and the Biofuels Technology Platform believe that flexibility should be the key aspect here. There are some 4 million hectares of compulsory set-aside in the EU-15. There are another 3 million hectares of non-cultivated land. With all the calculations we have done so far, it means that to meet such a target of 5.75%, we will have to include sustainable input options.

This brings us back to the research agenda and means that concise RTD efforts for yield and conversion efficiency must increase.

My final slides show the research priorities identified so far by the Biofuels Technology Platform working group on biomass supply and availability. At the moment, we cannot say that we would ever recommend a unique solution for Europe. It will have to be a combination of annuals and perennials, herbaceous grasses and trees. All this research is working towards optimising yields, conversion efficiencies, and trying to improve the environment of their production in terms of the sustainable use of the available resources – the land, water and soil.

In the short term, the biofuels industry is trying to use residual forms to learn and improve the conversion part of the system. We are aiming for diversified feedstock options, and certainly not just food crops, in order to minimise the food/fuel competition. We will try to increase the synergies of whole-crop exploitation or, by bio-refinery in options later in the future, try to exploit as much of the material without competing with each other, optimise the production and mix of raw materials trying to include systemic approaches, and put emphasis on quality issues through certification schemes and aligning certain procedures.

It is important to improve understanding of the primary production and the associated impacts of land use. We in the Biofuels Technology Platform believe that land is the major factor that we have to contribute towards all these targets, whether it will be for chemistry, energy, non-food or food. So we have to be aware of all these impacts on land use and try to include different cropping patterns, rotations, soil and water management, as well as – something that has to be emphasised – the impacts on

the rural communities themselves and the foreseen changes that such targets can bring to them.

Our main effort will be to include priority land-use strategies in the research, taking into account the traditions of different countries in Europe, to try to identify the specificities, the markets and the different subsidy frames, working closely with the farming and forestry community, and to have synergies with all the other technology platforms, because we do know that feedstocks, and especially EU agricultural feedstocks, are a crosscutting issue for a lot of plant farmers.

Christian Patermann
Thank you very much indeed for this very clear description of the fuels, perspectives and the very complex bias in Europe.

You have heard the word sustainability mentioned many times yesterday and today, and rural developments were also mentioned on various occasions. I am therefore very happy to present to you Annamarija Slabe from Slovenia. She is Agronomist and Technical Director of the Institute for Sustainable Development (ISD) in Ljubljana, which is a private research development institute for organic farming and sustainable development. Annamarija has been very active in European projects for a long time and she is also a member of our advisory group for the topics in Priority 2.

Annamarija Slabe – Rural Development
We have heard different scenarios, and I have one too. It is like reaching for the starts, and stars can be a good guide. In history, all the continents were discovered with the help of the stars and every culture related strongly to astronomy. However, even the stars are changing, so the universe is changing and we have to be able to follow these changes. It is good to rely on stars but it is necessary to know that even they are evolving.

Rural development, as we in Europe are trying to define it now, relates very much to sustainable management, so it about the sustainable management of natural resources. It is also about human resources, which also means good general living conditions in the rural areas. Neither should we forget management of nature. I think this should be mentioned in connection with biodiversity and I have not heard it mentioned over the last two days. Farmers today and in the future must also be partly responsible for that.

Should we expect public benefits and public services from farmers and people in the rural areas? For that, we would need a much improved rural/urban connection. If Europe wants to keep certain values that we appreciate today, we will have to understand a lot more and connect much more between rural and urban.

Then, of course, we want high-quality foods. I expect diets will also evolve in the future – we are already eating different foods from those we ate in the past. I can see that organic will be the standard in the future. For this, we will need highly qualified farmers and we will also need a lot of bio-adapted technologies. When I say

bio-adapted, that means the technologies will relate to ecosystems, to living beings, to animals and to plants and will be adapted to those systems and not vice versa, as we have been doing in the past.

This cannot happen without green taxation or tax reform. We can even imagine living without subsidies in such a system if we tax non-renewable resources and do not tax work. Then we can have a really free market that will support this. I can image environmental food-profiling.

I think the challenge is how to get from competition to cooperation. I only dare put this forward now because I came to this conclusion by myself, but then I read it in the Foresight report so that is why I included it. However, I believe it is a difficult process. If you want to cooperate then you need confidence, and we heard today that confidence has been lost in research – consumers do not have confidence and stakeholders feel neglected by research.

I would say that we have to integrate the consumer now as a way to go from competition to cooperation, because everything in sustainability is only a matter of perspective. So what is the time perspective? Something can be very competitive in the short term, but it can only be competitive in the long term if it is sustainable. Our problem is how to deal with this timeframe.

I believe we have some special issues in Europe. One of them is that we are really trying to make things more transparent, we are trying to integrate stakeholders. I think we are advanced in this respect and that we should use it because we now have support from the consumer for certain developments that we also perceive as sustainable at the moment. We should use this consumer support for sustainable agriculture, organic farming and rural development and build on it.

I believe we should also take into account the evolving concept of food quality. Quality of food is not just about unwanted substances and desirable substances, it is also about the process and in that case, the process matters. We heard earlier that the process is not important – in certain issues, the process is important.

Fair Trade is developing as a concept of food quality, so it is a part of the new concept of food quality. Animal welfare has become an issue. Local, geographical and traditional origins are already regulated by EU legislation. It would also help to overcome the lack of confidence if you integrate consumers, and we are all consumers – even the researchers. I think we have this strength in Europe to rely on ourselves and the European public will also be more confident, as it is for global issues.

I believe this is also certainly a role that Europe can play because we are in this position – many other countries are not. Many other countries have high GDP growth but maybe it is time we acknowledged that GDP is not the only thing that can grow. There are other things that need to grow – knowledge, awareness, responsibility, and compassion.

Another urgent need is to improve our knowledge and management of complex and changing agro-ecosystems as soon as possible. We see priority areas for food and farming research – and here I would like to say a few words on organic farming.

I said we have consumer support for organic foods in farming. That support is clearly shown by increasing sales. So consumers want organic produce and are willing to pay more for it. That is the clearest expression of support and the number of such consumers is growing. However, can organic farming deliver? Can it rise to the challenge? It is not some archaic and extensive agriculture that we should not even be considering? That is not the case and it misses the point. In organic farming, everything is about knowledge.

We held a vision camp for organic research a few weeks ago. We were trying to find out what we could deliver for European agriculture and where the gaps are, where the research needs are, what is special about organic food and farming research, where it can integrate into general research and where it needs a specific area.

The first area is food and health. The second is environmental and natural resources – and there, organic farming is very important. A lot of consumer support is because of this area because organic farming is performing well there. The third area is economics, political systems and social issues.

We were speaking about the need for integration. We do that all the time in organic farming and have been doing so for about 50 years in research. If we can agree that these three areas are very important for research, we need integration there. In organic farming, we say we are working in a framework that is even broader – an ethical and ecological approach in general. That is the starting point from where we explore.

It is also very important for us is that we acknowledge that women are a part of the system we are researching, so we are included in our research. Where we see a specific area for organic farming we would like to expand into it, so maybe some time in the future we will have only one research area. That would be ideal but we are still far from that.

I also believe that Europe should not close its eyes to developments in the world. I think we in Europe should actually look very sharply at new developments. Organic farming is not just open to new technologies, it depends on new technologies. Organic farmers are frontrunners in using new technologies but it was impossible before because these technologies were not developed. We had herbicides so it was not interesting to develop smart weeding systems, but the times are changing.

However, from our point of view, we have to assess every new technology against the four principles of organic farming. These are the four principles that have become part of the new regulation on organic farming, so I think life will be easier for even the policymakers to understand what we are after.

We see research priorities for organic farming in plant and animal breeding, for example, as we have very different breeding goals in organic farming. It has to do

with ecosystem management and is very different from what is happening now on a global scale, so we badly need good research in that area.

We will assess whatever new technologies we will use. Some technologies in plant breeding may be useful for organic farming, but we are not so sure about GM technology. It may seem attractive to be able to reduce organic farming down to just not using chemistry, but that is not true – organic farming is much more and that is only a small part of it. We have to assess it from a much broader perspective and at the moment we see no use for it, but we do see a lot of not-so-good developments there.

We see a big challenge and opportunity in self-regulating agro-ecosystems as a research field, but it should be regional and not for a global or ideal farm of tomorrow – there will probably be several different farms of tomorrow in Europe.

We need new pesticides suitable for organic farming, and then we will also be able to cooperate with developing countries, which have very good results in organic farming.

I hope we will also be able to build up new confidence among the European public through improved research in organic food and farming. Thank you.

Christian Patermann
Thank you very much, Annamarija, for giving us this different view, which I think is also an interesting subject for any future Foresight exercises.

We have heard a few words on forestry and woods, but we were thinking that it is absolutely necessary also to expand our knowledge on this important reservoir of fibres and biomass. That is why I am very happy that Christine Hagström-Näsi from Finland, from the Forestry Based Products and Forestry Technology Platform, is going to give us a brief introduction to new developments and a new research agenda in this important field.

Christine Hagström-Näsi – Forest and Wood
It has been very interesting listening to the presentations and discussions yesterday and earlier today. One thing, however, has been a little puzzling – is forestry really a part of agriculture? When listening to what has been said and reading the Foresight report, my conclusion is that maybe we are not in a small family. However, when you enlarge the meaning of a family, I could put us in the position of a first cousin.

This slide shows how the technology platform sees itself. It is a collection of statements from the mission document process, which I will not go through now but I will keep it back and you can have a look at it later.

Coming back to the relationship between agriculture and forestry, when you look at the Foresight report you will see that the drivers are basically the same. There is a stronger stress on energy and climate change in the forestry sector and I think the

area of globalisation is very strong because forestry is a more industry-driven sector than agriculture.

There is, however, one point where we differ, and that is the timeframes. Although the industrial side is working very rapidly, when you go into the forestry side you are looking at really long time-spans. When a farmer plants seeds he can usually harvest within a couple of months, but if he plants trees for timber use he will not harvest it, his children will, because the time-span is about 50 years. That also means that we need very sound Foresight processes in this area to be able to predict where the world will be when those trees are ready for harvesting.

Forestry also brings some additional features in the area of landscape and land use, in biodiversity and in the multifunctional use of forests.

At the other technology platforms, the Forestry Technology Platform has also outlined its vision for 2030. The main message is that the forestry sector will position itself as a key player in the knowledge-based bio-society. To do that, it has to meet a set of strategic objectives to meet the multifunctional demands on forest resources and their sustainable management, to enhance availability and the use of forest biomass both for products and for energy use, and the development of intelligent and efficient manufacturing processes downstream, and also the need for new products in the marketplace.

The deepening of the sector's scientific basis is one prerequisite but I will not go into the scientific areas, mainly because I do not think I could add anything that has not been said already. We need multidisciplinary research and the involvement of social sciences.

However, one thing I would like to comment on is the discussion of dissemination and knowledge transfer. I do not think we should be talking about knowledge providers and knowledge users, I think we have to rethink the whole information system. I would like to suggest building up something with an interactive open-source system where all the stakeholders can make their own contribution. Of course, this will be really challenging concerning IPR issues and things like that, but my idea is that we cannot meet these challenges and goals if we do not rethink how we are doing it rather than what we are doing. Thank you.

Christian Patermann
Thank you very much for giving us a statement on one of the four Fs – the fibre part.

The last contribution today is from an area you do not normally think of when talking about agriculture but it is growing in importance, and that is aquaculture. Indeed, the Technology Platform on Aquaculture was established recently, and that is why I am very happy to have Mr Torgeir Edvardsen, from Norway, here with us, who has long experience working in this area.

Torgeir Edvardsen – Aquaculture
Aquaculture in Europe as we know it today was brought to life with the help of a lot of farmers and with a lot of interest from agricultural academic research institutions. You probably know that this is one of the fastest-growing food sectors in Europe and in the world. It is growing because people eat more fish.

Yesterday, we talked a little about how much fish people eat. Worldwide, it is about 16 kilos per person per year, and 22 or 23 kilos in Europe. Spain and Portugal are two of the highest consumers of fish, eating about 50 or 60 kilos a year. Icelanders eat the most at close to 100 kilos a year. The consumption of fish has greatly increased over the last 10 years and that is why the sector is growing.

If we look at some statistics from the Food and Agricultural Organisations of the United Nations (FAO), they expect that in the future in 2030, we are going to need 180 million tonnes of seafood. Today, it is 120 million tonnes. An increase of 60 million tonnes is a lot. As a reminder, in 1966 we produced about 380,000 tonnes of seafood in Europe. In 2005, about 2.1 million tonnes was produced in Europe. On a world scale, we need 60 million tonnes within 25 years. That is a huge increase in production. This graph shows the hugest increase we have had in 40 years, since 1966.

It also shows a tremendous development in business opportunities in the industry. What it also shows is that in order to be able to do this, there has had to be a long stream of new inventions, new research and new knowledge.

To give you an example of how much this sector depends on research and the creation of new knowledge, 20 years ago in my native Norway, we used antibiotics by the ton. Today, these farms use fewer antibiotics than a normal European nuclear family – mother, father and two children.

Moreover, these are huge production facilities. The largest pens where they keep fish are the equivalent of about 2,200 500-kilo houses, so they are very big facilities.

We have been able to decrease our consumption of antibiotics because of our dedication to creating new knowledge from the farmers, from the research institutions, and not least from civil society who pushed us forward to this. So we all need to collaborate in order to bring our industry forward. We are still going to need a lot of research in future if we are going to reach the potential in this industry.

A number of people have come together and taken the initiative to create a technology platform for aquaculture. We had a launch meeting in Brussels on 22nd March and at this opening meeting, our chairman said that we all have to come together in our industry and get our act together in order to deliver even more food in the future if we have any hope of aspiring to what FAO is proposing is going to be the future need for fish.

What is the role of this technology platform? First of all, we will have stakeholder participation from everybody – all stakeholders are invited to participate. We are going to debate and we will end up with some decisions on a common vision and

also a common research agenda in the future. The simple idea is to bring the industry and stakeholders together to create a strategic research agenda.

The aims and objectives are to inform and influence the strategy-setting and funding bodies for our priorities suggested by the research sector through the strategic research agenda that we will establish.

The test for this strategy will be whether investments come in the area the platform is suggesting. That is one vital acid test. Other tests could be whether the aquaculture sector is on the agenda in Europe and how much ministerial time is dedicated to aquaculture. That will also be a key acid test for the success of the platform. Furthermore, whether there are projects and calls for research projects reflecting the priorities in the strategic research agenda.

Another very important issue for us is the tax incentives for research, which have to be much better in Europe than they are is today.

We are now at the stage where we are preparing for the next stakeholder meeting, where we will seek to establish the platform, as it is only an initiative and not really a platform yet. A working group is working towards that and at this first meeting, I hope that we can have at least the first version of the vision ready and adopt it. Then we will decide the crucial elements on how to structure the platform, how to create the strategic research agenda and the pillars to use for the debate. Then we are going to deploy the strategy in the future.

To sum up, Europe needs more fish. To get more fish, we need new knowledge. To get new knowledge, all forces have to contribute and cooperate and then they have to set priorities. Then we will mobilise and we will invest – and the point about the whole thing is that we will create new jobs in the coastal areas. We are going to take up the able competition from the Asian countries. We are going to be competitive. Thank you.

Christian Patermann
Thank you very much for this excellent presentation on ‘eat more fish and stay healthy’, as my German compatriots used to say.

Unfortunately, we have no time for questions now and I would suggest that you please approach the speakers after we finish and ask any questions you might have.

I am very happy that, as the representative of the policymakers, we have a very active Member of the European Parliament in the area of rural development and agriculture with us. He is Markus Pieper, who graduated in geography from the Hanover University in northern Germany. He has a doctorate in natural sciences and has been working in business and also in public authority, he has been a member of the Chamber of Trade and Industry in northern Germany and, as I said, he is very active in the area of rural development and agriculture in the respective Committees.

Closure

- Perspectives from the European Parliament

Markus Pieper – MEP
I would like to thank you first of all for the kind invitation to participate in this conference. I think the results so far have shown that the research programme represents an excellent opportunity for the agricultural community.

I am speaking here also on behalf of the Agricultural Committee of the Parliament. As you know, the Parliament has very much urged that funds be increased in this area, and you know as well that we are also actively involved in the programming. I will not go into the detail of this but let me just comment on the basic parameters and basic conditions that we think should apply to agriculture, agricultural policy and agricultural research.

I will start with the basic parameters. Policy is moving more away from market management. We have uncoupling, we have the elimination of export subsidies, the end of the milk quota rules is on the horizon and trade liberalisation is continuing apace.

We also have an increase in world population, increasing welfare, increasing high standards in the emerging countries and bio-energy is emerging. These are all issues which are very important for us all.

Global markets are changing at a breathtaking pace. What is important, however, is that we as Europeans should work towards a high-value demand economy. We have to bear in mind that we are also going through a period of climate change. The earth has been changing ever since mankind has been active on it but it has become very topical now. What does that mean in terms of European agricultural policy?

Agricultural policy must set the framework for agriculture and for research. We have to have a single market order based upon international competitiveness which we must be able to sustain.

At the same time, policy must also guarantee sustainable development through security, animal welfare, and plant diversity. These are all criteria that will guarantee sustainability.

We also have to provide some impetus for structural change in the rural areas. These are all areas of intervention but we need research to pursue this – agricultural research in particular. This is why the Parliament has welcomed the Commission proposal that we should have specific priority on agriculture, food and biotechnologies. This is to some extent symbolic of the increased significance of agricultural research. Also, agricultural research is covered more in environment nanotechnology. This will be a cross-cutting approach and this is justified.

The EU's research budget is making a major contribution to promote innovation and thus the competitiveness of regions, partially because research funding in future will

be increasingly linked to objective 1 – policy aims, namely structural change. If we make this link in the regions we will able to pursue far more wide-reaching projects, which is what we in Europe strive for.

The European Parliament has advocated four main points in agricultural research, which we have added in our opinion. First, the opportunities afforded by biotechnologies; secondly, the risks and also the opportunities afforded by climate change; thirdly, transparency in the food chain; and fourthly, the involvement of SMEs in the food industry to agricultural research, so better communication and better coordination between the research partners.

Finally, I would like to say something on these four points, and I will start with biotechnologies. Obviously there are risks here but there are also huge opportunities, particularly for the growing of energy plants and with regard to the sustainability of products. However, under this heading we also have to investigate new plants. Plants that are not typical of our area seem to be perceived as a threat, but I think we should be more open about these new species if we are to work towards sustainable agriculture. If we do not want to miss the boat of new technologies, I think genetic engineering also has to be given a chance. So we urgently need to make progress on the question of co-existence and Member States are waiting for binding European rules on this.

Secondly, on climate change, agriculture is one of the sectors that will be the most affected by the shift in climatic zones. You, Chairman, pointed out that I studied geography. I also studied climatology, and I can tell you that this is a process which has been occurring forever and that the ecosystems have constantly adjusted to these changes and have always found ways of working in harmony with nature, even under changed climatic conditions, so I do not wish to indulge in scaremongering.

We have to appreciate the risks, of course, but we also have to see the opportunities of the different vegetation phases. We also have to adjust to use new techniques and also new plants. There is also a great opportunity now with the discussion about new energy sources – biogas could replace part of our energy inputs in the foreseeable future. This is an excellent prospective, both for the rural areas but also for energy security in Europe. However, we also have to consider the competition with food production. Agriculture can never be the solution to Europe's energy problems but it will make a contribution and we have to acknowledge that.

On the food chain, we can be guided more closely by the client and by the market through targeted agricultural research. In the reform of agricultural policy, everyone will live through a renaissance of agricultural policy. We will have shorter cycles and greater pressure for innovation, but research will help us acknowledge and satisfy new consumer needs. However, the origin, source and quality of food must be communicated, which will increase consumer trust. Also, food has to be produced in the 'right' way – in other words, according to environmental and social standards. In this way, information technology and nanotechnology research can also make a major contribution.

The final point is the involvement of SMEs. I think agricultural research is not an end in itself – research in any event is not an end in itself. We have to think in terms of

market products and market services as the final outcome, so the results of research are to be transmitted and calls for proposals are to be disseminated in such a way that SMEs can participate. We will have to have direct participation of farmers, foresters and the food industry at the very early stages, especially if we want to have new production technologies and biotechnologies – there is enormous potential among SMEs. We do not necessarily need new institutions but we do need greater transparency and better networking.

We need clear information in the regions – who is researching, where and on what. It is only in this way that we can avoid ineffective parallel research in Europe and it is only in this way that we can effectively involve SMEs. Personally, I have found in my own region that everything we do in Europe here is too little known, that the call for proposals in research is well known to a few people but in agriculture, even large farms or the representatives of agriculture do not know enough about what is happening here. There is a need to remedy this on both sides, including from the European institutions.

Finally, I would like to congratulate you on this conference. I think the setting up of the Standing Committee on Agricultural research is excellent because this is a committee which has these ambitions as an ongoing agenda. We welcome the agreed coordination between European national and regional policy approaches. We also welcome setting up a new strategic framework for research planning and execution.

Ladies and Gentlemen, as I said, research is not an end in itself, and agricultural research particularly should be more targeted at the products that should result. This is why research should always bear in mind that the markets and jobs we are talking about are global competitiveness. At the same time, we have to develop a sustainable symbiosis with natural resources, and sustainability is a major challenge for agricultural research. Thank you very much.

Christian Patermann
Thank you very much to the Member of the European Parliament and to the Agricultural Committee. I am sure that we will be sending the report and we will also work out with your committee.

I now have the particular privilege and pleasure to announce our last speaker at the end of our meeting which has brought together so very many people, and I thank you very much for staying until the very end.

Zoran Stančič, our Deputy Director General, I ask you to take the floor to give us our final speech.

- Towards a Commission communication on coordination of agricultural research in Europe.

Zoran Stančič – Deputy Director General, DG Research
Ladies and Gentlemen, it is my pleasure and honour to be here today and to represent the European Commission at the closing session. I hope you will agree with me that the conference we have had today and yesterday on future challenges for agricultural research in Europe is a major success.

In today's conference in the first session we discussed the SCAR Foresight in view of other Foresight scenarios. The SCAR Foresight approach to define disruption scenarios proved to be a very useful tool to think beyond baseline projections. The global challenge scenario might be predominant. Furthermore, the energy-crisis scenario has already become part of reality. If we look back, we should admit that no baseline projection two years ago would have foreseen such a drastic linkage of food and energy crises, as we are experiencing today, nor analytic tools like the SCENAR 2020 study complemented with regionalised approaches.

The international dimension was captured by Mediterra 2008 looking at the extremely important partnership with countries south of the Mediterranean Sea. The International Food Policy Research Institute's analysis showed pathways to solutions, substantial new investment in agricultural research for both European and global public use, and the right programmes to allow European science to join forces in partnership with the South.

I am also very happy that we will benefit from the complementary Foresight endeavour that will be presented over the next two days by the ERA-NET Agricultural Research for Development during the conference in Brussels.

In the second session, we captured the comments of stakeholders in the agricultural food field. It became obvious that we have very high expectations of the research that will address these new challenges. We need to do more to prove the relevance of research for the ultimate beneficiaries, the farmer, and especially young farmers, and the consumers of Europe. We have to keep an open mind and keep up the dialogue to adapt our European programmes to these needs. I will give you a few examples.

The Commission will continue to improve two very successful FP6 schemes to also support a single research by small and medium enterprises – in fact, farmers and their associated SMEs could benefit more from these schemes.

On research agenda-setting, the technology platform and the SCAR working groups have shown their capacity to break down research challenges to specific fields covering the four Fs. In some areas, however, we are lacking appropriate platforms, for example in public-good oriented research and in organic agriculture. We have to use such mechanisms in a flexible way to cover the broad needs for priority-setting, and it will be very important to keep society fully involved. However, long-term research agenda-setting needs additional mechanisms. So what is the way towards a European agricultural research agenda?

In the opening question, we asked if the European agro-system has the capacity to adapt quickly to changing circumstances, generate economic value and remain competitive in the new international context highlighted by the Foresight scenarios. There is no choice.

Surely the ongoing restructuring of European agricultural knowledge systems has to take place beyond regional concerns in a European perspective. If we now focus on the implementation of agricultural research priorities, one should stress and highlight the unique role of the Standing Committee on Agricultural Research, one of the oldest committees in the European Union existing since 1974, which has been crucial in stimulating such a debate and will be even more important in the future.

You will recall that a new configuration of SCAR was set up in 2005 as a high-level platform with a renewed mandate from the EU's agricultural Ministers to play a major role in the coordination of agricultural research efforts in Europe, and also to address the Foresights. The new SCAR has met six times since February 2005 and taken forward a range of significant initiatives towards building a European research area for agriculture and in support of a European knowledge-based bio-economy, making progress that was not foreseeable only a few years ago. These initiatives include a comprehensive mapping of agricultural research capacities, institutions, activities and infrastructures, the establishment of collaborative working groups across several areas of research, which brought together funding organisations from across the European Union, and last, but not least, the Foresight process, which gathered us all here today.

What is the way forward? We need to go beyond classical short-term research programming into long-term planning and programming. The results of this comprehensive Foresight process, including the outcome of the conference discussions, provide important inputs to a report on the coordination of agricultural research in Europe, and the Commission will, according to the regulation establishing SCAR, transmit to the European Parliament and the Council. It is envisaged that this report will be finalised in early 2008.

What do we do afterwards? Forward thinking in times of great uncertainty about future developments is essential to avoid being taken by surprise. The establishment of an early-warning information system based on regular Foresights would provide the scanning and assessment of developments at regular intervals, giving a better understanding and insight into existing and new challenges so that they can be addressed in the most effective manner at European, national and regional levels. This will allow us to influence the direction and shape of European agriculture and to spread a change to a knowledge-based bio-economy and a sustainable society.

Ladies and Gentlemen, I would like to close this conference today by first thanking the speakers. I would also like to thank the panellists and the Chairs of the SCAR preparatory group, and I would like to thank you all for making this conference a success. Thank you very much.