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WORKSHOP REPORT: "LONG-TERM SCENARIOS: SUPPORTING ROBUST POLICIES FOR GLOBAL AGRICULTURE AND FOOD"

Contact person: Martin von Lampe (Email: martin.vonlampe@oecd.org)

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ABSTRACT

Scenarios, while not being predictions, are one important tool to provide alternative views of the future. With various challenges ahead in global agricultural markets and food systems, they aim to shed light on longer-term developments that might need policy responses today. The workshop on long-term scenarios has brought together various institutions working on such scenarios for agriculture and food systems, with the objective of synthesising the works done so far, finding commonalities and differences in the various approaches deployed, and systematising further research.

Different models, a useful tool in the development of scenarios, have seen significant progress in the past, but much work remains to be done. Some of the key driving forces such as climate change, water and land use, or links between agriculture and ecosystem services, are only partially understood, and calls for greater inter-disciplinary dialogue in the development of long-term scenarios. At the same time, models and model outcomes must be made fully transparent to create ownership with the users of the scenarios, and to allow for a helpful dialogue, fruitful criticism and consequent improvement of approaches and results.

While marked differences exist in the scenarios presented, some convergence exists in the conclusion that international trade in agricultural commodities will need to increase, and that an open and flexible trading system will be required in future even more than today to allow for trade to balance regional supplies and demands. A closer analysis of factors driving the differences across scenarios remains a priority for future work. The OECD remains engaged in this and other strains of work on long-term scenarios for global agriculture and food.

Keywords:

Agricultural trade; Agricultural policies; Climate change; Partial equilibrium modelling; General equilibrium modelling; Integrated assessment modelling; Expert panels

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Background

1. The PWB 2009/10 item 3.2.1 contains a two-part project aiming at identifying future challenges and opportunities for the global agro-food sector. The first part was the symposium *What future for agriculture and food in an increasingly globalised world?,* held 30-31 March 2009 at the OECD in Paris. The 1.5 day symposium attracted about 130 participants from a variety of institutions, associations and geographic areas, and it was instrumental in generating inputs into the Meeting of the Committee for Agriculture at Ministerial level, held 25-26 February 2010. In particular, the symposium revealed a widely shared "sense of urgency" about the global agriculture and food system, which went well beyond the recent experience of price spikes in 2007/08 and the subsequent steep drop in commodity prices in the later part of 2008.

2. As agreed by the JWPAT during its meeting of 21 May 2010, a workshop on long-term scenarios was held on 21-22 October 2010, forming the basis of the second part of the project. This workshop brought together various institutions working on long-term scenarios for agriculture and food systems, with the aim to condense the work done so far, to systematise further research and to find commonalities and differences in the various approaches deployed.

3. This workshop at the same time represented another step in a series of workshops previously organized by UK Foresight, a UK government think-tank. In particular, it follows two workshops held in Washington, D.C., and in London in March 2010.

4. This note summarizes the discussions and the outcomes of the workshop. The workshop agenda as well as a list of participants are presented as Annexes.

Summary of the workshop

Session 1: Reference Scenarios

5. The first session included presentations from four different organizations working on long-term scenarios, running until 2050. **Sherman Robinson** (UK Foresight and IFPRI), in a presentation prepared by Gerald Nelson (IFPRI), presented IFPRI's work done with the Global Change Model (of which the IMPACT Model[1] represents an important element) as well as preliminary results. He first stressed the location specificity of climate change in terms of precipitation, temperature and variability, requiring approaches that are sufficiently disaggregated both spatially and in time. Using climate change (CC) scenario results, such as CC induced yield changes, in economic models poses the additional problem that the different agronomic results are partly inconsistent, thus creating a high degree of uncertainty already at the input stage. For instance, the yield effects on rain fed maize are estimated to be relatively small in the US corn belt, but strongly negative in a number of areas in France, according to the CSIRO results of the A1B climate scenario; in contrast, strong yield losses are estimated for the US from the MIROC results of

1. IMPACT is IFPRI's International Model for Policy Analysis of Agricultural Commodities and Trade, a partial equilibrium (PE) model focusing on longer-term developments in agricultural markets and food security. More information on the model can be found at http://www.ifpri.org/book-751/ourwork/program/impact-model.

that same climate scenario, which estimates yield improvements for France. Different climate related yield changes are therefore used to generate sub-scenarios around the main one using 'optimistic', 'base' and 'pessimistic' assumptions on population and income growth.

6. One of the key results of IFPRI's work, though still preliminary, is that even without CC prices for major staple commodities would see significant increases in real terms between 2010 and 2050: real maize, rice and wheat prices would increase by between 60% and 90% in the "baseline scenario". The different CC effects would further push prices up, with real price increases of up to 170% in one of the scenarios. While the magnitude of such price changes differs across different population and income assumptions, the price rises remain significant under both optimistic (low population growth, high income growth) and pessimistic (high population growth, low income growth) scenarios.

7. According to the preliminary IFPRI results, most scenarios also suggest a drop in net cereal exports from developed countries as an aggregate. The magnitude of this drop would, however, depend significantly on the CC assumptions taken. Indeed, IFPRI estimates that in order to "reduce child malnutrition with climate change to the level with no climate change" (IFPRI's definition of agricultural adaptation to CC), investments of at least USD 7 billion would be required in rural roads, agricultural research, and irrigation technology and efficiency improvements. International trade flows help by moving food from surplus to deficit regions, but are not sufficient to compensate for different productivity effects of CC.

8. Using the ENVISAGE model[2], **Dominique van der Mensbrugghe** (World Bank) provided a somewhat different view of the future. While he agreed to changes in agricultural trade patterns, his base scenario shows increasing net food exports by high-income countries, but substantial increases in net food imports to the East Asian and Pacific region where net food imports could represent almost 3% of combined GDP by 2050. This will have consequences for the international trading system which will need to adjust accordingly.

9. Due to declining growth in food demand, related to lower population growth and declining income elasticities, the World Bank scenario suggests that prices for agricultural commodities should remain largely unchanged in real terms. Compared to the IMPACT results, the World Bank analysis would also suggest much smaller impacts from climate change on trade and agricultural prices, although total agricultural trade is found to be increased by climate change. Overall, therefore, the results suggest no particular "stress" on agricultural markets but marked changed in trade patterns. In addition, the removal of existing trade distortions would lead to significant growth in output and trade, with only limited impacts on global emissions.

2. ENVISAGE is the World Bank's Environmental Impact and Sustainability Applied General Equilibrium Model, a computable general equilibrium (CGE) model designed to analyze a variety of issues related to the economics of climate change. More information on the model can be found at http://econ.worldbank.org/WBSITE/EXTERNAL/EXTDEC/EXTDECPROSPECTS/GEPEXT/EXTGEP2006/0,,contentMDK:22520416~menuPK:1919040~pagePK:64167689~piPK:64167673~theSitePK:1026804~isCURL:Y~isCURL:Y,00.html.

10. Results obtained from the IMAGE system[3] were presented by **Elke Stehfest** and **Tom Kram** (Netherlands Environmental Assessment Agency PBL), in a presentation co-authored by Hans van Meijl (LEI) and others. These results suggest a significant expansion of agricultural land use between 2000 and 2050, most notably in Sub-Saharan Africa and in South and South-East Asia. Most of the expansion would take place by 2030.

11. Another key finding from the baseline scenario is that biodiversity is expected to significantly decline further between 2000 and 2050. Based on the global Mean Species Abundance (MSA) indicator which uses relations between environmental pressures and species abundance, results suggest that biodiversity losses will continue at a similar pace as it did during the 20th century.

12. A number of options for reducing biodiversity loss were listed, ranging from the expansion of protected areas over productivity improvements to dietary changes. The combination of measures that reduce global food supplies with those that increase supplies or reduce demand would allow reducing biodiversity losses with no or little aggregate impact on food prices, hence avoiding "leakage" due to price effects.

13. Comparing LEITAP results with those from IFPRI or FAO suggests that projections of food crop production and area by 2030 are relatively similar. At the same time, however, projections for grass and fodder area differ markedly, with both IFPRI and FAO globally suggesting declines from the 2000 level while LEITAP results would suggest a significant increase. In particular land use changes represented in the IMPACT model tend to be much smaller when compared to those simulated by LEITAP. This could partly explain the large differences in projected price changes between partial equilibrium (IMPACT) and general equilibrium (LEITAP, ENVISAGE) models.

14. A rather different approach to develop long-term scenarios was presented by **Bruno Dorin** (CIRAD) and **Sandrine Paillard** (INRA). The Agrimonde platform[4] essentially represents a forum for exchange among an expert panel, supported by a quantitative accounting tool (Agribiom). Using food calories as the common unit of account, this food balance tool focuses on the statistical analysis of past trends in crop and livestock production and use and allows for live simulations of long-term scenarios for collective debate, starting from the capacity of each region to meet its own food needs from domestic production, with trade filling in after the assessment of domestic capacities.

15. Historical data show that, while crop and pasture land increased globally by 13% and 11% over the past 45 years, respectively, both land and labour productivities were raised by 123% and 53% in the same period. While human populations increased in most parts of the world – though at very different speeds – farmers have become increasingly concentrated in Asia and Africa. In consequence, while average area productivities today differ by a factor 2.5 across the six large regions considered, with Asia

3. IMAGE is the PBL's Integrated Model to Assess the Global Environment, an ecological-environmental framework around the CGE model LEITAP for the simulation of environmental consequences of human activities worldwide. More information on the system can be found at http://www.pbl.nl/en/themasites/image/index.html.

4. Agrimonde foresight project is a collaborative scenario project by CIRAD (Centre de coopération international en recherché agronomique pour le développement, a French research centre working with developing countries to tackle international agricultural and development issues) and INRA (Institut national de la recherche agriconomique, the French national institute for agricultural research). More information on the Agrimonde project can be found at http://www.cirad.fr/en/news/all-news-items/articles/2009/science/results-of-the-agrimonde-foresight-study or at http://www.international.inra.fr/the_institute/foresight/agrimonde.

showing the highest values, average labour productivities vary by a factor 37, with Asia having the lowest value.

16. Based, as the other models, on the medium variant of the UN population assessment, two main scenarios for 2050 have been constructed, with the first being a trend-based, efficient Millennium Assessment scenario, and the second a normative scenario where daily food availability in all regions represents 3000 kcal/cap, of which 500 kcal/cap from livestock products. Both scenarios suggest that global food requirements will be met by 2050, with Sub-Saharan Africa, Middle-East North Africa, and Asia remaining net importers of food, with total net trade significantly increasing between 2000 and 2050. Regional net deficits and surpluses of food are found to increase more strongly in the second scenario as food use particularly in the large exporting regions would be lower.

17. The session's discussant, **Pavel Vavra** (OECD Secretariat) stressed the difficulties in comparing the different scenarios presented – while a harmonization was intended in the set-up of the workshop, the different institutions partly used quite different assumptions in their "reference" scenarios. In consequence, the significant differences in the scenarios presented by IFPRI and the World Bank require more in-depth analysis to find out their exact reasons. A number of important aspects for future developments in agricultural markets were also mentioned, including the relevance of domestic policies and the importance of technical progress, notably in the food processing sector. Clearly, reliable, consistent and complete historical data represents a prerequisite both for the set-up of useful scenarios and for their comparison and interpretation. Finally, it is important to not only look at more or less smooth scenarios that largely extend historical patterns, but to also consider the possibility of "black swan" events, i.e. sudden and drastic events that could result in lasting changes to the patterns and developments in agricultural markets.

18. In the subsequent **discussion**, developments in energy markets were identified as another key driver for future agricultural markets. With the emergence of biofuels and other forms of bioenergy, in addition to production inputs and trade costs, the link between fossil energy markets and food markets has become closer. Unfortunately, there doesn't seem to exist any clear perspectives for energy markets. Similarly, the discussion of scenarios must not be limited to considering future levels and trends of prices or trade quantities, as the question of variability in food markets remains important.

19. While the different scenarios are constructed for various purposes, they should mainly serve an increased dialogue both between researchers and models, among various experts, and between researchers and decision makers (both public and private). A key result across all approaches presented is the increased trade due to changes in relative abundance and scarcities, with rising imports to Sub-Saharan Africa in particular. Beyond that, the discussion needs to reflect the uncertainty that quite different scenarios are thinkable. Among others, trade policy assumptions, and the possibility of 'endogenous' policy changes such as export restrictions in situations of domestic shortages, are important elements. While a harmonisation of assumptions for "reference scenarios" remains an important target to make a comparison of the different approaches feasible, other assumptions on major drivers are equally valid (Bayesian prior of climate scientists: "All scenarios are equally unlikely."). In consequence, policies need to be "robust" enough to deal with quite different futures (see also Session 3 below).

Session 2: Key Drivers

20. **Wallace Tyner** (Purdue University) presented some key challenges and lessons from his work on climate change and land use change. Much of the work on land use changes done in other disciplines lacks economic foundation, and the communication between biophysical sciences and economics is key. On the other hand, much of the economic considerations are short to medium term rather than long term and based on rather aggregated data. Yields are often exogenous to models while in reality they are endogenous at least to some extent. Some functions used particularly in CGE models, such as the Armington trade

functions or CES production functions, restrict model adjustments while in the long run adjustments could be more profound.

21. Data (both their availability and their quality) will remain key to properly represent some of the major biophysical drivers in economic models. Biophysical factors, such as land or water, and the impacts of climate change, require a higher spatial resolution than the one used in many economic models.

22. Properly representing land use and land cover change in the models requires learning from other disciplines. For instance, conversion costs from one land cover type to another can be significant, particularly for forest. Changes in land cover also depend on many other drivers beyond relative prices, such as land property rights, local laws and customs etc. Similarly, more information is needed to estimate the productivity of newly converted land compared to existing crop land. Examples from Brazil suggest that the productivity ratio between new and existing land may be much higher than previously assumed.

23. Water represents an important constraint for future agricultural markets. For instance, McKinsey & Co. estimated water demand to exceed sustainable supplies by 40% in 2030. In addition to average water availability, precipitation patterns across time and space are important for crop production prospects, and variability seems to increase with climate change. Modelling water in the required detail is very data and time intensive. In addition, water markets are much distorted worldwide – handling water markets in market models therefore represents a particular challenge.

24. The significant uncertainties related to climate change need to be captured in the analysis, and communicated to public decision makers. While it is not a big problem to account for the CC-related yield effects in the models, different CC studies (using different models) give very different results on changes in temperature and precipitation, leading to different results for regional yield changes. Similarly, there is significant uncertainty about land use change related GHG emissions.

25. Insights from the *Agriculture Towards 2030/2050* project were presented by **Piero Conforti** (FAO). In contrast to several other projects presented at the workshop, this project is not about different scenarios, but generates one long-term projection or baseline that gets updated and extended every so many years in the context of the FAO's Global Perspectives work – currently, a new AT2080 baseline is being generated.

26. The AT2030/2050 accounts for increasing population and urbanization, particularly in developing countries, as well as for growing income. Climate change, developments in the biofuels sector, and population growth have been identified as major uncertainties. Overall, consumption of agricultural products (both food and non-food) is expected to slow down in all major world regions considered.

27. The number of food insecure people should decline significantly by 2050, but remain significant at some 360 million, according to provisional results from the AT2080 project. In total, global food production will need to increase by 70% from its 2005/07 average level, with production growing much more strongly in developing countries (+97%) than in developed ones (+23%). These growth rates are, however, significantly lower than those observed during the 1961/63-2005/07 period.

28. Most of this additional production will come from higher yields (77% of global increment) and crop intensities (14%), with area expansion contributing only to a limited extent (9%). In developing countries, the share of area expansion in the expected production growth is somewhat larger at 21%. FAO estimates that there is both enough land and water to achieve these growth rates, provided the necessary institutions and right incentives are in place. Yield gaps (i.e. potential yields in farm demonstrations less actual national yields) are significant in many developing countries, but more R&D is needed for food-security sensitive crops such as millet, sorghum etc.

29. Climate change could have dramatic impacts, with significantly lower crop land and grain output. In consequence, undernourishment could be much higher than what is suggested by the baseline, according to work by IIASA. In contrast, the impact on long-run agricultural prices seems relatively limited, and real prices are projected to rise only moderately during the next several decades.

30. During the subsequent **discussion** the need to integrate other disciplines was re-iterated. This would both improve credibility of economic models and give a voice to biophysics. For instance, the importance of eco-system services was noted. The large range of GHG values associated with land use change, together with the set of other uncertainties, increase the need to find and implement policies that are robust to various future scenarios.

31. Representing water in economic models is particularly challenging. Apart from being data and time intensive, modelling water as a factor of production has the added complexity of requiring a characterization of physical constraints (upstream/downstream) and whether water use is consumptive or non-consumptive (if after use by one user it returns to be available also to other users downstream), as well as the demand for water across agricultural and non-agricultural sectors.

Session 3: Sensitivity of Scenarios

32. In his second presentation, **Dominique van der Mensbrugghe** (World Bank) talked about the robustness of scenarios. Within the drivers of uncertainty, temporal uncertainty (e.g. demographics, economic growth, productivity) and structural uncertainty (i.e. assumptions related to the model design) need to be distinguished. While for instance most "reference" scenarios use the UN medium variant population assessment, alternative projections for populations vary substantially. Income scenarios are even more heterogeneous, as shown for several countries. The World Bank assumes gradual convergence of per capita incomes to those in high-income countries – but historical fit of such an assumption varies significantly across countries. In order to handle these temporal uncertainties, alternative storylines need to be explored, complemented, where possible, with min/max ranges and/or confidence intervals.

33. Uncertainties related to the model structure and parameters (such as demand elasticities, Armington representation of trade shares, nesting of production functions, market structures and price rigidities) can only be handled by systematic validation. Sensitivity analyses can help to identify key parameters, but unless their ranges are known this does not help to narrow down the degree of uncertainty. Monte Carlo simulations require reliable information about the underlying distributions and can be quite computer intensive, but provide some information about the distributions of model outcomes. Finally, back-casting can both overcome some of the problems related to the econometric estimation of large-scale models and improve credibility of model results. Experience is, however, relatively limited in global CGE modelling.

34. Specific policies need to be represented in a way as close as possible to their actual implementation (i.e. avoiding summarizing tariff equivalents). This, however, may be hard to do in large-scale CGE models.

35. The importance to differentiate between risk and uncertainty was stressed by **Sherman Robinson** (UK Foresight and IFPRI) in his second presentation. While risk implies the possibility to assign probability distributions to the randomness in variables, uncertainty refers to the absence of such mathematical probabilities. The representation of risk can best be done with stochastic models – it represents known unknowns. The model translates probability distributions around key drivers or other stochastic variables into probability distributions of output variables.

36. Uncertainty is more difficult to represent in models. Importantly, models must be used only within their domain of applicability (e.g., if designed for short-term simulation, it shouldn't be used for long-term projections). An example of significant uncertainty is the effects of climate change. Alternative scenarios produced with different models produce vastly different results, particularly at local levels. Implications of climate change on agricultural productivity are therefore far from clear, yet they can be significant. Differences in GCM results are more important for precipitation than for temperature, and there seems to be consistency in results on more frequent extreme weather events (storms, floods – even in dry scenarios).

37. The use of historical data to validate models (back-casting) can be useful if history is believed to provide a guideline for future developments. In this case, reduced form models can provide useful insights for future developments. Historical data provide only limited information if future developments are outside of historical domains. In this case, deep structural models based on underlying science and knowledge of technology and biophysical processes are required.

38. As a discussant to the session, **Hans van Meijl** (LEI) stressed the need for collaboration to make progress in the areas of basic information. Consistent and complete data as well as fundamental model parameters are key, and more research is required in these areas. Similarly, more work is required on endogenous technical change as well as on the types of technical progress. Models need to be flexible enough to be fitted to market and policy specifics, and models of different scope should be linked to obtain more robust and more general answers to research questions. Facing the uncertainty, sensitivity analyses are unavoidable, also in light of increased demand for information on the levels of uncertainty – yet they reduce the power of final messages. Decision makers will need to find "no-regret" policies robust to various future developments.

39. During the subsequent **discussion**, back-casting was brought up several time as a difficult and time-consuming exercise which however is required for credibility reasons (even mandated by some government for models used for policy recommendations), even in the presence of structural changes in the future.

40. The question of longer-term dynamics was also brought up: do we need fully dynamic models? Do we need vintage models representing different generations of capital stocks? With increased risks, we also need to better reflect farmers' responses and adjustments.

Session 4: Discussion of Scenarios

41. A final presentation was given by **Pierre-Alain SCHIEB** (OECD Secretariat – International Futures Program IFP). The IFP is the OECD's strategic foresight group to alert the Organisation and its Member States to emerging issues. The objective of foresight projects should not be about forecasting, but about exploring possible or plausible futures to stimulate debate. Foresight should help policy makers to be better prepared through the development of robust and flexible policy options.

42. Scenarios represent one in many foresight tools. At the IFP, it represented less than 30% of its activities over 20 years as expected benefits not always outweigh the costs. Scenarios can target various audiences but generally should foster debate and dialogue. Experience at the IFP with scenarios has been mixed, and often the value of scenario work has materialized in policy changes only in the longer run. The IFP's "Future of Food" (1998) has helped to change the OECD's policy agenda.

43. A number of potential problems can limit the usefulness of scenarios for policy advice. While involving decision makers in the development of scenarios can generate ownership, a large number of scenarios, and possibly extreme ones outside of the politicians' "mindset" or contradicting the clients'

positions, can limit their acceptance. The reputation of the source is important to assess the risk of bias or low quality. A major problem also is related to the lack of wild cards built in, particularly if shortly after the scenario generation significant crises happen. Finally, if there is a multitude of clients (e.g. in multilateral, international platforms), the heterogeneity of expectations can render a focused discussion very difficult.

44. In the future, it seems important to increase the scenarios' relevance by better exploring the breadth of possible futures through contrastive scenarios and wild cards. Increasingly, the work will need to assess policy options and impacts. Agent based models, non-general equilibrium assumptions etc. may be challenging and can be contentious, but may help to deepen the understanding of possible futures as well as the dialogue about them. Ownership needs to be increased by involving more decision makers in the scenario process, and in the discussions of policy implications.

45. The subsequent **discussion** highlighted the need for continuity in the institutions working with long-term scenarios. Credibility quickly erodes when the commitment to scenario work gets interrupted, and is expensive to restore. In addition, experience has shown that recreating the capacity to contribute with scenarios after some time, particularly if based on large-scale models, can be costly. Finally, researchers need to respond relatively quickly to changes in the environment and provide scenario results and policy recommendations when the process allows it. In consequence, abandoning modelling activities not of immediate use should be avoided.

46. Another key point mentioned was transparency in the approach and assumptions used. This both increases credibility with the users of the work and helps to use, criticize and improve models and assumptions. Collaboration and dialogue between different research groups as well as between researchers and decision makers is important

Conclusions and next steps

47. Approaches for the generation of long-term scenarios on future developments in agro-food markets are diverse, and while significant progress has been made in the past in the modelling of markets and economies, much work still needs to be done. In particular, some of the key driving forces, in particular climate change, water and land use, or links to ecosystem services, are only partially understood. Significant efforts will be required to connect biophysical and environmental sciences to economic modelling, a step that is crucial for scientists, economists and users of the research results alike. Building greater inter-disciplinary dialogue is vital for the required consideration of drivers and impacts of changes in agricultural supply and demand.

48. Models are useful tools and hence one of the inputs into scenarios as they help improving our understanding of the relevant processes. As they lack predictive power, however, they cannot be used for forecasting, but should help to explain scenarios in a consistent way. Transparency of model outcomes, as well as of the models themselves, is important in creating ownership with decision makers. Transparency is also important for fruitful criticism on approaches and results, and hence to improve future model outputs.

49. The spectrum of modelling approaches presented and the discussion both called attention to a dichotomy between internally-consistent approaches incorporating economic structure and approaches that have looser consistency requirements but are compatible with larger structural shifts over time, allowing for "broader" futures. Finding a balance between structure and breadth could be an important element to produce reference scenarios that are representative of what the future has in store.

50. Results of different scenarios differ markedly and are sometimes contradictive. Whether agricultural commodity prices will remain flat or double in real terms by 2050 not only matters for

producers and consumers, but gives different signs about the abundance or scarcity of food and productive resources in the future. More convergence exists, in contrast, in the expectation that trade from surplus to deficit regions will need to increase in order to balance increasing regional differences in levels of resource abundance and scarcity relative to food demand. Some countries, notably in Sub-Saharan Africa, will increasingly rely on food imports. An open and flexible trading system will be required in future even more than today to allow for the necessary trade flows – as well as sufficient options to generate the required incomes within deficit regions to participate in these markets. Overall, however, it seems that there is somewhat less sense of "urgency" in the debate today than what it was some time ago, notably after the price spikes in agricultural markets during 2007/08.

51. In addition, a closer analysis of the factors driving the differences across scenarios remains a priority for future work. While to some degree this was an objective in Session 1 of the Scenario Workshop, difficulties in harmonizing basic scenario assumptions across the four approaches presented made a detailed and consistent comparison impossible. In this context, the establishment of a comprehensive, consistent and publicly available database on historical data – both on market variables and on the driving factors behind them – as well as collaborative work on key parameters are fundamental for a better understanding and comparability of scenario results. This, however, should not be understood to be a need to harmonize all modelling or scenario work, as indeed differences in approaches and scenario stories remain important – scenarios are not true or wrong, but more or less useful.

52. Finally, the purpose of scenarios as a basis for dialogue needs to be reiterated. Scenarios are not projections of what the world will likely look like in the future, but stories of alternative future developments. As such, they aim to inform a discussion rather than to present final results, and decision makers and researchers alike need to engage in more in-depth debate about possible implications and policy options that are robust and flexible enough to deal with the future as it unfolds. Rather than THE baseline scenario which would be used to assess alternative policy options, this will require a broad set of scenarios, obtained from a range of different approaches including expert panels, partial and general equilibrium modelling, integrated assessment modelling, and/or alternative modelling approaches such as agent based models.

53. Future OECD work on long-term scenarios, as considered today and apart from the continued activities of the OECD's International Futures Program, is largely concentrated at the Environment Directorate (OECD/ENV). The OECD Environmental Policy Committee (EPOC) is currently preparing the third edition of the OECD Environmental Outlook, which this time would run until 2050. The previous one, the OECD Environmental Outlook to 2030 (released in 2008) highlighted four priority areas where urgent action is needed: climate change, biodiversity loss, water scarcity, and environment and health. The OECD Environmental Outlook to 2050 is to be published in time for the next EPOC Ministerial Meeting in April 2012. The modelling simulations for the Environmental Outlook will be carried out with the ENV-Linkages dynamic general equilibrium model, in tandem with the IMAGE model suite of the Netherlands Environmental Assessment Agency. One of the aspects that will get specific attention is the harmonization of both models in their projections for land use, land use change and forestry, and this requires harmonization of the long-term scenarios for agricultural production. The LEITAP model will be part of this harmonization.

54. Within the Trade and Agriculture Directorate, work on climate change and its links to agriculture is being considered for the Joint Working Party on Agriculture and Environment (JWPAE); project proposals on both adaptation and mitigation have been submitted and will go forward conditional on approval by delegates. The Joint Working Party on Agriculture and Trade (JWPAT) might consider being involved in further work related to trade and domestic policies in agriculture and their long-term links to market development. No resources are foreseen for this strain of work in the Programme of Work and Budget 2011-12. However, with a view of the next Meeting of the Committee for Agriculture at

Ministerial Level, which currently is scheduled for 2015, it is important to start thinking about elements in the future PWB that could inform this mid-decade Ministerial. In consequence, the Secretariat will maintain and strengthen its links to various research institutes working in the field of long-term scenarios for agriculture and food markets. Bearing in mind the resource intensity of doing large-scale modelling work on long-term developments in-house, together with the multitude of modelling efforts both elsewhere in the Secretariat and outside the OECD, the OECD Secretariat does not propose any additional modelling work in-house. Instead, being a platform for exchange and coordination across research activities outside the Secretariat would seem to make good use of the organisation's comparative advantages, and synthesising and interpreting the results of work done elsewhere for the next Ministerial could provide a valuable input for the meeting's discussions.

ANNEX 1.

AGENDA

Day 1

09h00-09h30	Welcome by the organizers, objectives and outline of the Workshop	Martin von Lampe, OECD
Session 1. Reference Scenarios		
	Chair	Hans van Meijl, LEI
09h30-10h50	Presentations by four organizations "reference run – outcome (with a focus on international trade) and key messages: what are the 3 or 4 main challenges to international agriculture and trade?"	
	• The IMPACT Baseline to 2050	Sherman Robinson, Foresight / IFPRI
	• The World Bank's long-term baseline	Dominique van der Mensbrugghe, World Bank
	• Base Scenario results from the IMAGE system	Tom Kram and Elke Stehfest, Environment Assessment Agency (PBL)
	• Key Scenario results from the Agrimonde system	Sandrine Paillard, INRA Bruno Dorin, CIRAD
10h50-11h15	***Coffee break*** *(coffee and tea provided by OECD)*	
11h15-11h30	• Discussant	Pavel Vavra, OECD
11h30-12h00	*Discussion*: what are the main common conclusions emerging from the "reference runs", where are the main differences, and how are those motivated? This discussion would be relatively technical: what do we, the research community, learn from these model results?	All participants
12h00-12h30	*Discussion*: what is the role of the international trading system and trade policies in mitigating some of the challenges indicated by the "reference runs"? This discussion would be more policy oriented: what can public policy learn from these model results?	All participants
12h30-13h45	**Lunch break** *(at participants' expense)*	
Session 2. Incorporating Key Drivers		
	Chair	Wilfrid Legg, OECD
13h45-14h30	Incorporating key drivers	
	• How should major biophysical issues, such as water, land use, and climate change be reflected in the modelling approach? How important are these issues with respect to the main conclusions? We expect water possibly to be the next major issue. We need much better information on land conversion costs and more realistic land supply functions in models. Our climate change agricultural adaptation research needs to convey the huge uncertainty inherent in the GCM models.	Wallace Tyner, Purdue University
	• Insights from the Agriculture Towards 2030/2050	Piero Conforti, FAO
14h30-15h15	Discussion	All participants
15h15-15h45	**Coffee break** *(coffee and tea provided by OECD)*	

Session 3. Sensitivity of Scenarios

	Chair	Frank van Tongeren, OECD
15h45-17h00	Presentations by several organizations "Sensitivity with respect to key assumptions".	
	• Robustness of Scenarios and Policy Analysis	Dominique van der Mensbrugghe, World Bank
	• Linking Models of Climate Change Shocks and Adaptation	Sherman Robinson, Foresight / IFPRI
	• Discussant	Hans van Meijl, LEI
17h00-18h00	Discussion	All participants
18h00	**Cocktail** *(participants are invited by the OECD)*	
19h30	**Social dinner near OECD** *(at participants' expense)*	

Day 2

Session 4. Discussion of results: What do we – and what should policy makers – learn?

	Chair	Sherman Robinson, Foresight/IFPRI
09h00-09h30	• Methodological questions in advising policy makers in the long run: what is the value of scenarios and where do they fail to meet the requirements of advice for policy making?	Pierre-Alain SCHIEB, OECD Futures Program
09h30-10h45	*Discussion*: what do policy makers need to be prepared for? What unknowns are known? What challenges need to be considered in current policy making? How should public policy deal with uncertainty and the "low probability, high impact" tails of the distribution?	All participants
10h45-11h15	**Coffee break** *(coffee and tea provided by OECD)*	
11h15-12h00	*Discussion*: What are the most important gaps that need to be closed in the knowledge / analyses area in order for the research community to provide better policy advice?	All participants
12h00-13h00	**Wrap-up session**	
13h00	**End of the Workshop**	

ANNEX 2.

LIST OF PARTICIPANTS

Mr. Daryl BREHM
Agricultural Counsellor
U.S. Department of Agriculture
Permanent Delegation of the United States to OECD
2 Avenue Gabriel
75008 Paris, France
Tel: +33 1 43 12 23 29
Email: daryl.brehm@fas.usda.gov

Mr. D. Shane CHRISTENSEN
Trade and Agriculture Advisor
Permanent Delegation
12, avenue Raphael
75016 Paris, France
Tel: + 33 (1) 45.24.74.28
Email: ChristensenDS@state.gov

Mr. Piero CONFORTI
Economist
Agricultural Development Economics Division
Food and Agriculture Organization (FAO)
Viale delle Terme di Caracalla
00153 Rome, Italy
Tel: + (39) 06 57053664
Email: piero.conforti@fao.org

Mr. Dario DEBOWICZ
Institute of Development Studies
at the University of Sussex
Brighton, United Kingdom
Tel: +441273606261
Email: d.debowicz@ids.ac.uk

Mr. Bruno DORIN
Senior Researcher (Economics)
CIRAD - Umr CIRED
TA C56/15, 73 rue J.F. Breton
34398 Montpellier Cedex 5
Tel : +33 (4) 67 61 75 82
Email: bruno.dorin@cirad.fr

Mr. Aziz ELBEHRI
Senior Economist, Trade Policy Service (ESTT)
Trade and Markets Division (EST)
Food and Agriculture Organization of the United Nations (FAO)
Viale delle Terme di Caracalla
00153 Rome, Italy
Tel: +39 06 57056002
Email: Aziz.Elbehri@fao.org

Ms Kristina GENDOVA RUZSIKOVA
Third Secretary
Permanent Delegation of Slovakia to OECD
28, avenue d'Eylau
75016 Paris, France
Tel: +33 1 56 26 50 96
Email: kristina.gendova@mzv.sk

Mr. Dong-Min HAN
First Secretary
Permanent Delegation of Korea to OECD
4 Place de la Porte de Passy
75016 Paris, France
Tel: +33 1 44 05 20 55
Email: dmhan@mofat.go.kr

Dr. Suk Ho HAN
Researcher
Agricultural Simulation Model Program Team
Korea Rural Economics Institute
Tel: +(82)2-3299-4279
Email: shohan@krei.re.kr

Ms. Elisavet KITOU
Economic Advisor
CAP Reform and Agricultural Markets Theme Group
DEFRA, United Kingdom
Email: Elisavet.Kitou@defra.gsi.gov.uk

Dr. Atsushi KOIKE
Department of Social Systems Engineering
Tottori University
4-101 Koyama minami
Tottori, 6808552 Tottori, Japan
Tel: +81 857 315313
Email: koike@sse.tottori-u.ac.jp

Mr. Makoto KONDO
First Secretary
Permanent Delegation of Japan to OECD
11 avenue Hoche
75008 Paris, France
Tel: +33 1 53 76 61 93
Email: makoto.kondo-2@mofa.go.jp

Mr. Tom KRAM
Expert, Global Sustainability and Climate
Netherlands Environmental Assessment Agency (MNP)
PO Box 303
A. van Leeuwnhoeklaan 9
3720 AH Bilthoven, Netherlands
Tel: +31 30 274 35 54
Email: tom.kram@pbl.nl

Ms. Lidija LEBAR
Executive Director, Agriculture and Agri-Food Canada
Research and Analysis Directorate - Strategic Policy
4th Floor, Tower 7
1341 Baseline Road
K1A 0C5 Ottawa
Tel: +1 613 773 2366
Email: Lidija.Lebar@AGR.GC.CA

Mr. Jun LI
Researcher
CIRED
France
Tel: +33 1 43 94 73 75
mailto: jun.li@centre-cired.fr

Mr. Robert MACGREGOR
Chief, Research and Analysis Directorate -
Strategic Policy Branch
Agriculture and Agri-Food Canada
Agricultural and Environmental Policy Analysis
1341 Baseline Road
Tower 7 Floor 4 Room 300
K1A 0C5 Ottawa, Canada
Tel: +1 613 773 2483
Email: bob.macgregor@agr.gc.ca

Mr. Daizou MATSUBARA
Section Chief Food Security Division
MAFF, Japan
Email: daizou_matsubara@nm.maff.go.jp

Mr. Hironobu NAKA
First Secretary
Permanent Delegation of Japan to OECD
11, avenue Hoche
75008 Paris, France
Tel: +33 1 53 76 61 95
Email: hironobu.naka@mofa.go.jp

Mr. Zebedee NII-NAATE
Economic Adviser
Partial Equilibrium Modelling
CAP Reform & Agricultural Markets Theme Group
DEFRA
Tel: +44(0)20 7238 5155
Email: Zebedee.Nii-Naate@defra.gsi.gov.uk

Dr. Sandrine PAILLARD
Foresight Unit, INRA
182 rue de Belleville
Paris, France
Tel: 33 1 42 75 95 37
Email: sandrine.paillard@paris.inra.fr

Mr. Michael REILLY
Foresight Research and Knowledge Management
United Kingdom
Email: michael.reilly@bis.gsi.gov.uk

Ms. Marjo RIIHELÄ
Counsellor (Agriculture, Forestry and Fisheries)
Permanent Delegation of Finland to OECD
6 rue de Franqueville
75116 Paris, France
Tel: +33 6 32 63 39 45
Email: marjo.riihela@formin.fi

Mr. Sherman ROBINSON
Research Fellow, Globalisation Team
Institute of Development Studies
At the University of Sussex
Brighton BN1 9RE UK
Tel: + 44 1273 915 698
Email: s.robinson@ids.ac.uk

Dr. Jörn SCHARLEMANN
UNEP-WCMC
219 Huntingdon Road
Cambridge, United Kingdom
Tel: +44 1223 277 314
Email: jorn.scharlemann@unep-wcmc.org

Ms. Elke STEHFEST
Scientist, Image Team
Global Sustainability and Climate Unit
Netherlands Environmental Assessment Agency
P.O. Box 303
3720 AH Bilthoven, Netherlands
Email: Elke.Stehfest@pbl.nl

Professor Wallace TYNER
Professor, Department of Agricultural Economics
Purdue University
403 West State St.
IN 47907-2056 West Lafayette, United States
Tel: +1 765 494 0199
Email: wtyner@purdue.edu

Mr. Dominique VAN DER MENSBRUGGHE
Lead Economist, Development Prospects Group
The World Bank
1818 H Street, NW
20433 Washington, United States
Tel: +1 202 473 0052
Email: dvandermensbrugg@worldbank.org

Mr. Hans VAN MEIJL
Senior Researcher
Agricultural Economics Research Institute, LEI
Bergemeester, Patijnlaan 19
P.O. Box 29703
NL-2502-LS The Hague, Netherlands
Tel: + (31-70) 335 8169
Email: hans.vanmeijl@wur.nl

Mr. Dusan VUJADINOVIC
Counsellor
Permanent Mission of the Republic of Slovenia to the United Nations Office at Geneva
Rue de Lausanne 147
1202 Geneva, Switzerland
Tel: +41 (22) 716 1785
Email: dusan.vujadinovic@gov.si

OECD Secretariat
2 rue André-Pascal
75016 Paris
France

Mr. Frank VAN TONGEREN
Head of Division
TAD/PTA
Tel: +(33-1) 45 24 78 81
Email: Frank.VANTONGEREN@oecd.org

Mr. Wilfrid LEGG
Head of Division
TAD/PE
Tel: +(33-1) 45 24 95 36
Email: Wilfrid.LEGG@oecd.org

M. Pierre-Alain SCHIEB
Counsellor / Head of Futures Projects
SGE/AU
Tel: +(33-1) 45 24 82 70
Email: Pierre-Alain.SCHIEB@oecd.org

Mr. Martin VON LAMPE
Senior Agricultural Policy Analyst
TAD/PTA
Tel: +(33-1) 45 24 96 94
Email: Martin.VONLAMPE@oecd.org

Mr. Andrea CATTANEO
Agricultural Policy Analyst
TAD/PE
Tel: +(33-1) 45 24 15 28
Email: Andrea.CATTANEO@oecd.org

Mr. Rob DELLINK
Economist/Policy Analyst
ENV/CBD
Tel: +(33-1) 45 24 19 53
Email: Robertus.DELLINK@oecd.org

Mr. Pavel VAVRA
Agricultural Policy Analyst
TAD/ATM
Tel: +(33-1) 45 24 18 41
Email: Pavel.VAVRA@oecd.org