Joint Working Party on Agriculture and the Environment

REPORT ON THE OECD EXPERT WORKSHOP ON MEASURING ENVIRONMENTALLY ADJUSTED AGRICULTURAL TOTAL FACTOR PRODUCTIVITY AND ITS DETERMINANTS

25-26 April 2016
OECD Conference Centre
Paris, France

This note is submitted for DISCUSSION at the 41st Session of the Joint Working Party on Agriculture and the Environment, to be held from 25-26 April 2016.

This work is mandated under the Programme of Work and Budget 2015-16 (Output Result, 3.2.3.1 Green Growth for Agriculture and Food, intermediate output 3.2.3.1.1. Monitoring and Evaluating Progress towards Green Growth in Agriculture).

Item 5.b. of the Draft Agenda

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REPORT ON THE OECD EXPERT WORKSHOP ON MEASURING ENVIRONMENTALLY ADJUSTED AGRICULTURAL TOTAL FACTOR PRODUCTIVITY AND ITS DETERMINANTS

Background

1. The Workshop was mandated under the 2015-16 Programme of Work and Budget (PWB) of the Committee for Agriculture (Output result 3.2.3.1.1 Monitoring and Evaluating Progress towards Green Growth for Agriculture and Food). It complements the work on monitoring progress towards green growth in agriculture and should provide an important contribution to development of the Framework for Analysing Policies to Improve Agriculture Productivity Growth, Sustainably, as well as to the related pilot country reviews and the planned work on evaluating agricultural productivity and sustainability at the farm level.

2. Moreover, agricultural productivity is directly related to some key dimensions of well-being, in particular i) income, ii) human health and environmental quality of life and as such the Workshop is linked to the OECD broader well-being framework. Finally, this work could also contribute to the development of the OECD Productivity Network. This work is undertaken in collaboration with other Directorates (ENV, ECO, STD and STI).

3. The Workshop was attended by around 60 participants, covering a wide spectrum of expertise and country origin (see list of participants in the Annex). Participants were mainly experts from academia, ministries and government institutions (e.g. ABARES, INRA, AAFC, KREI, LUKE, DEFRA, European Commission) and international organisations (FAO, IFPRI), who are specialists in the field of total factor productivity and have contributed empirical studies on measuring it. Experts from India and Indonesia also attended, as well as some Delegates to the JWPAE. Colleagues with expertise in this area from across the Secretariat (STD, ENV, STI, GOV, and ECO) provided an invaluable source of horizontal collaboration and support for the Workshop.

Key objectives of the Workshop

4. Against the backdrop of growing global food demand and pressures on natural resources (e.g. land and water), with existing tensions exacerbated by climate change, increasing the growth of agricultural productivity in a sustainable way has become a policy priority in several countries. To this end, productivity measured in a way that accounts for undesired outputs (e.g. pollution) and for non-market inputs from nature (e.g. natural resources) would provide important additional insights.

5. The overarching objectives of the expert Workshop were twofold:

- Assess available data and methodologies to calculate traditional TFP for the aggregate agricultural sector for OECD and partner countries from 1990-onwards in order to derive country level TFP indicators which will be based on comparable method and data and which can be easily updated.
- Assess available data and methodologies to calculate environmentally adjusted TFP (EATFP) for the aggregate agricultural sector for as many countries as possible from 1990-onwards, with the aim to be able to compare EATFP values with traditional TFP values.
6. The workshop included 19 formal presentations in two thematic sessions, and three short contributions from members of the concluding round table. In all five sessions, discussants provided valuable comments and insights. The Workshop concluded with a discussion between a panel of experts, a rapporteur and the Secretariat, which drew together the issues addressed in the Workshop that may be of the most interest and relevance to the Secretariat in taking the work forward.


**Overall summary of the Workshop**

**Day 1: Traditional TFP measurement**

8. The underlying purpose was to explore the feasibility of measuring agricultural TFP that would be comparable across OECD and partner countries and policy relevant, as is currently already done by OECD at the level of the whole economy for a similar group of countries.

9. The main discussion topic areas were threefold:

   - Data issues (availability, reliability, comparability of data across countries);
   - Methodological issues (choice of index number formulae, output and input aggregation rule and associated problems), legitimacy of TFP measurement at aggregate level (be it economy-wide or sector-wide, rather than at micro (farm)-level);
   - Quality-adjustment of inputs (whether it should be done, how to do it).

**Data issues**

10. Existing approaches in various countries show the heterogeneity of what is measured and how it is measured. Much relevant data is missing, and there is little co-ordination across statistics-providers in different countries. The extent to which this might matter was illustrated by a Canadian example, whereby average agricultural TFP growth over 50 years prior to 2011 was 1.6% p.a. if the unpaid labour input (operator) is measured by operator numbers and 1.9% when operator hours were used. Over the 50-year period, the former implies cumulative TFP levels that are 14% lower than using the latter. The trade-offs, in terms of reliability and ease of measurement, between different measures of the same concept were also discussed.

11. Some key conclusions were:

   - Standardisation of the definitions of outputs and inputs and measurement techniques is a prerequisite for more meaningful TFP comparability across countries. This applies to comparisons of TFP growth rates as well as levels.
   - In order to develop sound protocols for an OECD-wide methodology, further empirical comparisons like the Canadian example could be very instructive, in order to identify those variables that are more sensitive to measurement choices and to explore the robustness of TFP results with respect to such choices.
   - Most inter-country agricultural TFP studies have used data from the FAO (in some cases supplemented with data from national sources). These data are very comprehensive and
accessible – it’s easy access is considered to be one of the driving forces behind the expansion of empirical literature on global TFP growth over time. There are also several acknowledged deficiencies in the FAOSTAT data, specifically for measuring agricultural inputs, such as land, capital and labour. The FAO expert informed us that the FAO is constructing new agricultural capital stock database using a national accounts framework for over 202 countries, from 1970 through 2013.

Methodological issues

12. The wide-ranging discussion covered various relevant and partly unsolved issues. Comparisons of different estimates of TFP growth for the same countries from different sources did not lead to a clear sense of the role played by alternative methodological choices in creating these differences.

13. Most inter-country studies on agricultural TFP measurement have used the Data Envelopment Analysis (DEA) approach due to its practical advantages (e.g. analysis of inputs and outputs without a need for their market prices). Despite the practical advantages of DEA, this method is not free from drawbacks and the TFP growth rates estimated by DEA can produce counterintuitive results. The major alternative to the DEA approach is the Growth Accounting Approach (GAA), which does not require assumption about a common technology, but for which inputs and outputs have to be aggregated using price weights that can be difficult to obtain in practice.

14. Some key conclusions were:

- In any study, measured TFP is a residual as it accounts for changes in total output not caused by inputs. Hence, its interpretation is highly model-specific. Model dependency concerns not only which factors are accounted for in the model, but also how they are measured. Typically, the TFP residual contains not only disembodied technical change, but also unrecognised input quality changes, change in the supporting infrastructure and in the use of ecosystem services, measurement errors and other omitted factors. Hence, a high level of standardisation across countries regarding what is included under “input services” and how they are measured is a prerequisite for more meaningful cross-country TFP comparisons

- Comparison of TFP growth rates across countries requires careful interpretation to assure sound policy-relevant.

- Quantity-based index approaches are sensitive to the way implicit prices are measured; superlative index approaches would be preferable but are seldom feasibly due to the significant data requirements.

- Empirical comparisons of different methodological approaches can provide important insights, but again interpretation is important (giving consideration to the methodological approach applied and data used).

- Farm level versus aggregate agricultural sector productivity analysis both provide useful information about the sources of economic growth in agriculture and both types of information can be useful in the development of policies that enable growth. The key is to ensure that the applicability and limits of this information are well-understood. Consistent use of appropriate terminology (e.g. yields measures land productivity and not total factor productivity) is one way in which economists can make this information more useable and less subject to misinterpretation.
**Quality-adjustment of inputs**

15. While such adjustments are theoretically desirable, there were few concrete suggestions for doing so. Adjustment of produced capital for the age and composition of the capital stock is a standard feature of capital measurement, although industry-level capital stocks that account for asset composition are traditionally hard to get.

16. No concrete examples were given for land, but there are different approaches: some countries (including United States, Australia) recognise the greater productivity of irrigated hectares by converting them to rain-fed equivalents, others recognise differences between arable land, pasture, and so on. There was no general discussion of which aspects of land quality should be adjusted for, or of whether, given the heterogeneous land conditions across countries. Thus of the relevant parameters affecting land quality, it would be sensible to standardise the parameters according to which land quality is adjusted in a large multi-country study.

17. For labour, Canada provided an explicit example for the effects of measuring operator labour (number of operator, operator hours, operator hours adjusted for composition) where each measure has different labour-quality implications. The Canadian example shows how important it is for the underlying data to be reliable enough to support adjustments for quality (composition).

18. Some key conclusions were:
   - The issue of adjusting labour input needs more study and development.
   - For land, discussions should be taken up with national accountants and those involved in the implementation of the UN System of Integrated Environmental-Economic Accounts (SEEA) to work towards standardised data on land use and on land values for use, *inter alia*, in agricultural TFP measurement.
   - Similarly, any development of agricultural measures of capital input that accounts for age and composition of assets should follow national accounts practice to avoid comparisons across industries and countries.

**Day 2: Accounting for environmentally-related outputs and inputs in agricultural TFP measurement**

19. Essentially, adjusting conventional TFP measures to include the role of the environment in agricultural production relies on the concept of joint outputs. Externalities (positive or negative) are mostly seen as joint outputs – (un)desirable outputs or by-products – associated with the production of goods (desirable outputs). Three groups of approaches can be distinguished in the literature to measure environmental performance depending on how environmental impacts are dealt with:
   - treating pollutants and or environmental services as an additional input or (un)desirable output variable;
   - the eco-efficiency frontier models which use the frontier framework to derive eco-efficiency measures (also referred to as environmental efficiency) defined as the ratio of the economic value of output divided by an indicator of the environmental pressures involved in production processes; and
• the nutrients balance-based models which view pollution as the balance of materials (nutrients) – defined as the difference between nutrients in inputs and nutrients in outputs – and attempts to minimise this balance.

20. One of the key objectives of this part of the Workshop was to assess the extent to which it would be possible to apply the GAA, that is, for which countries and for which environmental variables. The GAA for calculating agricultural EATFP across countries has two desirable features: i) as the approach does not involve the estimation of parameters, long-time series data are not needed; and ii) is compatible with the OECD approach at country level. However, the GAA approach would require not only quantity, but also data on the prices of all inputs and outputs included in the calculation. The price data requirement can be a problem, especially in the case of non-marketed outputs or inputs.

21. The materials-balance approach, which is relatively recent in inter-country empirical studies, has lately attracted interest in environmental economics. The approach is flexible insofar as it can be estimated either through non-parametric methods (e.g. DEA) or parametric methods (e.g. Stochastic Frontier Approach, Stochastic Nonparametric Envelopme

22. Key questions addressed were:

• Should shadow prices of non-marketed output and inputs reflect private (producer) or social costs?
• What are the implications of this choice for the policy relevance of the EATFP measure?
• Merits of pragmatic approaches vs. theory-consistent approaches
• The potential contribution of the material balance approach. What are the implications of this approach for the interpretation of the TFP index?
• A number of empirical studies at micro (farm) level and regional level incorporating environmental concerns into the agricultural production framework gave rise to keen discussions. How can such analyses performed at the sub-sectoral level be used to complement aggregate sector analysis?

23. Some key conclusions were:

• While EATFP is highly desirable, it is no feasible to produce a credible measure in the short run.
• It is not theoretically valid to treat emissions either as inputs or as outputs in a single production technology. In fact, two technologies should be specified – a production-generating technology and a pollution-generating one.
• By-products do not always reduce the cost of output.
• It is invalid to assume constant returns to scale for priced outputs and inputs only. This assumption, if used, should extend to all outputs and factors whether priced or not.
• It is important to maintain theoretical consistency in all methodological choices (e.g. private or social perspective).

• The aim of EATFP is to capture how agricultural production itself harms or enhances the environment. By contrast, elements like rainfall, temperature during the growing season, frequency of weather events like frosts, storms, floods, are regular inputs into the agricultural production process. When these elements exhibit trends over time (as when climate change is occurring), if they are not explicitly accounted for in the model they will be gathered in the residual and will bias estimated TFP growth even when estimates are averaged over longer periods.

• The issue of climate change needs to be tackled in the context of traditional agricultural TFP measurement, and not merely introduced for the first time when contemplating environmentally-adjusted TFP (EATFP).

• The material balance approach could be useful in the context of sectoral EATFP in order to measure emissions (while bearing in mind that it identifies potential rather than actual pollution). In the context of EATFP measurement, the majority opinion favoured a static approach to linking production activity and emissions, whereby the current year’s disposal of nutrients is ascribed in its entirety to the current year’s production activity, rather than using a distributed lag to try and mimic the timing with which these emissions might show up as pollution that can affect third parties and linking this year’s emission disposal with production activity over a number of future years.

• Because sub-sectoral (farm level) studies are typically done on a selective and ad hoc basis, it would be difficult to transfer any of their concrete findings into the cross-country sectoral framework in a systematic way. However, such studies contain a wealth of information that individual countries can use when interpreting their sectoral estimates; and insights from these findings could also stimulate methodological or data refinements that could be adopted in the cross-country protocols.

An overall assessment – recommendations for future OECD work

24. The workshop was very rich in ideas and information, and stimulated excellent discussion. It also provided a good overview of where things stand at the moment regarding inter-country TFP measurement for agriculture and the possibility of adjusting it to reflect its environmental damage and enhancement.

25. A key lesson from the workshop was that continued effort needs to be devoted to ensuring reliable, cross-country consistent, sector-level agricultural TFP measures for OECD and partner countries are available and correctly interpreted. Agricultural TFP measure provides useful information for better policy making and a reference point from which one can begin to examine the relationship between agricultural production and environmental (non-market) factors.

26. During the Workshop, a number of suggestions were made regarding work that could be undertaken by the OECD and by countries themselves to help advance the agenda for measuring TFP and EATFP for the aggregate agricultural sector. There was unanimity in the demand for more reliable, transparent and regularly available data on agricultural inputs, outputs and total factor productivity.

27. One particular suggestion was to establish an OECD co-ordinated network of experts from relevant countries and organisations to facilitate a dialogue and possible co-operative research towards the development of a better framework for cross-country TFP comparisons, and in due course the initiation of
environmentally adjusted TFP indicators. The network's activities would be based on the experience and efforts to date of academic experts in the field, and relevant work on productivity in the Organisation as well as elsewhere (ERS, ABARES, AAFC, European Commission, DEFRA, IFPRI, FAO, etc.). The initial effort would start with OECD and partner countries for which suitable expertise and data are available.

28. The development of a manual to provide information on measurement and methodological issues that have previously been given insufficient attention (e.g. treatment of decoupled payments; appropriate prices to be used; environmental outputs and inputs; etc.) was also suggested as one of several possible concrete outputs of the network.
OECD EXPERT WORKSHOP

MEASURING ENVIRONMENTALLY ADJUSTED AGRICULTURAL TOTAL FACTOR PRODUCTIVITY (EATFP) AND ITS DETERMINANTS

14-15 December 2015
OECD Headquarters, Paris

Draft Agenda
(Final)

For further information on the Workshop please contact:

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Trade and Agriculture Directorate, OECD
e-mail: Dimitris.Diakosavvas@oecd.org

Information on the Workshop, including papers, presentations, hotel registration and logistics, is accessible though the OECD website, at: http://oe.cd/eatfp
### Monday, 14 December 2015

(OECD Conference Centre, Room CC 12)

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<td>09h00-09h30</td>
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<td><strong>09h30-10h10 : Session 1</strong></td>
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<td><strong>SETTING THE SCENE:</strong></td>
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<td><strong>OBJECTIVES OF THE WORKSHOP AND EXPECTED OUTCOMES</strong></td>
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<td>09h30-09h40</td>
<td>Welcoming remarks</td>
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<td>Ken ASH, Director, Trade and Agriculture Directorate, OECD</td>
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<td>09h40-10h00</td>
<td>Productivity Measurement at the OECD – An Overview</td>
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<td>Paul SCHREYER, Deputy Director, Statistics Directorate, OECD</td>
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<tr>
<td>10h00-10h10</td>
<td>Overview of the Workshop</td>
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<tr>
<td>Dimitris DIAKOSAVVAS, Senior Economist, Natural Resources and Policy Division, Trade and Agriculture Directorate, OECD</td>
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<td><strong>10h10-12h15 : Session 2</strong></td>
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<td><strong>DATA AVAILABILITY, QUALITY AND MEASUREMENT OF FACTORS OF PRODUCTION (CAPITAL, LAND AND LABOUR)</strong></td>
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<td>This Session will focus on discussing the availability and quality of data on capital, labour and land and measurement issues. It will also discuss the data issues that can be resolved by the completion and implementation of the United Nations’ Integrated System of Environmental Economic Accounting (SEEA).</td>
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<td>Moderator:</td>
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<tr>
<td>Joaquim OLIVEIRA MARTINS, Head, Regional Development Policy Division, Public Governance and Territorial Development, OECD</td>
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<tr>
<td>10h10-10h30</td>
<td>How can the SEEA Experimental Ecosystem Accounting Framework be Used for Growth Accounting and Productivity Analysis?</td>
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<td>Carl OBST, Lead technical expert for the FAO System of SEEA – Agriculture, Forestry and Fisheries; consultant to the joint United Nations Statistics Division, UNEP, and CBD project to advance the testing and guidance on ecosystem accounting</td>
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<td>10h30-10h50</td>
<td>How the FAO’s Capital Stock Database can be used for Productivity Analysis</td>
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<td>Sangita DUBEY, Senior Statistician, Statistics Division, FAO, Rome, Italy</td>
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<td>10h50-11h10</td>
<td>Capital as a Factor of Production in Agriculture: Measurement and Data</td>
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<td>Sheng YU, Senior economist, Australian Bureau of Agricultural and Resource Economics and Sciences (ABARES), Canberra, Australia</td>
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<td>11h10-11h30</td>
<td>Discussant: Robert G. CHAMBERS, Professor, Agricultural and Resource Economics, University of Maryland, United States</td>
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<td>11h30-12h15</td>
<td>General discussion</td>
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<td><strong>Session 2 (continued)</strong></td>
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<td>14h00-14h20</td>
<td>Valuation of Agricultural Land within the System of National Accounts</td>
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<td>Jennifer RIBARSKY, Head of Section, National Accounts Division, Statistics Directorate, OECD</td>
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<td>14h20-14h40</td>
<td>Methods of Calculating Land Input in TFP Calculations – The Case of India</td>
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<td>Nilabja GHOSH, Associate Professor, Institute of Economic Growth, University of Delhi, New Delhi, India</td>
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<td>14h40-15h00</td>
<td>Measuring and Valuing Operator (Holder) Labour Services in the AAFC Production Account for Canadian Agriculture</td>
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<td>Sean CAHILL, Senior Economist, Research and Analysis Directorate, Strategic Policy Branch, Agriculture and Agri-Food Canada, Ottawa, Canada.</td>
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<td>15h00-15h15</td>
<td>Discussant: Isabelle PIOT-LEPETIT, Senior Research Scientist, institut national de la recherche agronomique (INRA), Moisa/Supargo, Montpellier, France.</td>
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<td>15h15-15h45</td>
<td>General discussion</td>
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<td>– Coffee Break –</td>
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<td>16h00-18h00</td>
<td><strong>Session 3</strong></td>
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<td>METHODOLOGICAL ISSUES AND APPROACHES TO CALCULATE INTER-COUNTRY AGRICULTURAL TFP</td>
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<td>This session will discuss various methodological issues and approaches to calculate inter-country agricultural TFP. Due emphasis will be given to the feasibility of applying the growth accounting approach, which is the approach adopted by the OECD for calculating TFP for the whole economy.</td>
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<td>Moderator: Nick JOHNSTONE, Head, Structural Policy Division, Directorate for Science, Technology and Innovation, OECD</td>
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16h00-16h20  |  Market efficiency and Index Numbers: Is there a “Price” to Pay for Cross-country Productivity Comparison?  
Sheng YU, Senior economist, Australian Bureau of Agricultural and Resource Economics and Sciences (ABARES), Canberra, Australia

16h20-16h40  |  Measuring TFP in the EU28: Methodological and Data Challenges  
Koen MONDELAERS, Socio-Economic Analyst, D-G Agriculture and Rural Development, Unit E2, Agricultural Modelling and Outlook, European Commission, Brussels, Belgium

16h40-17h00  |  An Approach of Measuring TFP within European Agriculture  
Jean-Pierre BUTAULT, Directeur de recherche, INRA Nancy, France

17h00-17h15  |  Discussant:  
Sean CAHILL, Senior Economist, Research and Analysis Directorate, Strategic Policy Branch, Agriculture and Agri-Food Canada, Ottawa, Canada

17h15-18h00  |  General discussion

- End of the first day -
Tuesday, 15 December  
(OECD Conference Centre, Room CC 12)  

Session 4: 09h00-11h10  
Session 5: 11h10-15h40  
Session 6: 16h00-18h00

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<tr>
<td>09h00-11h10</td>
<td><strong>ASSESSING THE FEASIBILITY OF APPLYING THE GROWTH ACCOUNTING APPROACH TO CALCULATE INTER-COUNTRY AGRICULTURAL EATFP</strong></td>
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| 09h00-09h20  | Environmentally Adjusted Multifactor Productivity: Methodology and Empirical Results for OECD and G20 Countries  
Ivan HASCIC, Senior Economist, Environment Directorate, OECD |
| 09h20-09h40  | Thinking about Productivity Accounting in the Presence of By-products  
Robert G. CHAMBERS, Professor, Agricultural and Resource Economics, University of Maryland, United States |
| 09h40-10h00  | Green Productivity in Agriculture - A Critical Synthesis  
Timo KUOSMANEN, Professor, Aalto University School of Business, Helsinki, Finland |
| 10h00-10h15  | Coffee Break |
| 10h15-10h35  | Discussants:  
Tomasz KOZLUK, Senior economist, Economics Department and Environment Directorate, OECD  
Koen MONDELAERS, Socio-Economic Analyst, DG Agriculture and Rural Development, Unit E2, Agricultural Modelling and Outlook, European Commission, Brussels, Belgium |
| 10h35-11h10  | General discussion |

The key objective of this session is to assess the extent to which it would be possible to apply the growth accounting approach, that is, for which countries and for which environmental variables.

Moderator:  
Paul SCHREYER, Deputy Director, Statistics Directorate, OECD
### 11h10-15h40 : Session 5

**ACCOUNTING FOR ENVIRONMENTALLY-RELATED OUTPUTS AND INPUTS IN AGRICULTURAL TFP MEASUREMENT — DATA AND METHODOLOGICAL CHALLENGES**

The objective of this session is two-fold: i) To discuss the choice and availability of data of environmentally-related outputs and environmentally-related inputs which are deemed desirable to be included in calculating inter-country EATFP, including data sources and methodologies to calculate stocks and flows of nutrient balances; and ii) To discuss some methodological issues such as the nutrients balance approach which has been used in the literature to measure efficiency levels and analyse economic-environmental trade-offs for the agricultural sector in OECD countries.

**Moderator:** Chang-Gil KIM, Director, Korea Rural Economic Institute, Seoul, Korea; Chair, OECD Joint Working Party on Agriculture and Environment

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<tr>
<td>11h10-11h30</td>
<td><strong>Traditional and Environmental Agricultural Total Factor Productivity in OECD Countries</strong>&lt;br&gt;Vincent HOANG, Senior Lecturer, Queensland University of Technology, Business School, Economics and Finance, Brisbane, Australia</td>
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<td>11h30-11h50</td>
<td><strong>An Adjusted Measure of Agricultural TFP with GHG Emissions as a By-product of Agricultural Production</strong>&lt;br&gt;Alejandro NIN PRATT, Senior Research Fellow, Environment and Production Technology Division, International Food Policy Research Institute (IFPRI)</td>
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<td>11h50-12h10</td>
<td><strong>Modelling Cumulative Effects of Nutrient Surpluses in Agriculture: A Dynamic Approach to Material Balance Accounting</strong>&lt;br&gt;Timo KUOSMANEN, Professor, Aalto University School of Business, Helsinki, Finland</td>
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<td>12h10-12h20</td>
<td><strong>Discussant:</strong>&lt;br&gt;Julien HARDELIN, Agricultural Policy Analyst, Natural Resources and Policy Division, Trade and Agriculture Directorate, OECD</td>
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<td>12h20-12h50</td>
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| 14h00-14h20 | **Measuring Dynamic Eco-efficiency under the By-production of Undesirable Output**  
Alfons Oude LANSINK, Professor, Head of the Department of Business Economics, Wageningen University, and Scientific Director of the Wageningen Graduate School of Social Sciences |
| 14h20-14h40 | **Environmentally-adjusted total factor productivity: the case of carbon footprint - An application to Italian FADN farms**  
Silvia CODERONI, Research Fellow, Adjunct Professor of environmental economics, Department of Economics and Social Sciences, Università Politecnica delle Marche, Italy. |
| 14h40-15h00 | **Measurement of Environmentally Adjusted Agricultural Total Factor Productivity using the Malmquist-Luenberger Index in Korea**  
ChangGil KIM, Director, Korea Rural Economic Institute, Seoul, Korea; Chair, OECD Joint Working Party on Agriculture and Environment |
| 15h00-15h15 | **Discussant:**  
Raushan BOKUSHEVA, Senior Agricultural Policy Analyst, Policies in Trade and Agriculture Division, Trade and Agriculture Directorate, OECD |
| 15h15-15h40 | **General discussion** |
| 15h40-16h00 | – Coffee Break – |
| 16h00-18h00 | **ROUNDTABLE DISCUSSION – WHERE DO WE GO FROM HERE?** |

In this final session, a rapporteur will provide a summing-up of the key messages, and a panel of experts will be invited to provide concrete conclusions and suggestions on how to advance this work. Concluding comments will be made by the Moderator, particularly in connection with potential follow-up work within the OECD.

**Moderator:**  
Paul SCHREYER, Deputy Director, Statistics Directorate, OECD
<table>
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<th>Session</th>
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<tr>
<td>16h00-16h20</td>
<td>Rapporteur: Alison BURRELL, Agricultural economist and policy analyst</td>
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<td>16h20-16h50</td>
<td>Panel Discussion</td>
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<td>Robert G. CHAMBERS, Carl OBST, Sheng YU</td>
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<td>16h50-17h50</td>
<td>General discussion</td>
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<td>17h50-18h00</td>
<td>Concluding comments from the OECD Secretariat</td>
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- Closure of the Workshop -
# OECD EXPERT WORKSHOP

Measuring Environmentally Adjusted Agricultural Total Factor Productivity (EATFP) and its Determinants

OECD Headquarters, Paris
14-15 December 2015

## List of Participants

### Experts

<table>
<thead>
<tr>
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<th>Affiliation</th>
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