Session 2.6 Global Economics and Integrated Assessments

Oral Presentation

Title: **Dynamic economic model of arable crop rotation**

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Abstract: Rapid progress is being made in CRISPR and other forms of gene editing technology. The techniques are helping to reduce the cost of development of arable crops with traits to alleviate biotic and abiotic stresses, and to provide nutritional and other downstream benefits. The investment required to develop and obtain approval for new traits to be released into the environment remains substantial. An economic model has been developed to provide a decision support tool for assessing the return on investment in crops with novel traits, as part of a work package with the FP7 project 'Assessing and Monitoring the Impacts of Genetically modified plants on Agro-ecosystems' (AMIGA) (www.amigaproject.eu). The progress of a novel crop compared with an equivalent conventional crop is modelled in monthly time steps, with management decisions about application of controls (pesticide or herbicide for example) applied at each monthly step. The simulation extends over up to seven crop cycles, enabling simulation of the effect of crop rotation on soil condition, including decisions regarding use of tillage. In this paper, we report simulation of arable farm gross margin over typical crop rotations before and after inclusion of crops with novel traits as one or more of the crops in the rotation. The results include simulation of variation in crop stresses that may arise as a consequence of climate change.

Oral Presentation

Title: **Intensification and production reallocation: Attributing land-use changes to their underlying drivers**

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Abstract: Debates on bioenergy production emphasized the complex nature of land-use changes which put into play responses from the demand and supply-side based on price signals and biophysical potentials. Every change in agricultural production leads to mechanisms of intensification, production reallocation and changes in demand which usually refer to as indirect land-use changes (ILUC). These indirect effects have been estimated by many studies, however their mechanic has never been made completely explicit. Thus, to improve our understanding of land-use dynamic, the objective of this paper is to attribute as precisely as possible land-use changes to their underlying drivers. The following processes are considered: changes in yield due to (i) input use and to (ii) expansion on marginal lands, and changes of production allocation (iii) across countries and (iv) across sectors (between crop and livestock). This study provides first an analytic decomposition of land-use changes from a production shock that makes it possible to distinguish between land-use changes directly resulting from the production shock and those resulting from price-induced effects. A numerical analysis is then conducted using the global model of land-use NLU in the case of a biofuel scenario from rapeseed in France.