Global Agricultural Costing and Investment model

Yiorgos Vittis and Michael Obersteiner
School of Geography and the Environment, University of Oxford, Oxford, UK

Increasing competing demands for land, water and energy along with increasing world population call for strategies to minimise environmental impacts while producing adequate food for 9 billion people. Studies have highlighted trade-offs between yields, biodiversity and socioeconomic goals in alternative land management solutions that share or spare agricultural land, pointing out the necessity of demand-side adjustments to meet environmental and food security goals. On the contrary, research has demonstrated that agricultural intensification through sparing and sharing agricultural land at global scales has the capacity to close yield gaps, reduce land requirements and increase biodiversity. Here we address the fundamental question: Would agricultural systems produce adequate food under a land sharing and targeted sparing scenario at lower financial costs? Optimal allocation of agricultural production, based on biophysical constraints, enables increased efficiencies and thus, we hypothesize that production is going to be less costly at global scales. To address this question, a cost engineering method is employed using crop modelling and inventory data on 16 crops to assess financial implications of sharing and sparing production scenarios. Preliminary findings demonstrate that at national scales, where there are potentials for greater and more efficient food production, there is larger spatial aggregation of production systems and thus higher costs that relate to large inputs of nutrients required to close yield gaps. Further forthcoming research will allow the identification of financial balances at global scales and enable the present study to confirm that current production volumes can be maintained at lower financial and environmental costs.