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## The Impacts of Changing Paradigms for Coffee Production in an Integrated Modelling Framework

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### Abstract

Coffee production is shaped by its high climate sensitivity and the dominance of North-South trade for demand. Projections of future trends make deep changes of the paradigms of coffee production likely: On the supply side climate change will negatively affect major coffee producing countries like Brazil; increasing population and global income have been postulated to drive up demand.

Here, we integrate these paradigm shifts in the modelling framework Globiom to *ex-ante* analyse the impacts on the coffee sector. Three methodological gaps had to be addressed here. First, a global model of the impacts of climate change was used to estimate spatially explicit shifts on yield potential. A spatially disaggregated dataset of coffee production statistics was generated to calibrate Globiom and last, a demand scenario that projects increasing demand depending on population and GDP increases was developed.

We here show that by the 2050ies climate change may reduce the area available for coffee production by half and could reduce global yield potential by 20% on remaining area compared to historic climate. Total demand was projected to be increased 2.5-fold. However, market effects resulted in prices up to 58% higher than with historic climate, and a reduction of production by 5 million tons per year. Thus, climate change impacts may be equivalent to the size of the baseyear 2000 market volume. In addition, an increasing share of production will be met by low-quality Robusta coffee, rather than high-quality Arabica. We conclude that despite the drastic climate change impacts on the sensitive coffee shrub because of market effects there will be coffee on the table in 2050. But this coffee will be of lower quality, will cost more and it will still be the lab rat of sustainable enterprises because its production will still be shaped by poverty risk and environmental problems.

**Keywords:** Climate change, coffee, partial equilibrium