Global Agricultural Costing and Investment framework

Dr Yiorgos Vittis and Dr Michael Obersteiner
Introduction and summary of work
Agricultural activity and the continuous croplands expansion at global scales exert a wide range of pressures on natural ecosystems and is expected to continue with increasing world population and upscale demand.

The debate of land sharing versus land sparing has emerged as a strategy to assess balances between biodiversity conservation and high-yield agriculture.
We develop an *agricultural costing and investment framework* to understand cost functions and test the hypothesis that *agricultural production in land sharing and sparing scenarios* is less costly than in current practices at global scales.

Through a bottom-up approach we gather *physical and financial information* for agricultural systems from inventory data, scientific literature as well as data surveys and calculate costs of production across *three distinct scenarios, business as usual (BAU), land sparing (MLS) and land sharing (TCS)*.

Preliminary findings demonstrate that it would *cost approximately 40% less in MLS and TCS in comparison to BAU* to produce the same amount of food at a global scale.
Touch screen discussion part
Methodological approach

• We construct a cost engineering framework in line with the Farm Accountancy Data Network (FADN) and the Farm Business Survey (FBS) accounting methods.

• Cost functions are disaggregated in seven cost elements and are distinguished between variable and fixed costs:
  – Seeds
  – Fertiliser
  – Plant protection
  – Labour
  – Fuel and energy
  – Financing
  – Infrastructure
Data tools – Farm Business Survey

Welcome to the Farm Business Survey
The official source of farm income figures in England & Wales.

Farm Benchmarking
Compare your business to farms in the Farm Business Survey (FBS).

Projection Calculator
FBS projection calculator is the unique internet tool that allows users to calculate projected margins into the future.

Enterprise Gross Margins
England: Winter wheat (conventional)
Use these pages to compare your business to farms in the Farm Business Survey (FBS) with results for the year ending 2019.
We calculate *machinery expenses* for various crop commodities as a function of *soil hardness*, *machinery power* and *distance to markets*.
Assumptions

Average **field size** (per country) is related to production practices such as **technology adoption**.

Assumptions

Soil workability indicates tillage resistance and thus, relates to differentiation of machinery costs.

Downscaling national financial data

We use physical data to estimate production intensity (Intensification factor - *IF*) through input-output functions.

\[
IF = 0.25 \times \left( \frac{Y_{LDG}}{Y_{LDG}_{MAX\_CNTRY}} + \frac{Y_{LDG}}{Y_{LDG}_{ATT\_MAX\_CNTRY}} + \frac{F_{TN}}{F_{TN\_MAX}} + \frac{F_{TP}}{F_{TP\_MAX}} \right)
\]
Downscaling national data - IF
Downscaling national data - IF
Preliminary findings – Global Costs of production
Preliminary findings – Global Costs of production mapped
Preliminary findings – Supply Curves

$ per Tonne

Barley

Groundnut

Wheat

Maize

Soybean

Sunflower

Tonnes Produced
Preliminary cross validation – FAOSTAT

Wheat cost of production and Producers’ prices per country
Preliminary cross validation – FAOSTAT

Potatoes cost of production and Producers’ prices per country