

Tools – The SUPREMA model family

IFM-CAP

IFM-CAP is a comparative static positive mathematical programming model applied to each individual farm from the Farm Accountancy Data Network (FADN). The model allows for assessing a wide range of farm-specific policies while capturing the heterogeneity of EU commercial farms. Its main simulation outputs are land allocation, herd size, livestock density, share of arable land in utilised agricultural area (UAA), share of grassland in UAA, land use change, agricultural production, intermediate input use, CAP first and second pillar subsidies, intermediate input costs, variable costs, total costs, gross farm income, and net farm income, as well as biodiversity index and soil erosion.

IFM-CAP uses data from FADN, Farm Structure Survey (FSS), CAPRI database and Eurostat. The data are adjusted to the model format, the outliers and the missing values are addressed. Because some of the indicators such as, for example, unit input costs of crops, are not directly available in FADN, they are estimated using external data sources.

IFM-CAP is based on the assumption that farmers maximise their expected utility at given yields, product prices and CAP subsidies, subject to resource endowments (arable land, grassland and feed) and policy constraints. The farmers' expected utility is defined as expected income and the associated income variance with a constant absolute risk aversion specification. The expected income, in turn, includes direct payments, the accounting costs (costs of seeds, fertilisers, crop protection etc.) and total revenue, which is calculated using expected prices and yields. Model calibration follows positive mathematical programming approach, and estimates model parameters from an observed base-year situation. IFM-CAP is calibrated for the base year 2012 using cross-sectional analysis (i.e. multiple observations) and Highest Posterior Density approach with prior information on regional supply elasticities and dual values of resources (e.g. land rental prices) (the sources for this section are Blanco et al. 2019 and Louhichi et al. 2015).

Although IFM-CAP has been developed to analyse policy scenarios in a 'what if' manner, rather than to provide projections, it, nevertheless, can produce a baseline. In the model version, used for the current report, the growth rates of prices and yields of CAPRI 2030 baseline have been used. In particular, the growth rates of commodity and country specific farm gate prices and yields in 2030 relatively to the base year values of CAPRI entered IFM-CAP to imitate the changes by 2030. Since 2012 (Base year for IFM-CAP) was a particular year with price spikes in many agricultural commodities, the growth rates assumed for IFM-CAP were calculated using a three-year average (2011-2013) as a reference point.

References:

- Blanco, M., P. Martinez, P. Witzke, M. van Leeuwen, R. Jongeneel, P. Salamon, S. Frank, P. Havlík, J. Barreiro-Hurlé, M. L. Rau, H. van Meijl, A. Tabeau, J. P. Lesschen (2019). Deliverable 1.5: Documentation of the SUPREMA model tools. Project Support for Policy Relevant Modelling of Agriculture (SUPREMA). Online: <https://www.suprema-project.eu>.
- Louhichi, K., P. Ciaian, M. Espinosa, L. Colen, A. Perni, S. Gomez y Paloma (2015). An EU-Wide Individual Farm Model for Common Agricultural Policy Analysis (IFM-CAP). First application to Crop Diversification Policy. European Commission. Joint Research Centre. Online: https://publications.jrc.ec.europa.eu/repository/bitstream/JRC92574/jrcreport_jrc92574.pdf