5.3: REPORT ON DOWNSCALING OF CURRENT EU AND GLOBAL MODEL

Global or economy-wide events and EU policies sometimes affect individual decision making (IDM) directly but sometimes indirectly through market impacts. This is typically the case of climate change impacts which besides direct impacts on yields in a specific location may even more substantially affect the economics of the farm by changes in commodity prices induced by severe weather extremes in other parts of the world. Current EU/Global models contribute to the assessment of both the direct and indirect – market mediated – effects, which are ideally downscaled to the level necessary to interface with the IDM models. From the other hand indicators at certain geographic scales, thematic areas, or sectors are typically not covered by the new IDM models, e.g. global scales or contribution of agriculture to the number of jobs in rural areas. In this case, indicators from current models are used directly or downscaled, as proposed in past applications of MAGNET, CAPRI and GLOBIOM. The applied methods for spatial downscaling of sectoral result from the GLOBIOM model is outlined in chapter 2. The downscalR toolbox was used for downscaling global land use projections harmonized with crop and management system projections to SimU resolution. The toolbox – originally implemented for GLOBIOM LUC – is a statistical downscaling method, employed in several EU projects. It can provide consistent high-resolution projections. At the core of downscalR is an econometric high-resolution model, which relates observed land use change data to a set of driver variables. It is open-source and available as an easy-to use R package[1].

Two novel and critical updates were implemented for downscalR:

- First and foremost, the tool originally developed for land cover distribution was extended to downscale crop and management systems to the simulation unit grid.
- Second, downscalR was updated to contain functions for calculating possible gross transition when only level projections are given. This was essential to transform GLOBIOM crop and management levels given in the ACR_Compare parameter to gross transitions.

This improved downscaling is of particular relevance because it permits, for instance, identifying those regions most affected by policy or technology changes, for which further analyses at farm-level can be conducted. While the focus of the downscaling work within MINDSTEP was on the agricultural production sector, it is also important to take into account economic branches along the agricultural value-chain like input providing- and processing industries. In particular the latter plays a major role in shaping regional agricultural production patters, for example in the case of a sugar processing plant and the specialization of farmers in sugar-beet production in surrounding areas. The deliverable therefore also provides a conceptual overview on potential approaches to take such patterns also into account for spatial- or regional downscaling. In this case it is argued that further development of spatially explicitly supply chain optimization models, including land use models and minimizing food supply costs is crucial. In fact, ideally these models should be directly included in the macro-economic models for a bottom-up approach.

Finally this deliverable addresses the achievements regarding the usage of market responses of market models for the re-parametrization of farm-level models to create more plausible and consistent scenario set-ups and results. Linkages of the bio-economic farm model FarmDyn to the market models CAPRI, MAGNET, and GLOBIOM have been developed that permit establishing a chain of simulations by adjusting input and output prices. This requires also the specification of correspondences between different classifications for commodities and inputs and the definition of model input-output relations. These steps are outlined for the exemplary cases of FarmDyn and CAPRI.

[1] Source code available on GitHub: https://github.com/tkrisztin/downscalr

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