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Behavioural changes and lifestyles: the food driver

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The contents of our plates and the way we produce and distribute our food is a key driver for reducing global greenhouse gases emissions, preserving ecosystem services, solving nutrition-health problems (from under-nutrition to overweight and cardiovascular diseases), providing rural livelihood and opening new opportunities of biomass production for non-food uses (agrofuels, fibres, building materials, etc.). But the tradeoffs equation remains puzzling to solve, as the Cirad-Inra foresight study "Agrimonde" well illustrates it through two contrasted scenarios of food and agriculture in 2050 (Paillard, Treyer and Dorin, 2011). This foresight exercise gathered almost every month and during two years a panel of French experts from different fields and intuitions. Their views on the past and their many assumptions on the future where guided or checked by a simple biophysical model (Agribiom) that estimates and balances in kilocalories the consumptions, productions and trade of food biomass from a group of countries to the whole world.

In the baseline scenario called "Agrimonde GO" (AGO), inspired from the "Global Orchestration" scenario of the Millennium Ecosystem Assessment (2005), free trade and economic growth are high and reduce significantly poverty, which boosts everywhere the consumption of animal foodstuffs such as meat, milk and eggs. These foods, like the ones of plant origin, are produced at low cost by few large-scale agro-industries but with a high exposure to climate, epidemic and economic risks (soaring of oil prices or other)[1]. To meet the demand in AGO, the production of food plant has to increase by almost 85% from 2003 to 2050, mostly to feed humans and, above all, animals that will have to raise tremendously their production (+137%). The figure is not so far from the FAO projections (2009) which states that the overall food production will have to increase by 70% between 2006 and 2050. In AGO, significant differences in food availability per capita remain, as well as important wastage from the field to the plate, while the net trade between the six regions studied (OECD-1990, Latin America, Former Soviet Union, Middle East and North Africa, Sub-Saharan Africa, Asia) should increase by +325% to clear surpluses and fill in deficits if human migrations from a region to another remain low (medium variant projections of the United Nations, with 9 billions people in 2050). Yields increase significantly in AGO too, based on the assumption that inputs of the green revolution (irrigation, chemical fertilizers, pesticides) and biotechnologies will extend past progress in that field (+1.9%/year between 1961 and 2003, +1,2% between 2003 and 2050). But due to the large demand for food and feed, croplands should also increase by +0.4% per year (+0.3% between 1961 and 2003) and pastures by almost +0.2% (+0.25% between 1961 and 2003). Carbon emissions from land use changes should therefore also rise. Combined with the CO_2, N_2O and CH_4 emissions coming from transport and processing, husbandry, as well as the manufacture and use of industrial inputs (chemical fertilizers, agricultural machineries, etc.), this scenario should increase the already high greenhouse gases emissions from the food and agricultural sector. It should also accelerate the move of human populations from rural to urban areas.

[1] Such potential problems are not really anticipated in AGO scenario since it is believed that they can always be overcome once they become too acute.

The “Agrimonde 1” scenario (AG1) imagines a very different picture of the world in 2050. It tries to test and investigate further the ideas of “agro-ecology” or “ecological intensification” developed in France by M. Griffon (2006) as well as their call for a change of ethos in many other fields than agriculture. A key challenge of that world is to promote the diffusion of practices and technologies that enable agriculture to meet growing needs, to provide livelihood to numerous people in rural areas and to preserve ecosystem services. On the supply side, instead of input-dependent and ecologically simplified food production systems that are labour-saving (AGO), AG1 bets on a mosaic of complex high-productive agro-ecosystems (including trees) that save capital, inputs and water by exploiting the best local biological synergies (Altieri, 1999) that can be found (with modern science and local know-how) amongst numerous plant and animal species, above and below the ground. Since the worldwide development of such agro-ecosystems calls for deep reforms in many areas, it has been assumed that regional AG1 yields in 2050 won’t be much above those observed in the early 2000s (+0.1% per year between 2003 and 2050 at the global level). Cropland (assumed to be much richer in carbon and biodiversity than today) should therefore be extended (+0.7% per year between 2003 and 2050) to the detriment of pasture (–0.3% per year) in order to meet the food demand of 9 billions people in 2050. However, this demand should be much lower than in AGO while it should solve both under- and over-nutrition. For 2050, it has indeed been assumed that the daily per capita availability of food would be everywhere equal to 3000 kcal, with 500 kcal of animal origins (the world average in the early 2000s). Such move will lead to sharp decreases in regions such as OCDE (4000 kcal today, with 1200 kcal of animal origin) where present huge wastage of food will be avoided, and the consumption of food plants rich in proteins, fibres, vitamins and minerals will be encouraged. It will also lead to sharp increases in regions such as Sub-Saharan Africa (less than 2400 kcal in 2003, with less 150 kcal of animal origin). All in all, in AG1, the caloric production of food plants has to increase by less than +30% from 2003 to 2050, partly to feed animals whose increase in production will be rather modest (+21% compared to +137% in AGO). This scenario should therefore be much more virtuous than AGO regarding resilience (to climatic or economic shocks), conservation (of soil, water and biodiversity) and greenhouse gases emissions, except for intercontinental transports linked to the net trade between regions. In AG1, the latter should indeed increase by +740% (+325% in AGO) if food move instead of people for clearing surpluses (OECD, Former Soviet Union, Latin America) and filling in deficits (Asia, Africa and Middle East) …unless agro-ecological yields in deficit regions are much higher than what was assumed, which would then open large opportunities for surplus regions (fertile land-abundant areas with rather low population pressure) to produce large quantities of non-food biomass such as agrofuels, fibres and building materials. The latter movement is certainly not the current trend, for economic and political reasons that need to be better modelled and understood.

References

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