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Reaching the Farm to Fork objectives and beyond: Impacts of an agroecological Europe on land use, trade and global food security

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The joint publication in May 2020 of the Farm to Fork (F2F) and Biodiversity strategies, part of the European Green Deal, paved the road for an ambitious and systemic transition of the EU food system. The strategies set ambitious and unquestionable targets that have to be reached by 2030 if we are to keep our food system within planetary boundaries. Since their publication, however, the strategies have been under criticism from most economic actors, according to whom their implementation would lead EU farmers and food processors to be crushed by their competitors and put world food security at risk. Yet, the only impact assessment currently available is the one published in December 2020 by the Economic Research Service (ERS) of the United States Department of Agriculture (USDA)[1]–which suffers from several methodological flaws. In particular, it focuses on the consequences of implementing new constraints on production without considering the changes in demand that would result from the strategies' other objectives.

Against this backdrop, this *Policy Brief* presents the key results of a study that analysed the implications of an ambitious agroecological[2] transition across Europe, following the TYFA scenario.[3] While this scenario was published three years ago, what it proposes by 2050 is fully aligned with the objectives that the strategies aim to achieve by 2030, in particular regarding the decrease in pesticides, nitrogen, and antibiotics on the supply side, and the transition towards more plant-based diets on the demand side. Using a world biomass balance model (GlobAgri-AgT[4]), the impact of the TYFA scenario in the EU on world land use, the EU physical trade balance, the provision of calories and global food security was analyzed in addition to key policy levers to spur the transition.

1 Beckman, J., Ivanic, M., Jelliffe, J. L., Baquedano, F. G., & Scott, S. G. (2020). Economic and Food Security Impacts of Agricultural Input Reduction Under the European Union Green Deal's Farm to Fork and Biodiversity Strategies (No. 1473-2020-1039).

2 We define agroecology as the combination of the principles of organic agriculture with the redeployment of natural grasslands and the extension of agroecological infrastructures (hedges, trees, ponds and stony habitats)

3 Poux, X., & Aubert, P. M. (2018). An agroecological Europe in 2050: multifunctional agriculture for healthy eating. Findings from the Ten Years For Agroecology (TYFA) modelling exercise, Iddri-AScA, Study, (09/18).

4 Le Mouël C, de Lattre-Gasquet M, Mora O editors. Land Use and Food Security in 2050: A Narrow Road. Agrimonde-Terra. Quae Edition; 2018.

KEY MESSAGES

Because of the reduction in the consumption of animal protein and the relocation of plant protein production, an agroecological EU outperforms today's system in providing nutrients/calories to the rest of the world, and becomes a net exporter of calories by 12% of what it consumes. Indeed, while today the EU is a major exporter in value terms thanks to high value commodities (ex. spirits, wine, cheese, cigarettes and other high processed commodities) that are not part and parcel of global food security, it is a net importer of calories and proteins by11% and 26% of what it consumes, respectively.

No sustainable agroecological transition can happen in the EU without strong policies that:

- Support a great dietary transition towards healthier and less calorie-dense diets with less animal and ultra-processed food products;
- Maintain EU price and non-price competitiveness in the domestic and foreign markets through agronomic research, a better coordination between actors and a market segmentation for EU "ecologically intensive" agricultural commodities;
- Change current market conditions to improve EU protein autonomy through the reintegration of legumes in rotations.

POLICYBRIEF

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1. THE EU NO LONGER FEEDS THE WORLD

Claims that the EU is "feeding the world" with its agricultural exports are no longer tenable, even if they held some truth in the past. Today, the EU is a net importer of calories, it has lost much of its market share when dealing with quantities and remains a major agro-exporter mostly for high-value commodities which little relate to food availability and security.

In the last thirty years, the EU position changed in the world markets. The EU shifted from being a key player in the world agricultural supply to a new situation where this role is shared with traditional players, such as the USA, and new emerging countries showing particularly high potential for agriculture (Brazil, Argentina, Malaysia, Indonesia, Ukraine, etc.). Despite the increase of agricultural production and exports in absolute quantities, EU production and market share stagnated or declined for almost every main exported commodity, meaning that the rest of the world grew at a faster pace. At the same time, after the Uruguay Round (1986-1994), a movement of specialisation took place in Southeast Asia and Latin America. Favoured by greater trade liberalization, the emerging countries in these regions consolidated their position or entered massively in the market of vegetable oils, soya, sugar and poultry meat.

Despite the decline of production and export shares when dealing with quantities, today, the EU is with the USA the main agro-exporting region when considering value. However, of the top-10 exported products, contributing to 44% of total exported value, most are "premium commodities" (ex. spirits, wine, cheese, cigarettes and other high processed commodities) which are bought by wealthy consumers in countries such as Japan, USA, China or Russia. They therefore contribute economically to the EU, but not to global nutritional needs. In addition, in terms of calories, EU is a net importer because of vegetable proteins imports used as feedstuff. Taking its origin in the post-war trade deals between the EU and the USA (Dillon Round), this dependence continues today as a result of unprofitable economic margins for EU growers producing non-genetically modified soybeans and an unsuitable climate in Northern Europe. This unfavourable situation also prevents the EU from closing the nitrogen cycle at a fine territorial level through the (re)integration of legumes in crop rotations.

2. THE AGROECOLOGICAL TRANSITION IN THE EU TO BETTER CONTRIBUTE TO GLOBAL FOOD SECURITY

By way of contrast, our simulation shows that, from a strictly physical point of view, an agroecological EU (Box 1 for a concise description of TYFA scenario) could improve its contribution to the provision of calories and proteins to world market, irrespective of what would happen in the rest of the world—while at the same time restoring biodiversity and natural resources, and greatly reducing GHG emissions from agriculture. This contradicts the recent USDA-ERS assessment regarding the impact of the European Farm to Fork and Biodiversity Strategies on food security[5] and the vision of many stakeholders such as farmer federations[6] and policymakers.[7]

This result is a direct consequence of two key hypotheses of the scenario that would require significant policy changes to happen (see next section): a reduction of the total amount of calories consumed (in particular calories coming from animal products) and a relocation of vegetal protein production accompanied with a move away from soybean imports. Under the TYFA scenario, the EU can thus feed its own population without expanding its use of agricultural land. While the areas destined to crops such as fruits and vegetables, coarse grains, soybeans and pulses increase substantially, they decline for other crops (wheat, oilseeds).

In terms of trade, while in the EU the share of production oriented to satisfy the domestic market decreases with dietary changes, the exported quantities grow. By 2050, the EU could maintain a similar level of exported commodities as in the business-as-usual scenario. However, this implies a considerable upsurge of absolute exported quantities compared to the initial situation, as the world market size increases in 2050 due to population growth and gradual changing diets in developing countries. Furthermore, because of a lower consumption level and the internalisation of soya production, the EU drastically reduces its imports. Therefore, the EU shifts from being a net importer to being a net exporter of agricultural goods (in calories). However, the EU remains with a marginal role in ensuring the global provision of calories. The share of EU exports is never comparable to the one of Brazil/Argentina or Canada/USA, which remain top exporting regions regardless of the scenario.

Another key result of our study is that the EU agroecological transition does not depend upon the different pathways taken by the rest of the world. The main difference between a scenario combining an agroecological transition in the EU with a business-as-usual scenario for the rest of the world (ALONE scenario) and another one in which the rest of the world also follows an agroecological transition and healthier food regimes (TOGETHER scenario) is not the EU land use or the aggregate trade balance, but the composition of the EU exported baskets. Since the rest of the world demand differs between these two simulations, in the first scenario the EU exports relatively more animal products, sugar and wheat, while in the second, the EU exports relatively more coarse grains, pulses, fruits and vegetables.

As far as the rest of the world is concerned, it is also only slightly influenced by the EU agricultural transformations, even

5 Beckman, J., Ivanic, M., Jelliffe, J. L., Baquedano, F. G., & Scott, S. G. (2020). Economic and Food Security Impacts of Agricultural Input Reduction Under the European Union Green Deal's Farm to Fork and Biodiversity Strategies (No. 1473-2020-1039).

6 Coordination rurale (2020). Lettre ouverte aux décideurs français et européens : quelles sont les prospectives de la nouvelle PAC ?

7 https://www.politico.eu/article/epic-battle-over-green-organic-sustainable-farming-divides-eu-departments-green-deal/

if disruptive. For example, in the ALONE scenario, the world agricultural production and land use remain at almost the same level as in the business-as-usual scenario, while exports decrease especially in the oilseed exporting regions because of the reduced EU demand of imported products. Indeed, countries in South and North America and South-Est Asia are the most impacted by the EU changes. Since the EU drastically decreases its imports of soya and other oilseed products, these countries, which are the main exporters of these commodities, reduce their exports relatively to the business-as-usual scenario. However, because of increased world population in developing countries and of the westernization of diets, this level remains similar or even higher than today for products such as soybeans and palm oil showing the rather limited role of the EU in shaping the future of the world agricultural trade patterns.

2. A PLAN FOR THE EU AGROECOLOGICAL TRANSITION

While the agroecological transition is biophysically possible in the EU without expanding the agricultural lands and, at the same time, maintaining or even increasing EU market share, its implementation requires ambitious policy, economic and societal changes. More in detail, policies are needed in order to support a dietary transition towards healthier and less rich food regimes, maintain EU price and non-price competitiveness in the domestic and foreign markets and improve EU protein autonomy.

Changing the current food regimes based on an energy-rich diet with animal products and ultra-processed food commodities (NOVA classification[8]) is a key element for the EU agroecological transition (and from a public health perspective). Only with a vigorous shift in human diets,[9] growers, collectors and manufactures will be ready to accept the challenge and change the existing agricultural production systems. A sign from demand is also needed in order to encourage policymakers to support such a transition with vigorous policy measures which today are often not taken since the risk of losing political consensus is too high. More in detail, promoting the ambitious changes in food regimes envisaged by the TYFA scenario requires a combination of two different kinds of policies: measures to make an agroecological diet appealing to consumers through information and social marketing and government interventions to change the market environment. The nutritional and environmental labelling, the reinforcement of origin indications and the launch of public education campaigns are measures belonging to the first group. Their main asset is the relative simplicity of their implementation, but they risk having a limited effect on influencing the consumer behaviour[10], especially if they are poorly targeted and not participative. The second group of policies includes subsidies or tax differentiation to food products, regulation of food provision in schools and in workplaces and advertising control in specific media or at certain hours. While these policies could have a greater impact than the ones belonging to the first group, they are also those that arouse the most political opposition as they might be perceived by citizens as an illegitimate limitation of their freedom of choice and could potentially threaten the economic and financial interests of a certain number of actors in the agro-food sector.

A key element for the success of the TYFA scenario is also to maintain EU price and non-price competitiveness. In a current situation already characterized by a decline of EU competitiveness[11] and a considerable price differential between local and imported feedstuff, the EU could implement an agroecological production system and find itself unable to export its high environmental value products because they are perceived as too expensive by the world consumers. At the same time, the EU could be overwhelmed by cheaper imports coming from regions having lower environmental and GHG emissions standards. This means that the EU should promote agronomic research to increase organic crop yields and reduce their annual variation. The EU should also invest in developing technical references adapted to the pedoclimatic conditions for diversification crops such as course cereals or legumes and for a wider range of varieties inside the same species to enhance intra-crop diversity. Investments are also needed in order to build new storage structures (smaller and more versatile) adapted to the new diversification crops and in sorting equipment to improve the harvest efficiency of crop associations. The EU should also achieve a better coordination between growers, collectors and transformers and segment the market with the help of geographical indications and environmental labelling in order to make the foreign and domestic consumers pay a higher price for EU "ecologically intensive" food products.

Without an effective segmentation in the domestic market, the legislator could impose an artificial one through an increase of tax and tariffs on imported commodities whose methods of production do not comply with the EU environmental standards. This change in trade policies appears particularly important in the sector of protein crops. All model simulations based on the TYFA scenario rely on a golden rule regarding the ban of imported soya in the EU: this aspect becomes compulsory in order to phase out synthetic fertilisers responsible for high greenhouse gas emissions and closing the nitrogen cycle at the finest territorial level. Besides, achieving a better protein autonomy through a domestic production of soybeans and more generally of legumes

8 Monteiro, C. A., Cannon, G., Levy, R. B., Moubarac, J. C., Louzada, M. L., Rauber, F., ... & Jaime, P. C. (2019). Ultra-processed foods: what they are and how to identify them. *Public health nutrition,* 22(5), 936-941.

9 In the TYFA report (Poux and Aubert, 2018), the human intake has been estimated at around 2,400 kcal/person/day, while today it is around 2,600 kcal/person/day (EFSA, 2017). In the TYFA scenario, the food waste is also reduced by 10%

10 Capacci, S., Mazzocchi, M., Shankar, B., Brambila Macias, J., Verbeke, W., Pérez-Cueto, F. J., ... & Saba, A. (2012). Policies to promote healthy eating in Europe: a structured review of policies and their effectiveness. Nutrition reviews, 70(3), 188-200.

11 Wijnands, J. H., & Verhoog, A. D. (2016). Competitiveness of the EU food industry: ex-post assessmentof trade performance embedded in international economic theory (No. 2016-018). LEI Wageningen UR.

is in line with the objectives of an increased protein sovereignty declared by various governments at the EU level.[12] However, under constant market conditions, a boost of the protein crops sector is difficult to take place. For good environmental reasons, EU farmers are subject to more rigid environmental conditions than farmers in other regions of the world (ex. genetically modified soybeans) and are not allowed to produce crops which are legal to import. Indeed, a period of temporary protection from international competitiveness seems necessary in order to allow a sort of «import substitution industrialization». During this period, the actors in the EU vegetable protein industry could focus on testing innovations, explore new production possibilities and achieve economies of scale. Given the ecological interest of protein crops and legumes specifically, a subsidy policy through the CAP aids could also be effective. For example, the development of agri-environment-climate measures favouring an increase in the share of legumes in rotation can be a solution. Increasing the current first pillar coupled subsidy scheme in favour of legumes should also be considered. Imposing such a policy to EU commercial partners would be a historical overturn of EU negotiating position since the Dillon Round (1960-1961) and without a change in World Trade Organisation (WTO) regulations, it will certainly be challenged. There is also the risk that foreign countries may trigger strong reactions reducing EU premium exports (liquors, wine, cheese, high value food preparations) in consolidated markets (ex. USA) or emerging ones (ex. Brazil). Since in a regime of "artificial segmentation" imports are limited while the domestic production is submitted to high environmental standards, another consequence of such a policy could be the increase of food expenditures for households because of higher prices for staple commodities. If some of them are ready to accept these changes or have the means to adapt, the more modest households could risk finding themselves in a position of increased food insecurity. For this reason, policies such as food stamps directed to reduce the negative impact of higher prices on these people will probably be necessary.

12 https://www.reuters.com/article/us-france-agriculture-idUSKBN28B5I6

BOX 1: THE TYFA SCENARIO

The TYFA scenario abandons pesticides and synthetic fertilizers, phases-out bioenergy crops and vegetable proteins imports, increases the share of legume crops in rotations, redeploys natural grasslands and extends agroecological infrastructures (hedges, trees, ponds, stony habitats) in Europe (EU-27). It also envisages the generalization of healthier and more balanced diets based on nutritional recommendations. This scenario reduces agricultural sector greenhouse gas emissions, limits feed/food competition, stops imported deforestation, restores biodiversity and protects natural resources (soil life, water quality, more complex trophic chains).

BOX 2: THE GLOBAGRI-AGT PLATFORM

Simulations of the TYFA scenario in the EU under contrasting contexts in the rest of the world are carried out using the GlobAgri platform developed by CIRAD and INRA and the GlobAgri-AgT model[4] specifically customised for the Agrimonde-Terra Foresight. GlobAgri is based on FAOSTAT Commodity Balances. GlobAgri-AgT includes 38 aggregates of agri-food products and covers 14 world regions. The reference year is the 2007-2009 average, and the simulation horizon is 2050. Biomass balance models provide a resource-utilization balance equation for each region and each agri-food product. Facing changing utilization, the model works to balancing resources. GlobAgri-AgT considers a maximum cultivable area for each region. When in one region the cultivated land area cannot expand because the maximum cultivable area is reached, as there is no price mechanism in the model, the new equilibrium is reached through trade adjustment.

In this study, we coupled TYFA hypothesis for the EU with two contrasting pathways of evolution for the rest of the world borrowed from Agrimonde-Terra foresight (Metropolization_Ultrap and Healthy_AE) to end up with the ALONE and TOGETHER scenarios. Then, we compared the results of ALONE and TOGETHER with the findings of the original Metropolization_Ultrap scenario, which we use as a business-as-usual scenario for 2050. A sensitivity analysis for the hypothesis of changing diets in the EU has also been simulated (ALONE_UltrapEU scenario). It will be discussed in more detail in the full report.

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