Impact Assessment Study on EC 2030 Green Deal Targets for Sustainable Food Production

Effects of Farm to Fork and Biodiversity Strategy 2030 at farm, national and EU level

Authors: Johan Bremmer, Ana Gonzalez-Martinez, Roel Jongeneel, Hilfred Huiting, Rob Stokkers

Executive summary

1. Introduction

As part of its Green Deal Roadmap, the EU Commission has launched the Farm to Fork (F2F) and Biodiversity (BD) Strategies to cope with the environmental and climate challenges. Currently it is still uncertain what the implications of the proposed targets could be for EU agriculture and the food system. However, explorations into the potential consequences are vital for both policymakers and stakeholders to have an informed debate on the future food production in the EU.

CropLife Europe, along with CropLife International as well as several agri-food chain stakeholders commissioned a study executed by Wageningen Economic Research to assess the potential impacts of five key targets of the F2F and BD strategies. The study focuses on the impacts on a selected number of annual crops (wheat, rapeseed, maize, sugar beet and tomatoes) and perennial crops (apples, olives, grapes, citrus and hops).

In the study four scenarios have been developed in which the following objectives of the Green Deal are combined:

Scenario 1: 50% reduction in the overall use and risks of pesticides and a 50% reduction in the use of more hazardous pesticides

Scenario 2: 50% reduction in nutrient losses and a 20% reduction in the use of fertilizers

Scenario 3: at least 25% of the agricultural land under organic production

Scenario 4: objectives of scenarios 1 and 2 combined with the objective to place at least 10% of the agricultural land under high-diversity landscape features. In this scenario we have not included the effect of the increase of organic production to 25% of the agricultural area.

2. Main results

According to the assessment at macro level, the implementation of the objectives of the Farm to Fork and Biodiversity Strategies will result in a decrease of the produced volumes per crop in the entire EU on average ranging from 10 to 20% (scenario 4). The production volume can decline up to 30% for some crops such as apples, but there are also crops of which the production hardly suffers as a result of the F2F strategy such as sugar beets. The produced volume of perennial crops will decline more than that of annual crops. Prices of products such as wine, olives and hops will increase. By consequence,

international trade will change significantly: EU exports were found to decline and EU imports will increase (the volume of the import of products can double).

The implementation of the objective to increase the area under organic production to 25% will result in a production decline of less than 10% and go together with a price increase of just under 13%. Increasing the area under organic production could contribute to the reduction of the overall use and risk of pesticides and the reduction of nutrient losses, given that the use and risk of pesticides in organic production measured by the Harmonized Risk Indicator I would be lower than in conventional production. For annual crops this is indeed the case, but our findings suggest that for some perennial crops the opposite is true. In such cases, there would be a lack of an incentive to shift to organic production from a sustainability point of view.

Table 1 Overview of expected economic impacts related to the achievement of the targets

Scenario	Production & prices	Trade	Indirect Land Use Change	Negative impact on the value of production
1 – Reduction pesticide use	Limited production and price impacts (maize, sugar beet and hops) Large price changes for others (wine, olives and hops) Limited price increases for wheat (2%), with larger declines in production (-7%)	Increases in net imports (maize, rapeseed and citrus) Declines in net exports (tomatoes, olives, wine and hops)	ILUC 1: 0.8 million ha ILUC2: 1.8 million ha	Almost EUR 6 billion
2 – Reduction fertiliser use	Production declines below 15% Price increases below 20%	Increases in net imports (maize, rapeseed and citrus) Declines in net exports (tomatoes, apples, olives, wine and hops)	ILUC 1: 2 million ha ILUC2: 2.7 million ha	Almost EUR 8 billion
3 – Expansion of organic area	Production declines are below 10% in most cases Price increases below 13%	Increases in net imports (maize, rapeseed and citrus) Increases in net exports (hops)	ILUC 1: 0.5 million ha ILUC2: 1.6 million ha	Around EUR 3.4 billion
4 – Combined targets 1 and 2 + 10% set aside	Production declines of 0 - 30% per crop Large price increases (olives, wine and hops) Limited price increases for wheat (3%), with larger declines in production (-18%)	Increases in net imports (maize, rapeseed and citrus) Declines in net exports (olives, wine and hops)	ILUC 1: 2.5 million ha ILUC2: 4.4 million ha	At least EUR 12 billion

Source: Authors.

3. Other findings

- The objectives to reduce the risk and use of pesticides by 50% and to reduce nutrient losses (50%) have significant impacts on yield levels. Estimated yield losses per case study vary:
    - From 0 to 30% in scenario 1 (reduction of pesticide use and risk)
    - From 2 to 25% in scenario 2 (reduction of fertilizer use)

  - From 7 to 50% in scenario 4 (objectives of scenario 1 and 2, and 10% of the agricultural land under high-diversity landscape features)
- The estimated yield level of organic production is 7% to 54% lower compared to conventional production presented in the reference scenario.
- Impacts of F2F-objectives for permanent crops such as grapes, apples, olives, citrus fruits are found to be higher than for annual crops such as oilseed, rapeseed, wheat, maize and sugar beets. This is due to the fact that for permanent crops there are less options available to reduce the negative impacts of the implementing the reduction targets than is the case for annual crops.
- While yield impacts (at market level) for arable crops are comparable to those of JRC study, our study shows that yield loss impacts for perennial crops tend to be higher than those of the JRC study.
- The potential impacts on quality are not taken into consideration by other studies, nevertheless we have included this analysis due to their impacts on the destination of the product and farm revenues.
- The decline in yields negatively affect production and generates a decrease of supply in the EU home market, which induces increases in commodity prices.
- The impacts on EU trade are significant and in percentage terms larger than the shocks to production. The general pattern is that EU imports (e.g. maize, rapeseed) substantially increase, whereas EU exports (e.g. wheat, olives, wine) decrease.
- The estimated indirect land use change virtual area effect of the assessed crops is 2.5 (related to additional import) and 4.4 (related to reduced EU export) million ha (conditional on unchanged EU crop demands for food and feed).
- The income of farmers is likely to suffer since revenues tend to decline, probably at a faster pace than cost declines would typically happen.

4. Recommendations

On the basis of the results the following recommendations are presented:

1. To help reduce/overcome the negative impacts of reduction of pesticides and nutrients, especially for permanent crops, there is an increased need for innovations in crop protection techniques, such as biocontrol, breeding, precision agriculture, biostimulants and other techniques that contribute to the resilience of crop production against pests, weeds and diseases. Removing legislative barriers to new breeding techniques, in order to shorten the breeding process significantly could help. This will contribute to making crop production more sustainable in the mid-term for annual crops and in the long term for permanent crops, while reducing the negative impacts on yield and quality of products.

2. Consider the pros and cons of the use of the Harmonised Risk Indicator to measure the reduction of pesticide use and risk, since this measure is susceptible for decisions to change the category of an active substance.

3. In addition to market challenges, the objectives to reduce pesticide use and nutrient emissions could be perceived as a disincentive to shift to organic production. This was found to be the case for permanent crops, which made use of copper-based active substances. Moreover, expanding organic production may face market constraints (e.g. insufficient demand growth) that could erode the current price premium for organic products and therewith their attractiveness/profitability: a price premium is needed to cover additional costs per unit of product. These aspects need further research.

4. The European Union, the MSs and private stakeholders should take into account the following potential trade-offs and combine efforts to develop mitigation strategies:
   a. F2F/BD create a competitive disadvantage relative to EU imports (raises a level playing field issue, causing an increase in trade dependency),
   b. indirect land-use effects (close to 7 million ha),
   c. a likely farm income loss and
   d. a reduced EU contribution to 'zero-hunger' SDG.

5. Methods

The study consisted of two phases: In first phase of the study, we have investigated the potential consequences of each of the scenarios at farm level. For this 7 case countries and 10 case crops have been selected, which we have combined into 25 case studies, consisting of a crop – country combinations. Each case study has been executed by local experts filling in a detailed questionnaire capturing the responses of farmers to cope with the proposed reduction targets. This implies that in the scenarios the spraying schemes and fertilizer use have been adjusted in such a way that the farmer complies with the objectives reducing the negative impacts as much as possible. The impacts at farm level for each of the four scenarios have been assessed for a 'typical' farm in the region and have been measured relative to a baseline situation. The main parameters assessed are the level of yield and quality loss of the products. The experts have been provided by the authors with the necessary background information about the policy scenarios and reported their results with accompanying information to better understand the optimized farmer responses to the policy shocks.

In the second phase of the study, the results of the case studies have been used to explore the consequences at macro level, by extrapolating the results from the case studies to all EU member states Subsequently the AGMEMOD model, a partial equilibrium model comprising key agricultural sectors, with a representation of EU policy and Member State level detail and some targeted equilibrium displacement (EDM) models have been applied to calculate the market impacts (e.g. new balance in produced volume for each of the case crops, the corresponding adjusted price level, and the net effects on trade). The adjusted price level is a response to changes in the volume of production as well as changes in the quality level of the considered crop products. The consequences of the changes lead to an overall reduction on the price and the availability of the product. Furthermore we have calculated the indirect land use change, namely the additional area that will be required elsewhere in the world to compensate for the reduced production volume in the EU.

A unique feature of this study is the data collection at farm level, which allowed the researchers to assess the farmer responses at a very detailed and practical level, which cannot easily be captured in a similar way by other model studies. The assessment also addressed the potential quality impact of the EU policy objectives on crops, with consequences for their potential use and the prices farmers receive. So far, such impacts pertaining to the quality of the crops have not been addressed in any other study.

The study also faces limitations, namely that it focuses on crop production, leaving out of scope the potential impacts of the EU F2F and BD strategies on the animal production sector as well as consumer behaviour (changing diets, reduction of food waste). As a consequence our results may overestimate the trade and indirect land use impacts. Moreover, as the focus of the modelling tools used was on the EU, the world market responsiveness to the EU policy interferences may have been underestimated.