POLICY BRIEF
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GOVERNMENT'S ANALYSIS, ASSESSMENT AND RESEARCH ACTIVITIES

Perspectives into topical issues in society and ways to support political decision making

# A controlled dietary change could produce climate benefits, improve nutrition and maintain Finnish agriculture

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## Dietary change as part of a sustainable food system

Dietary change has been promoted in climate policy discussions as one of the possible means to reduce climate impacts from the agri-food sector. The FoodMinimum project examined how a large-scale dietary change would impact the climate, the intake of nutrients and the agri-food sector and evaluated policy means that could support the change.

A diet that is climate-friendly and follows the nutrition recommendations can be achieved in a number of ways. However, all of them require a clear reduction in meat consumption. In addition, in the case of diets containing products of animal origin, determined efforts are required to maintain and increase carbon stocks in agricultural land. A climate-friendly dietary change would revolutionise the agri-food industry, but the value of production could be kept at the current level. A controlled change would require new value chains and investments. Public-sector steering could support the change with strong strategic objectives and combinations of economic and informational policy measures.

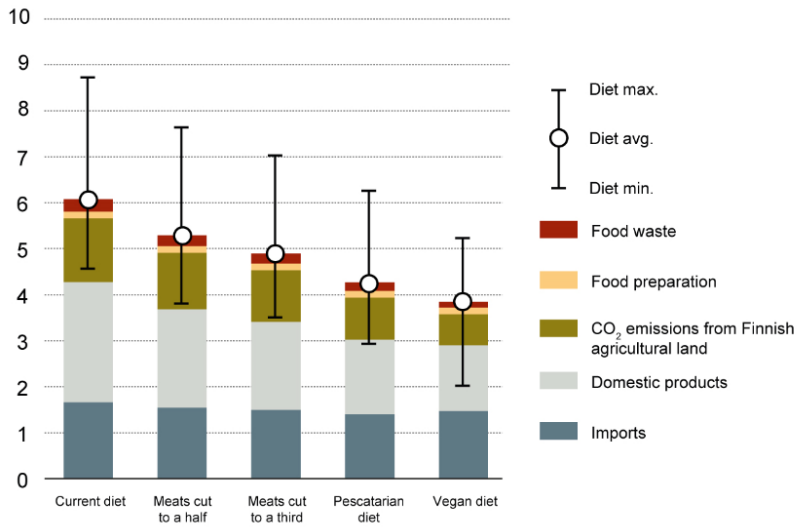


*Figure 1. Climate impact of the diets reviewed with ranges, kg CO2e per day.*

## New instruments are needed to achieve the climate goals

Finland and other EU Member States have committed to cut emissions in the EU by at least 40% below the levels of 1990 by 2030. Finland has also committed to reduce its emissions by 80-95% from the levels of 1990s by 2050 in accordance with the EU low-carbon roadmap.

Agriculture is part of the 'effort-sharing sector', for which the emissions reduction target is 39% below the levels of 2005 by 2030. Emissions from changes in carbon stocks in agricultural soil and biomass belong to the land use, land-use change and forestry (LULUCF) sector. For the purposes of the Paris Agreement, the EU has agreed on a target according to which LULUCF-sector emissions in a Member State may not exceed the calculated removals. The significance of agricultural land in the achievement of this target will be great because agricultural land is one of the major sources of emissions in the sector and because the use of forest sinks has been limited in LULUCF accounting.

Finland's Medium-term Climate Change Policy Plan examines means in which to achieve the emissions targets in the effort-sharing sector. The role of consumption in the reduction of food-related emissions has been highlighted as opportunities to reduce agricultural emissions through instruments targeting production or technology are limited. The FoodMinimum project examined how a large-scale dietary change would impact the climate, the intake of nutrients and the agri-food sector and evaluated instruments that could support the change.

### The FoodMin dietary model combines environmental and nutritional aspects

In the project, the climate impacts and eutrophication potential of different diets were analysed by using the FoodMin dietary model[1], which combines a life-cycle analysis of environmental impacts and a review of nutrient contents. Here, 'diet' refers to all food products consumed by an individual. In addition to production-related environmental effects, the environmental impacts of a diet can also be affected by activities and phenomena that occur post-production but before the products are consumed, such as food preparation and food waste. The project also examined how a decrease in carbon stocks in agricultural land and related mitigation measures would affect the climate impacts of different diets.

## Nutrient intake needs to be considered when planning a dietary change

The premise of the project was that the modified diets must comply with the national nutrient intake recommendations and that environmental impacts of each diet can be reduced by modifying the diet's product selection. A total of four alternative diets were formed: meats cut to a half, meats cut to a third, pescatarian, and vegan (Figure 1). In each diet, the nutrient

[1]The FoodMin dietary model combines a life-cycle analysis of the environmental impacts of the foods in a diet and a review of consumer waste, CO2 emissions from domestic agricultural land used for food production, and emissions from food preparation into an overall assessment of the environmental impacts of the diet. The model also evaluates the nutritional quality of the diet by comparing the intake of nutrients against the national nutrition recommendations. The research materials and the structure of the model are described in detail in the project end report (in Finnish).

intake complied with the recommendations with minor exceptions, such as the intake of vitamin D in diets other than the pescatarian diet. In terms of nutritional quality, the best diet was the pescatarian diet, which also contained dairy products but no meats. The vegan diet had the biggest nutritional challenges. Due to this, for some product categories, products with the poorest nutritional value were eliminated from the selection and in the case of the vegan diet, the role of enriched products was emphasised more than in the case of the other diets.

### The input-output analysis reveals the potential for economic value added

The economic impacts of a dietary change on the agri-food industry were assessed by using the traditional demand model of the input-output analysis. The model is based on input-output data of the National Accounts of Statistics Finland. It includes direct effects of a change in demand for foods on their processing industry, as well as indirect effects of a change in demand for raw materials on domestic primary production. The analysis focused on the output and value added effects in Finnish agricultural production and import effects in alternative diet options, current price ratios, input structures, production technologies, and import ratios were assumed to remain unchanged.

### Food system operators participated in the policy-mix analysis

Promoting a dietary change as part of a sustainable food system requires horizontal measures that can be implemented throughout the system. The FoodMinimum project brought together different operators (including producers, food-industry representatives, restaurants, food service providers and retailers) with influence over the sustainability of the food system to discuss the feasibility, acceptability and necessity of different public and private policy measures. The policy-mix analysis was carried out on the basis of a survey submitted to the operators and a workshop, which helped to collect the views of the operators regarding existing and new policy instruments promoting a sustainable dietary change.

## Results and conclusions

### A dietary change and measures in the agricultural sector would complement each other

According to the results of the FoodMinimum project, the climate impacts (Figure 1) and eutrophication potential of a diet decrease as the share of products of animal origin in the diet decreases. The climate impacts and eutrophication potential of the pescatarian diet are lower than for diets containing meat, but higher than in the case of the vegan diet, provided that the pescatarian diet emphasises the consumption of domestic wild-caught fish.

The results indicate that dietary evaluations involve considerable uncertainties. Some of these are depicted in Figure 1, using climate-impact ranges. The ranges reflect the variations in the life-cycle climate impacts of the products in each food category of the diet, as well as differences in the results of the two different methods used to assess changes in soil carbon stocks. The assessment of the eutrophication potential involves even more uncertainties than the evaluation of the climate impacts because there are fewer studies on the eutrophication impacts of different products and the research methods are more varied. In addition, the indicator of eutrophication impacts currently used in life-cycle assessments (i.e. the eutrophication potential) is not very useful when evaluating and comparing emissions occurring in varying environments as it does not take local conditions into account.

*CO2 emissions resulting from the decrease in carbon stocks in agricultural land account for a significant share of the climate impacts of different diets.*

The project also included a rough analysis of the effects of two measures aiming to prevent the decrease in soil carbon stocks on the climate impacts of the different diets[2]. The measures were targeted at cattle production emphasising the use of organic fields or at all mineral soils. According to the results, the comparative advantage of the measures decreases as the share of products of animal origin in the diet decreases (Figure 2). The best outcome is achieved when both measures are implemented. This means that the climate impacts of the 'Meats cut to a third' diet can be decreased by nearly 30 per cent, compared with the climate impacts of the current diet. Shifting to the vegan diet would decrease the climate impacts by nearly 40 per cent from the current level, both without measures targeting soil carbon stocks and with measures targeting mineral soils.

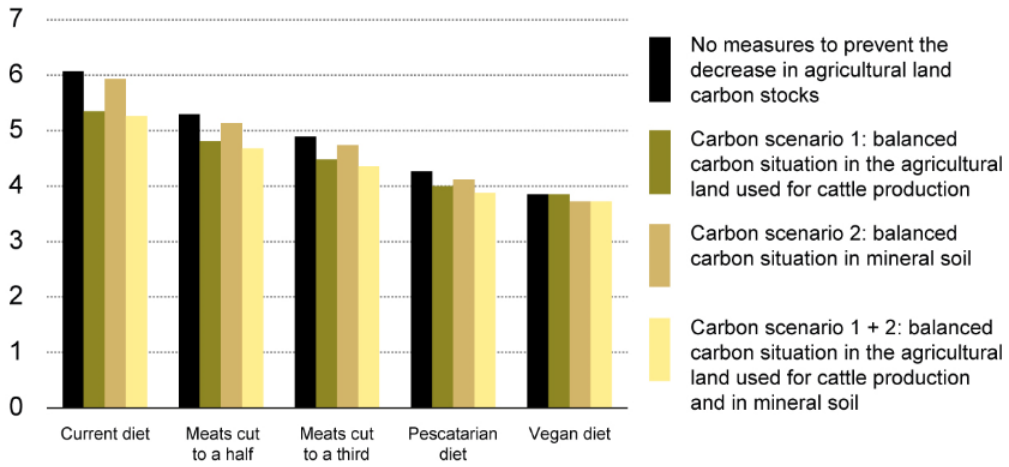


*Figure 2. The effect of measures reducing carbon degradation in agricultural land on the climate impacts of the diets reviewed.*

According to this rough analysis, CO2 emissions from agricultural land account for nearly half of the total greenhouse gas emissions from the use of farmland reported in Finland's national Greenhouse Gas Inventory (Figure 3). This indicates that the CO2 emissions from agricultural land used for the purposes of the current diet may be even higher than suggested by the results of this study. This means that measures aiming to prevent the decrease in carbon stocks in agricultural land and instead increasing them may have even more significance than estimated here. A more precise assessment is impossible at this stage as the scopes of the Greenhouse Gas Inventory and the life-cycle assessment differ from each other. For example, the Greenhouse Gas Inventory also covers agricultural land used for producing products

[2]For the first measure, it was assumed that cattle production achieves a situation where carbon stocks in agricultural land no longer decrease (without specifying how this could be achieved). For the second measure reviewed, it was assumed that the decrease in carbon stocks in mineral soil can be stopped by adding biochar to the field (10,000 kg every ten years; total carbon stock growth 210 kg C/ha; see the 'MAHTAVA – Modelling the carbon sequestration potential of soil amendments' project) and that this impact is further supported by planting catch crops among harvest crops in some fields (potential for 180 kg C/ha, but the measure could reduce yield by around 5%). The review does not take account of the feasibility of these measures, life-cycle emissions for biochar, or the extent of the cultivation of catch crops.

for export, and the concept of agricultural land used in the Greenhouse Gas Inventory also covers fields not used for food production[3]. The carbon emissions calculation method used in the FoodMin dietary model may, to some extent, underestimate the size of agricultural land required by cattle production as the method relied on needs-based estimates concerning cattle feed instead of outcome data about the use of feed. In other words, the results of this study provide more information about the size of agricultural land required for efficient food production than about the actual use of agricultural land. Furthermore, unlike the Greenhouse Gas Inventory, the FoodMin dietary model does not factor in emissions resulting from changes in land use (Figure 3).

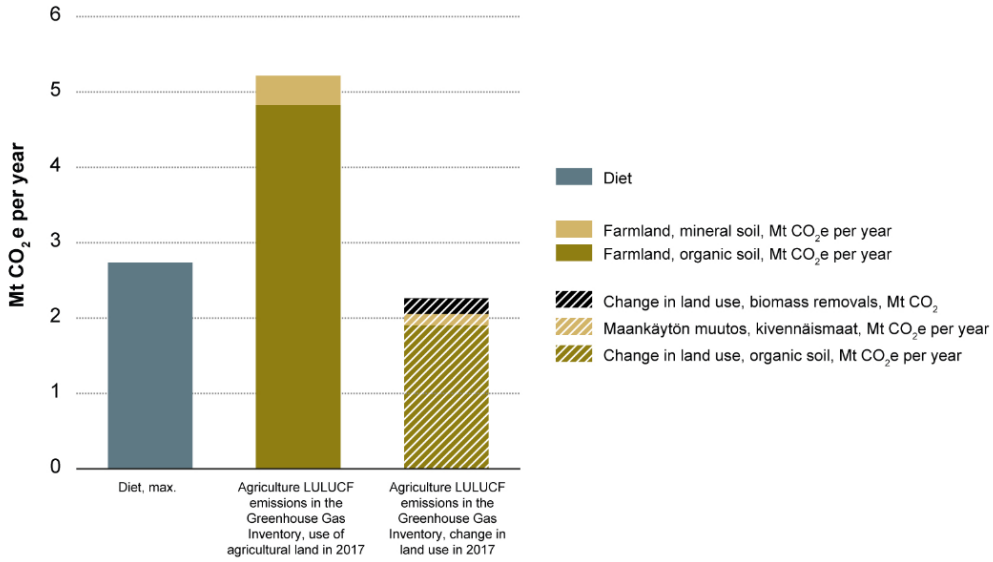


*Figure 3. Comparison of soil emissions according to the FoodMin dietary model and the national Greenhouse Gas Inventory.*

## Change in diet requires new value chains

According to the input-output analysis, agricultural output and value added would clearly decrease in the pescatarian and vegan diets, but would remain at the current level if the share of meat in diet was reduced to a half or a third from the current level (Figure 4). On the other hand, the value added of the food-processing sector could remain at the current level in all the options analysed. Imports would increase from the current level in all diet alternatives, but especially in the vegan diet, both in terms of production inputs and food imports.

A climate-friendly dietary change requires a significance increase in plant-based products in a diet. However, opportunities for any significant growth in the production of plant-based products in Finland are limited. The current competitive advantages of the Finnish agriculture lie in livestock and greenhouse production, not so much in plant production. The share of livestock production represents almost half of the gross return of agricultural production at market prices. Furthermore, the opportunities available to producers to increase the production of plant-based productions vary between regions.

[3]The concept of 'agricultural land' used in the Greenhouse Gas Inventory is based on the National Forest Inventory, in which the size of land classified as agricultural land is around 200,000 ha larger than the area recorded as agricultural land in statistics (see the 'MISA – Potential actions of land use sector to achieve the climate objectives' project).

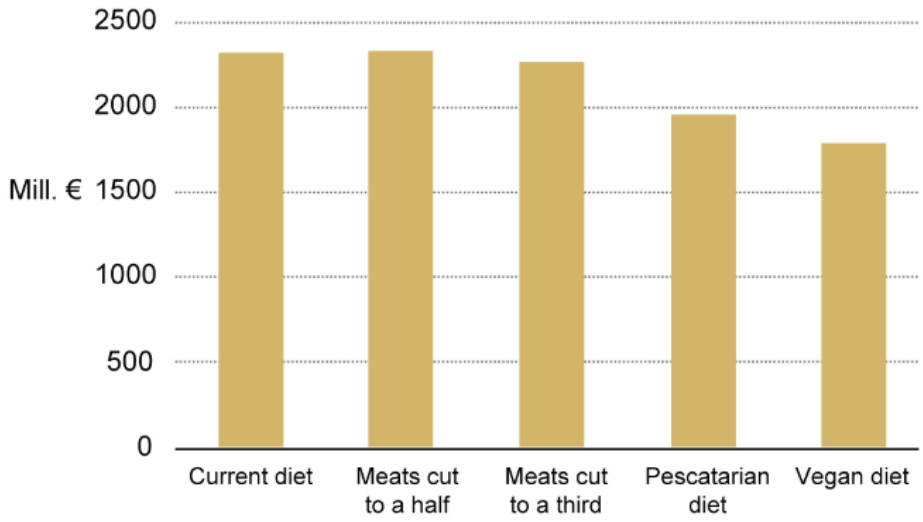


*Figure 4. Impact of the diets reviewed on value added.*

Another obstacle in the way of a successful shift towards a more plant-based diet is the lack of facilities suitable for interim processing or pre-processing that could supply legume-based ingredients and other plant-based raw materials for use by the food industry. Thus, a dietary change would involve considerable investments in the agri-food industry to particularly promote production and processing of plant products. It would also require the development of new products and the creation of new value chains.

## Public goals and means are needed to steer the change

A controlled dietary change requires the support of horizontal measures that can be implemented throughout the food system. Traditionally, policy instruments have been divided into informational, economic and regulatory policy instruments. In Finland, the sustainability of the national food system has mainly been steered through agricultural subsidies and regulations. Shifting the emphasis to demand and consumption increases the role of new policy instruments and actors.

| | Public-sector steering | Self-regulation |
|---|---|---|
| **Informational instruments** | Strong integration of environmental criteria into the nutrition recommendations<br>Enhancing food education in schools | Combination of informational steering and nudging |
| **Economic instruments** | Targeting of agricultural subsidies at the reduction of CO2 emissions from agricultural land, carbon sequestration and diversification of production crop varieties<br>Combination of health-based and environmental taxes | Development and harmonisation of eco- and health labelling<br>Creation of new value chains for new plant-based products |
| **Regulatory instruments** | Emissions reduction targets set in line with the climate policy<br>Binding nutritional quality and low-carbon targets for public food service providers | Green Deal and materials efficiency agreements between the state and private corporations to support a sustainable dietary change |

Finnish food policy has traditionally emphasised voluntary measures when guiding food chains towards sustainability. Creating new value chains for plant-based products requires significant investments in primary production and in the food industry. In addition to paying attention to eco- and health labelling, retailers and restaurants could also nudge their customers towards more sustainable diets. Green Deal and materials efficiency agreements between the state and industry would help to commit the private actors to the sustainability.

## *Private measures need to be supported with public targets and effective combinations of informational and economic policy means*

In Finland, public food service providers have operated in the long term for the promotion of healthy eating. Stronger integration of environmental criteria into the national nutrient recommendations would support public food service providers in improving the sustainability of their operations. Based on the review, public food service providers are very motivated to promote a sustainable dietary change. The setting of binding nutritional quality and low-carbon targets for public food service providers, as well as safeguarding the resources of local authorities, is needed to strengthen their work.

Public policies affect also food prices through agricultural subsidies and taxation. In the future, the effectiveness of agricultural subsidies and taxation must be assessed more closely in terms of their climate and health impacts. In the case of agricultural subsidies, special attention should be paid to the reduction of carbon emissions from organic soils and diversification of high-protein and other plants production. It is also important to review the impacts of health-based and environmental taxes as a whole, as well as to assess the impacts of different taxation models from the perspective of costs and fairness.

### Conclusions and proposals for further action

- A dietary change that complies with the nutrient recommendations could decrease diet-based climate impacts by up to 40 per cent.
- The achievement of climate benefits requires a decrease in meat consumption.
- Decreasing CO2 emissions from agricultural soil would supplement the impact of the diet change, particularly in the case of diets containing products of animal origin.
- A climate-friendly dietary change would revolutionise the agri-food industry, but a controlled change could help to retain the value of production.

- Strong support from the public sector for a sustainable dietary change: jointly agreed strategic goals and effective combinations of economic and informational policy tools.
- Integration of environmental criteria into the national nutrition recommendations.
- In the reform of the agricultural subsidy scheme, special attention should be paid to the reduction of CO2 emissions from agricultural soil and diversification of crop varieties.

### Areas for further research

- Reducing the uncertainties involved in the assessment of the impacts of different diets.
- Economic impacts of a dietary change on the agri-food industry.
- Impacts of different health-based and environmental taxation models.
- Collaboration between the scientific community and food system actors in the specification and testing of criteria and measures promoting a sustainable food system.

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# The FoodMinimum project was part of the implementation of the 2018 Government plan for analysis, assessment and research.

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