

## Reducing household food waste by dietary meal planning

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This research aims to reduce food waste at household level by formulating meal plans. One-third of global food production is lost or wasted. This is a problem because food waste is indirectly accompanied by many environmental impacts. Food waste is a significant contributor to climate change, as food waste is estimated to generate 8% of global greenhouse gasses. Of the total food waste in Europe, about 50% is caused by households. One of the reasons for household food waste is poor planning. Poor planning leads to the wastage of food because of, among others, difficulties consumers face with inappropriate packaging sizes and managing leftovers. Diet modelling has proven to be an effective method for solving food planning problems. However, diet modelling has not yet been considered for reducing household food waste. In this research, food waste is defined as “any substance or product, whether processed, partially processed or unprocessed, intended to be, or reasonably expected to be ingested by humans” (EU 2002). Therefore, for example, a banana peel is not considered waste by the EU definition. Currently, in literature, food waste is frequently expressed in weight. However, if the purpose of reducing food waste is to mitigate climate change, other units of measure might be more appropriate. For instance, environmental impact indicators such as greenhouse gas emissions, land use, and water use. Moreover, food waste could be measured as the nutritional contents wasted, for instance, the amount of protein.

A dietary meal planning model is developed to estimate to what extent food waste can be reduced at household level when planning is optimized. Meal plans are formulated by the model by selecting optimal combinations of recipes. The model also considers perishability, costs, overall environmental impact, and nutritional value. The Netherlands is taken as a case study, the Dutch National Institute for Public Health and the Environment and a large Dutch supermarket chain are the main data sources. Meal plans are formulated for a varying number of days and persons.

Analyses are performed to find trade-offs between (food waste) performance indicators. Furthermore, reducing food waste as a means to reduce environmental impact of a diet is assessed. The meal plans formulated can be used to inform on meal planning and to select and promote recipes that are affordable, healthy, and have a low environmental impact.