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LCA-based labelling systems: Game changer towards more sustainable food production and consumption across Europe

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1. Introduction

In recent years many LCA-based labelling systems on food (further on called ecolabels) have been introduced that make it possible to assess and communicate on the environmental impact of all food (see for an overview [1] and [2] and Table 1; examples are Eco-Score [3], Planet-Score [4], Enviroscore [5], Eco-Impact [6], Made Green in Italy [7] and the French government initiative [8]. These systems are different in two ways from traditional labels such as fair trade or organic. First, they are supposed to indicate the sustainability of all food instead of only the products that are certified according to that specific scheme. Second, they are fully based on measuring impacts (e.g. Greenhouse gas emissions, water use) instead of process type of indicators (e.g. do you have a manure management plan?) that are the most common type of indicator with traditional labels. For these and other reasons that are described below ecolabels can be a game changer in making food more sustainable. This is not only a trend that is happening on product level but also on organisation level (driven by mandatory reporting guidelines of the European Commission like CSRD [9]) and to a lesser extent investment level (driven by the financial industry). In this factsheet we will concentrate on product level.

In the next section, we will present a short overview of recently launched ecolabeling systems on food. After that we will present their advantages and disadvantages and the challenges still remaining. We will also discuss how ecolabels are implemented both in the private sector and public sector (government policies) and discuss additional applications. We will finalise this paper on the steps needed to make ecolabeling a game changer towards sustainable food production and consumption.

2. Ecolabelling

Consumers are faced by many sustainability claims. Some of these really indicate superior sustainability performance but for many of them the improved sustainability performance remains a challenge to quantify [10]. This, and the enormous amount of certification schemes and claims, leads to consumers facing misleading commercial practices related to the sustainability of products. Producers are only slightly stimulated to make their products more sustainable and are hesitant to start investments because it is hard to convince consumers that their product is more sustainable

than competing alternatives. In the Netherlands, the organisation Milieu Centraal, which is co-funded by the Dutch government, identified a set of 12 top (traditional) labels to help consumers identify labels that actually have an improved sustainability performance over other types of labels [11]. About 19% of current food consumption in the Netherlands has one of those labels [12]. Through these top labels consumers are better informed, although many labels only cover a small number of sustainability themes and none of them guarantee a superior performance over the full range. For 81% of their food consumption, consumers cannot rely on one of the top labels for information on how sustainable it is. Because these labels only compare products within a particular product category, they do not help consumers to make purchasing decisions between product categories (e.g. meat versus meat replacer). For the selection between product categories consumers can only count on some general principles such as eating more plant-based food and less animal-based food, and eating locally produced, seasonal fruit and vegetables.

Ecolabeling systems have the potential to support consumers both in the selection between product categories and within a product category. Table 1 provides some of the most promising initiatives. Van Haaster-de Winter et al. (forthcoming, see [31]) provide a more detailed description of these initiatives. The common denominator is that they are based on a systematic methodology to measure environmental impacts of products over the full life cycle using Life Cycle Assessment (LCA) as the main approach.

Table 1 *LCA-based ecolabelling initiatives communicating environmental impact of products*

Eco-Score	Planet-Score	Enviroscore	Eco Impact	Coop Sweden Sustainability Declaration	Made Green in Italy	French initiative
						

Life Cycle Assessment is the systematic analysis of the potential environmental impacts of products and services during their entire life cycle. The LCA methodology has been applied for more than 30 years but the methodology was never fully standardised, which made it problematic to compare results between products. The European Commission has developed a very detailed LCA standard (Product Environmental Footprint, see [13]) that describes in detail which methodologies and data need to be used. The general PEF guidance is further specified by the development of product category specific methodologies in Product Environmental Footprint Category Rules (PEFCRs), detailing product category specific issues. In total 16 different environmental impact categories (such as greenhouse gas emissions and water use) have been included in PEF and through normalisation and weighting a single weighted score can be calculated.

PEFCRs have been developed for a select group of food categories and have proven to be a huge investment by sectors to develop. Also, PEFCRs are not consistent in terms of methodological approach between product categories. For assessments that bridge food categories, the use of PEFCRs is therefore challenging. PEFCR studies are also expensive to execute and a lot of LCA expertise is needed. This was the reason why its large-scale application against reasonable costs was not possible. As a response the French government has built a database that includes product category averages for 2,500 different types of food products sold in France, called Agribalyse [14]. Agribalyse is largely based on existing databases (e.g. Ecoinvent and World Food Lifecycle Database) where methodological consistency was considered, and a methodology report was published. Average environmental impact per food product is already very useful information for consumers to make purchasing decisions between product categories. Ideally, however, you also would like to help consumers select products within a particular product category, meaning between similar products from different producing companies; if you want to buy milk, which brand is more sustainable? Several of the ecolabeling methods in Figure 1 support this by correcting the average

score with product-specific information. Figure 2 shows the methodology of one of these initiatives called Ecoscore [5]. The average Agribalyse score is corrected by a bonus/malus based on product-specific information around labels, origin of ingredients, packaging and threatened species. This type of information is easily available at the producer level and some retailers already have these data in their databases. If these simple product-specific data are available, a total average score can be calculated. Ecoscore translates this score into a label (A to E), and visually resembles the Nutriscore label, which is recognised by consumers and has already been introduced in countries such as France, Belgium, Germany, Spain and Switzerland.

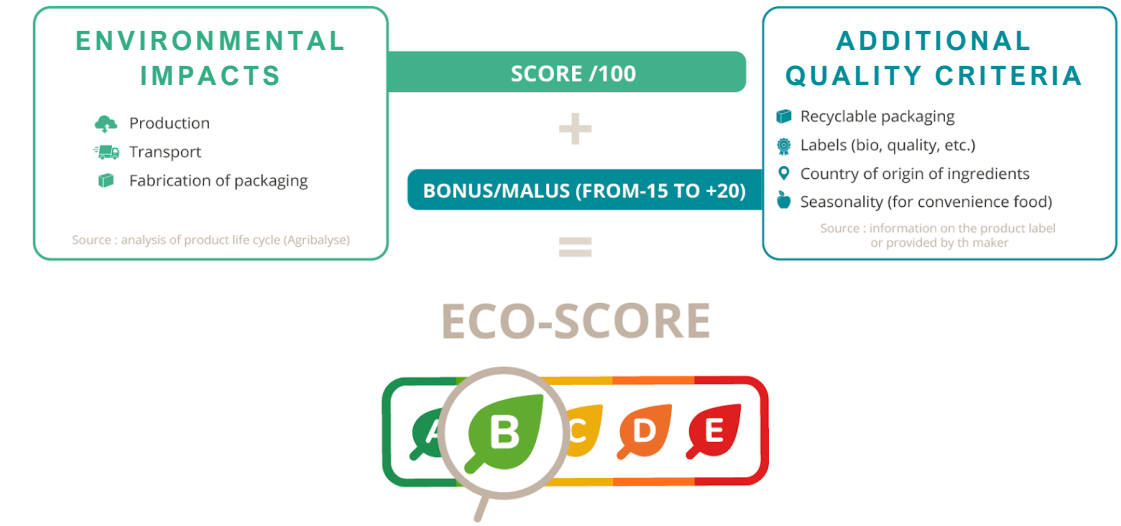

Figure 1 *Ecoscore methodology (see [3]).*

Ecoscore is based on readily available data and therefore can be easily applied. Lidl has piloted it on a small scale in several countries [15] and Carrefour [16] and Colruyt [17] applied it on a large scale on nearly all their food items. A French app (Yuca) uses it to score thousands of products and Open Food facts [18] also made it available in many other countries. The methodology to calculate scores is not very precise. Other ecolabelling initiatives like Planet-score [4] and French government [7] have started to implement similar systems starting from product category averages in Agribalyse [14]. They try to improve the methodology without creating a large administrative burden for suppliers. Enviroscore [5], Eco-impact [6], and Made green in Italy [7] do not start from product category averages but demand producers to calculate a full LCA. Enviroscore aims for application of PEFCRs, while Eco-impact is developing a PEF-based harmonised approach. This leads to more precise calculations but also to a larger administrative burden. It also means that they do not have a default score available based on product category averages so that it is harder to apply them on all food. Several large food producers however prefer this very specific score instead of a slightly adapted product category average score that does not fully represent the real score of their product. Ecolabelling initiatives have been applied on a large scale by retailers all over Europe (Migros Switzerland, see [19]), Coop Switzerland [20], Coop Sweden [21], Eroski Spain [22]).

The European Commission has two relevant workstreams in this respect: The Green Claims Initiative (GCI, see [23]) and the Sustainable Food Labelling (SFL) framework [24], [25]. Through the GCI the Commission wants to make Environmental claims reliable, comparable and verifiable across the EU. It will explain how PEF will be implemented in EC policy. The most probable proposal will be that if you make a claim, it should be substantiated with PEF. The release of the CGI policy has been postponed several times. The latest date of 30 November 2022 has been postponed to 'first part of 2023'. The SFL framework will cover the provision of consumer information relating to the nutritional, climate, environmental and social aspects of food. It is planned that the framework will be launched at the end of 2023. This will not be an EU label but only a framework on how to provide information that might be used to assess existing food labels in the EU. France is a

frontrunner in Europe. The French government is developing their own methodology and will introduce it for all food in 2023. Although officially it is not mandatory, all producers are expected to implement it.

3. Advantages and disadvantages of ecolabelling

On behalf of the Dutch Ministry of Agriculture, the authors of this paper studied the methodology behind the ecolabelling initiatives (and several others) and had many dialogues with a variety of stakeholders: (traditional) label owners, food processing companies, retailers, governments and NGOs. These provided insight into the methodological approaches, the support and future potential of these initiatives. Among the companies/organisations are Ahold Delhaize, Carrefour, Colruyt, COOP Sweden, Coop Denmark, Lidl International, Lidl Netherlands, Independent Retail Europe, Eurocommerce, Stichting Milieukeur, Foundation Earth, Ecoscore, Planetscore, the governments of France, Belgium, Germany, Denmark and the Netherlands and many others. We also consulted open sources and specifically open feedbacks from various organisations during open public consultations on food labelling policy initiatives (see 24]). A third group of feedback was assembled through group meetings with different stakeholders and at least 15 presentations on conferences.

Based on all this feedback and the fact that both retailers and governments started shaping their visions and implementing them on a large scale, we expect a lot of potential for ecolabelling, for the following reasons:

1. First, because ecolabelling can be applied to all food instead of only a percentage of products such as with traditional labelling schemes. This means consumers will not only be able to identify products with a superior performance but also ones that do not score that well. Potter et al. (2022, see [26]) showed that consumers might be more influenced by a negative indication of sustainability than a positive one. A positive sustainability indication is sometimes associated with a higher price and a lot of consumers do not need to be a frontrunner. Contrariwise, they also do not want to be the one that buys products with the worst sustainability scores.
2. Second, PEF-based ecolabelling covers a broad range of 16 impact indicators. It is also recognised that PEF still needs improvement, but through the Technical Advisory Board and the Agricultural Working Group this is work in progress [27].
3. Third, ecolabels stimulate continuous improvement because a score on a continuum is generated so even small changes can be recognised. This advantage is not valid when the score is translated to a consumer facing a label with a limited range of possibilities (say A to E) but even in that case can still be used in a Business-to-Business context. Most traditional labels only give a yes/no indication so there is only a temporary positive incentive for producers to get certified but if you are certified, there is limited incentive to improve more.[1] To compare with the financial results indicator of profit, a traditional label only tells if the product is profitable or not but the data behind ecolabelling can show the real amount of profit/loss.
4. A fourth advantage is that ecolabelling can be used for comparisons between product categories and within a product category where traditional labelling mostly only provides guidance within a product category.

There are also several disadvantages of ecolabelling:

1. First, the workload to assemble impact indicators for the full supply chain can be significant. Some ecolabels have found ways to decrease the workload but this comes also at a cost of lower accuracy of the score.
2. Second, systems still need to be developed to assure that the calculated numbers are reliable. Verification of the data needs to organised. This is in most cases already an integrated aspect of traditional labels.
3. Third, LCAs only focus on environmental performance and do not measure all environmental impacts and ecosystem services, which may lead to an underestimate of the performance of

[1] Most traditional labels increase demands over time and some traditional labels strengthen the requirements after the first couple of years of certification so there is still limited incentive to improve.

low-input farming such as organic production. Both the PEF team of the European Commission and most ecolabelling initiatives are working on solutions but it is hard to find a solution that is easily scalable for all food. This is one of the reasons that a group of environmental NGOs sent a letter to the European Commission (see [28]) stating that the PEF methodology is [currently] not adequate to assess the [overall] environmental performance of agri-food products. Other methodological discussions are related to the integration of differences in nutritional content in comparison between products from different product categories.

4. Fourth, it might be hard to assemble reliable data. The PEF prescribes company-specific data for the most relevant processes but allows average product category data for less relevant processes. It might be hard to find reliable average product category data. The lack of this led the Norwegian Consumer Agency to forbid the LCA-based Higg index for consumer communication [29].

4. The Dutch ecolabelling initiative

In the Netherlands, the authors of this paper started to develop an ecolabel, commissioned by the Dutch Ministry of Agriculture, Nature and Food Quality. Current ecolabels are either not well fit for application in the Netherlands (for example because of a lack of a database with Dutch product category averages) or methodologies could be improved. The Ministry does not currently intend to make it mandatory. It will be available for those who have an interest on a voluntary basis. It will also be based on PEF. PEF, however, has two limitations. First, it has been developed for comparisons within a product category and methodologies differ between product categories. Second, the methodology has been developed for a limited set of product categories and the intention is that it will be applied to all food in the Netherlands (see Figure 2). Therefore a PEF-like methodology will be developed that is harmonised over all product categories and is also available for product categories that do not have a PEFCR yet. Companies can report in different ways. First, they can use PEFCR calculations for those product categories where a PEFCR exists (blue variant in Figure 2, the list of available PEFCRs is available under [30]). A Dutch database with 3,000 product category averages (orange variant in Figure 2) will be developed. Companies can correct these averages with product category specific data (green variant in Figure 2). A recipe calculator is an option to calculate the exact amount of all ingredients of a composed product based on listed (but not amounts of) ingredients on the packaging and total nutritional content of the composed product. Two variants (varying in level of data requirements) will be developed for that:

- Simple option: This variant uses data that is very easily available at producer level and might even already be available at retail level, such as certifications, country of production etc. This makes it possible for SMEs to participate from the start, even when limited capacity and expertise is available.
- Advanced option: In this variant a more advanced set of company-specific information can be plugged into the models with product category averages, such as yields, energy mix used, production methods.

As described above, PEF does not cover all environmental issues. Therefore, themes are added (which remain to be determined, but likely with a focus on environment) that are not yet covered by PEF (middle yellow variant in Figure 2). The additional data that are delivered by companies to make their score specific in the green variant (like certifications) might also be used to cover these themes that are not well covered by PEF. In this case all companies should deliver this type of information, also the ones that did a full PEF-compliant LCA. A harmonised method to calculate the ecoscore from the results on the LCA indicators and the additional non-LCA indicators will also be developed.

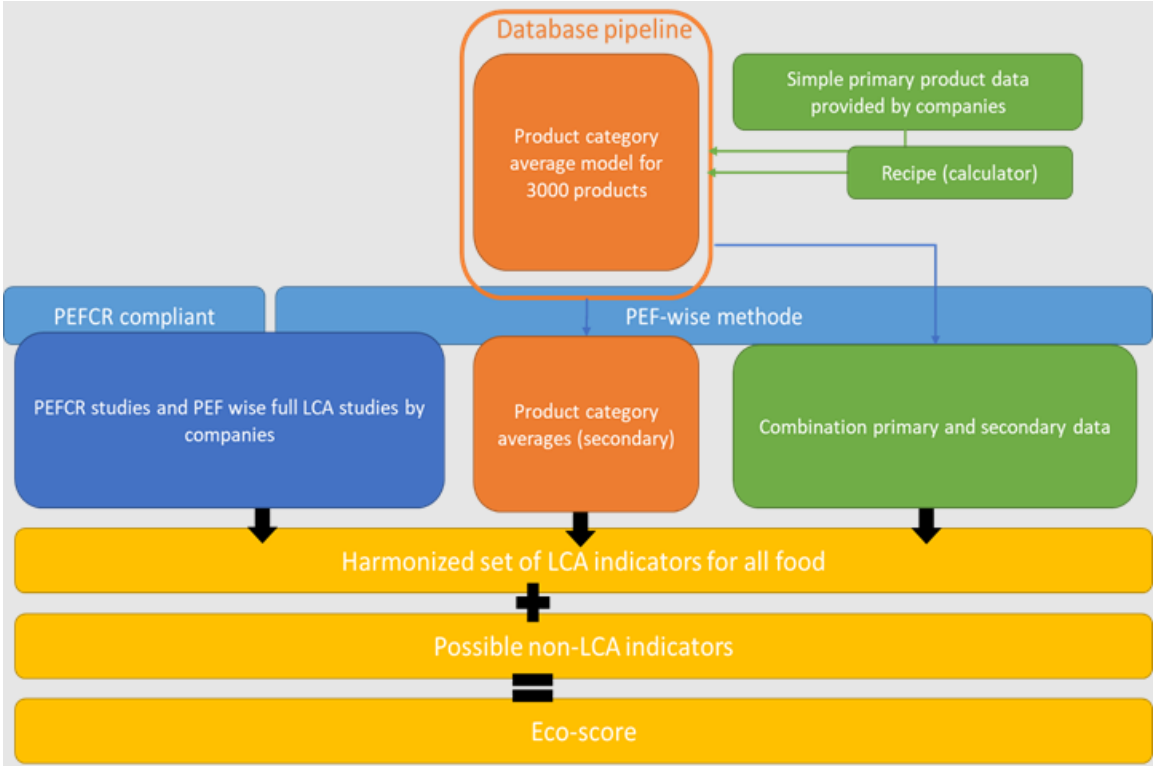

Figure 2 *Methodology for Dutch ecolabelling initiative (own presentation)*

The Dutch ecolabelling initiative is currently being developed together with the Dutch Ministry of Agriculture, Nature & Food Quality and a very broad set of stakeholders representing all important food categories, both food processing and retail, the financial sector, the National Institute for Public Health and the Environment (RIVM) and the public information organisation Milieu Centraal, which enables consumers to make sustainable choices. This group was originally formed to stimulate harmonised footprint calculations in Dutch food supply chains but has extended their scope.

To stimulate international alignment, an expert group of researchers and government officials from Northwest Europe was initiated that meets every few months to share updates about national developments and discusses methodological issues. Also, bilateral contacts are set up to stay connected to all relevant public and private initiatives including the relevant directorates from the European Commission (DG-AGRI, DG-ENV and DG-SANTE). In response to a call from the LIFE Program a proposal with France, Spain and Germany was made to jointly develop a methodology for product category averages, for a methodology to translate LCA results into an ecolabel that can be communicated to consumers and to test that ecolabel in the four countries. The Dutch team cooperates intensively with Foundation Earth that developed Eco-Impact [6] and is currently working on an improved methodology that has much overlap with the Dutch ecolabel.

5. Additional applications of environmental impact data

Introduction of an ecolabel on all food is expected to have more effect on improved sustainable consumption than traditional labels that are only available for a fraction of all food products. It also provides the opportunity for other applications that might stimulate alteration of consumer behaviour such as social gaming, or include the total score over all food on the retail receipt or green points saving systems where these points might be used for green presents or discounts. The total ecolabel score could also be translated into a true price that adds the total environmental costs of the production process to the normal price. This true price can be used for raising awareness to consumers but also used as a way for consumers to pay an additional amount that can be used to mitigate the environmental damage of the product or to pay the producer to prevent having the

environmental damage in the future. Governments can also use it as a base for subsidies and taxes to stimulate sustainable production.
We should however not put all the burden on the consumer. Other stakeholder groups should also better integrate sustainability in their decision making. The data behind the ecolabel score could also be used for Farmer to Business, Business to Business, Business to Finance, Business to Retail and Business to Government communication. In this way all these different actors could also more easily integrate sustainability into their decisions and provide the right incentives. The financial sector can for example provide financial discounts to producers that have a good environmental score on their products. All these actors should also be transparent about how they have included the sustainability information into their decision making. Retailers for example can play an important role in stimulating both sustainable production and consumption. In the Netherlands the government is working on a motion from Dutch parliament that asks the government to develop a reporting standard for Dutch retailers. If the Ecoscore is operational, it would be possible to have an indicator on the effect of all their measures on the average environmental score of all the food they buy and sell.

Harmonisation and transparency about sustainability of food is an important necessary condition for integrating sustainability into decision making. It might not be sufficient to solve the enormous environmental problems in food chains in the short term. It is still necessary that governments set minimum requirements on production processes to prevent free riders. It might also be necessary that the government set a joint target together with the food supply chain partners to reach an improvement in the average environmental burden score in a certain time period. The scores behind the ecolabel could be an efficient way to define these targets. Because it integrates a very broad range of environmental impacts, the risks of trade-offs between environmental impacts is lower.

6. Conclusions

The introduction of LCA-based ecolabelling initiatives for all food could be a game changer for making food more sustainable. The introduction is supported both by governments and large retailers all over Europe. There are still several issues that need to be solved but this support will create many resources to help solve these problems. Ecolabelling is expected to help consumers to choose more sustainable products, resulting in business cases and incentives for producers to make food more sustainable. In addition to consumers and producers, all other stakeholders (retail, food supply chain partners, financial industry, governments, landlords) play an important role in making ecolabelling a game changer: The quantitative impact data should also be used by all the other stakeholders in their decision making so they can also provide incentives to the supply chain partners for a higher score. All these groups should be transparent in their yearly sustainability reports on how they use the ecolabelling impact data in their decisions. Governments together with all supply chain partners can use the environmental impact data of food to set quantitative time-bounded goals.

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