FOUNDATION EARTH

POSITION PAPER 2

TRANSLATING ENVIRONMENTAL IMPACT ASSESSMENTS INTO SCORES: THE FOUNDATION EARTH GRADING SYSTEM

Introduction

The execution of the harmonised "Farm to Fork" (covering cradle to grave life cycle stages) Foundation Earth PEF methodology will produce product scores which need to be translated into a grade for communication to the consumer. Although superficially simple, the development of a grading system to communicate Life Cycle Assessment (LCA) calculations to the customer can be complex, depending on the factors and calculations which are to be included. Generally, the following factors must be considered when generating product grades:

- The **grading type** which will be used. A range of grading types are possible, including numerical grading, alpha-numeric grading or alphabetic grading. The grade range is also important, with narrow ranges being easier to understand but less granular than wider grade ranges.
- The **baseline or comparators** against which grades will be awarded. The awarding of grades can be carried out by relating a product to other products which are assessed, or against specified scores or grade bands which are either pre-determined or based on the scores awarded to a number of other products.
- The **life cycle stages** for which a grade will be awarded. Grades can be awarded for the whole life cycle of the product, or for the individual life cycle stages such as farming, transport, packaging etc. It can also apply to combined stages of the production chain, running from farm to distribution, or farm to consumption.
- The **distribution of the bands** for the grades into which the product will be categorised. There are several ways in which grades can be awarded to products. Grade bands can be pre-determined with grades being set before any product is graded – or the grades can be determined relative to the scores of other products.

Foundation Earth PEF Grading System

The Foundation Earth grading system must be able to take the scores produced from the Foundation Earth assessment system and translate them into a grade which reflects the environmental impact of the food and communicates it to the consumer.

The creation of grade bands requires access to a bank of product scores which range from high to low performing. These scores can be used to create grade boundaries, allowing products from the Foundation Earth methodology to be classified. Several options were considered to provide this data bank. Each option was associated with their own set of advantages and disadvantages. In conjunction with the Foundation Earth Scientific Committee and other knowledge-based organisations, the decision was taken to use information published by Agribalyse[1] to enable the development of grade boundaries for the full range of products assessed by Foundation Earth.

The use of the Agribalyse database is acknowledged as an interim measure which will eventually be replaced. As the Foundation Earth assessment system becomes widely used, and scores are calculated for thousands of products, the grade boundaries will be adjusted using information from within Foundation Earth. Consideration has also been given to the inclusion or non-inclusion of nutritional correction factors within the grading system, and, initially at least, no nutritional correction will be applied. The Foundation Earth position and reasoning on this is covered in another paper in this series.

1 AGRIBALYSE is a French LCA database for the agriculture and food sector. It is provided by ADEME, and includes LCAs for approximately 2500 agricultural and food products produced and/or consumed in France.

In building the grading system, Foundation Earth has considered the following parameters:

- The number of grading groups (the current system uses 8 groups: from A+ to G)
- Categorisation (determination of thresholds for each group)

The Foundation Earth grading system is required to have the following characteristics:

- Simple to use, but genuinely reflective of the environmental cost of the food being graded
- Able to be explained and defended to retailers, key food producers, NGOs and consumers
- As little subjectivity as possible, although it is recognised that subjective judgements will have to be made in some areas
- The grading system must enable European-wide food production to be compared

Potential options for translation of LCA scoring into grades

A range of options exist for the conversion of LCA scores into final grades which are awarded to products:

1. **Calculating the raw scores for each life cycle stage and the conversion of these individual scores into an overall score for the product.** This has the advantage of simplicity but does not reflect the fact that some life cycle stages can have a much more substantial impact on the environment than another life cycle stage, even though its raw score is similar.

2. **Quoting of the environmental cost of food on the basis of its weight.** This also has the advantage of simplicity, but a significant argument against this is that it does not reflect the value of the food to the overall diet, in which a low-density food would have to be consumed at a much higher level than a nutritionally dense product to meet daily requirements.

3. **Quoting of the environmental cost of food on the basis of its weight, but adjusted for nutritional content**. This is a more difficult system to implement, but it does have the advantage that it can also be used to increase human health along with environmental improvement. It also has the advantage that it can be perceived as being fairer to producers of food, which is highly nutritionally dense, which is often associated with higher environmental costs of production.

4. **Quoting of the environmental cost of food on the basis of its serving size**. Some LCA systems have used portion size as the Functional Unit. This has advantages but hands control to the food manufacturer who can reduce the portion size to manipulate the grade of the product. If portion size could be standardised, it would be a useful Functional Unit because it is easily understood by the consumer and is reflective of how the food is consumed.

5. **Quoting of the environmental cost of food on the basis of its serving size, but corrected for nutritional content.** This is an option which has not been used in other systems and would probably be unnecessary because the serving size is broadly related to the nutritional content of the product.

6. **Quoting of the environmental cost of food on the basis of its contribution to a balanced diet.** This is the most complex of the grading options. It would require very significant additional scientific research, and testing and amendments over a period of years to deliver. Currently, existing levels of knowledge are

not high enough to accurately use this method. In addition, the output of this method would require very clear communication to the consumer to ensure that there is a full understanding of the labelling and its application.

Grading range

There is a surprising degree of conformity amongst the range of ecolabels that are in current use. The large majority use a type of traffic light system which is augmented by a numerical score or an alphabetic grade. The width of the scale is more variable, with some schemes running from 1-9 or 1-10, and others using A-E, A-F or A-G, with some schemes also using A+ or A- as well.

Two grading scales were considered for the new Foundation Earth system, including that currently used: A+ to G, or from A to E. A decision was made to use the larger of the two scales, from A+ to G. It was reasoned that although the smaller scale was easier to understand, it does not provide the necessary resolution to encourage food businesses to make changes which improve the environmental performance of the food.

In addition, unpublished work by Broekema and Boone from Wageningen University in 2022 provides evidence that a higher number of grades (eight instead of five) is preferable, as the wider grade range provides better differentiation between products, providing more detailed consumer information, and enabling manufacturers to improve grades more easily, encouraging positive change in the supply base. They considered several options, outlined in the following table:

Sce-nario	# of classes	Definition of classes	Explanation
1	5	Linear	The single score is distributed linear between classes A to E
2	8	Linear	The single score is distributed linear between classes A to H
3	5	Square Root	Classes A to E decrease in variety of the single score; classes get smaller
4	8	Square Root	Classes A to H decrease in variety of the single score; classes get smaller
5	5	Exponential	Classes A to E increase in variety of the single score; classes get bigger
6	8	Exponential	Classes A to H increase in variety of the single score; classes get bigger
7	8	Equal # products per class	Single scores attributed to classes A to H are a result of an equal amount of product in each class

The seven options were used to understand the variation in grades which each produced, and to reason their likely effect on consumer purchasing behaviour. Broekema and Boone concluded that Option 7 was the mathematical approach which likely provided the most useful information for consumers aiming to make sustainable purchasing decisions, although it is work noting that Option 7 also contains a very large upper class (H), which could make it difficult for producers to move products outside this category. Following consideration of all options, Foundation Earth has selected an 8-grade scale as the most appropriate option.

Score range for each grade

LCA scores are raw numbers which will have little relevance to the consumer. Conversion of scores to grades in combination with traffic light colour indicators enables the consumer to easily understand the environmental impact

of the food which is labelled.

The grades which are awarded under the Foundation Earth "Farm to Fork" PEF methodology will initially be based on grade boundaries derived from the Agribalyse database. Once the Foundation Earth database of food scores is of sufficient size, it will be used to define new grade boundaries. In defining the initial grade boundaries, several options have been considered:

1. **The creation of absolute grade boundaries**, with the scores for each grade being pre-determined, with for example, scores from 0-0.15 receiving an A+ grade, scores from 0.151-0.22 receiving an A grade and those from 0.221-0.34 receiving a B grade, etc. The grade awarded would not be influenced by how many other products fall within each grade band, but would instead be determined against scientific information around environmental impact.

   Under this scenario, the grades for each product will be relatively static over a period of years, unless the production process is changed prior to re-assessment and certification.

   A major challenge under this type of grading system is that the determination of the static grade bands is difficult, due to the range of scientific opinions around product impacts. In addition, under a static system such as this, there can be a slightly reduced incentive for improvement as the product grade is unlikely to change unless the production process is changed, whereas, under a scheme where the boundaries continually move (because other products are being improved), there is built-in pressure for companies to continually reassess their production process to reduce impact.

2. **The creation of relative grade boundaries**, with the scores for each grade being relative to the scores of other products in a database. This essentially means that as products are added to the database, or as existing products are improved, the overall grade boundaries will move on a regular basis, and products which are at the grade boundaries are likely to have their grades changed.

   This regular re-evaluation of the grade boundaries creates significant impetus for manufacturers to continue to modify their farming and production processes to ensure that their products grade as well as possible. However, under a grading system such as this, a decision is required about how the grade boundaries are created:

   a. **Evenly spaced grade boundaries** based on the full range of scores within the database. This is the simplest method of analysis but can mean that one or two of the grades contain a very high proportion of the products in the database.

   b. **Variable grade boundaries to ensure that an even number of products are distributed to each grade.** This is a useful method of ensuring that the Eco Impact label utilises the full grade range, but can mean that products which are in absolute terms performing well receive relatively low grades.

   c. **Use of Logarithmic scales.** This can be a useful method of setting grade boundaries, but can have the effect of creating very wide grade ranges at the higher environmental impact levels, meaning that it can be difficult for poorly performing improvements to achieve a better grade despite a focus on improvement.

d. **Use of algorithms to create grade systems** based on, for instance, a Bell Curve, where the majority of products are concentrated towards the middle of the grade bands, with only the very good and very bad falling into the highest or lowest grades. This type of grading system has the advantage of encouraging wide scale participation, but tends to award a very similar range of grades to quite different products.

Grade boundaries are the foundational component of grade allocation, but as the Foundation Earth PEF grading system is a modification of an existing PEF methodology, no reference data exists within Foundation Earth itself. As a result, a decision was made to utilise an existing PEF-based database to provide a ready-made set of reference data from Agribalyse. Over time Foundation Earth will build enough data to create its own reference data, and once a critical mass is reached, this will be used to inform and potentially reallocate grade boundaries.

The Agribalyse database contains scores calculated for 2500 food products from across France. France was recognised by the Foundation Earth Scientific Committee as a good proxy for wider European food production as it contains production systems which are representative of Northern European production, and other systems which are representative of Southern European production.

Upon consideration of the options available, Foundation Earth have chosen to use option B - the use of even numbers of products in each grade, based on a linear (not logarithmic) scale. The Agribalyse database has therefore been divided into eight categories, with each category of approximately 300 products defining the range for each grade. This decision was taken to ensure that a full range of grades are awarded within the Foundation Earth system, encouraging continual development work to reduce the environmental impact of food production.

Summary

1. Foundation Earth grading will range from A+ to G, giving a total of eight grades for which grade boundaries need to be determined.
2. Analysis of the Agribalyse database was undertaken to understand the total range of scores which are present. The maximum and minimum scores have been used to set the end points of the grading system boundaries.
3. Foundation Earth has selected ‘equal product numbers’ grade boundaries as the initial system because it ensures that a full range of grades are awarded and that there is incentive for food manufacturers to make changes to production chains to improve grading.

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