Application of the Biodiversity Footprint Methodology for the production of a chocolate bar of Tony's Chocolonely

GENERAL INFORMATION

Biodiversity measurement tool	**Biodiversity Footprint Methodology & Calculator Tool**
Company	**Tony's Chocolonely**
Sector	Food sector
Turnover	Approx. 264 million euro for 2018 / 2019 (Year report)
Date/Period of measurement (year(s))	Measurement took place in 2016 based on data from 2014 / 2015

Business application(s)

BA 1: Assessment of current biodiversity performance	Biodiversity footprint per 180g chocolate bar (Pure and milk) in 2014
BA 2: Assessment of future biodiversity performance	Assumed that cacao productivity will increase in the future
BA 4: Comparing options	Comparing between milk and pure chocolate bar and between low and high productivity of cocoa production

Organisational Focus Area (site, product, supply chain, …):

OFA 3: Product level	Footprint calculated for the production of 180g chocolate bar (pure and milk)
OFA 4: Supply chain level	Raw materials (cacao, sugar, milk, raw feed), chocolate processing, paper and aluminium package,

DESCRIPTION OF THE CASE

See summary description of Biodiversity Footprint Methodology and Calculator here

Context

The company Tony's Chocolonely was interested to participate in a research case study about the biodiversity footprint of their chocolate. Tony's Chocolonely (TC) sells 'slave-free' chocolate bars based on cocoa beans produced in Ghana and Ivory Coast. Tony's social mission comprises five principles of cooperation:

1. Pay a fair price
2. Follow the cocoa bean
3. Improve quality and productivity together
4. Farmers stand strong together
5. In for the long haul

Natural capital is second priority to this mission. In this case, the difference in the footprint of milk (32% cocoa) versus pure chocolate (70% cocoa) is investigated in two cocoa bean productivity systems, i.e. a low productive and a high productive system. The more productive system is the current system of an existing cooperative plantation. The low productivity system is a system by farmers that were not part of the cooperative but produce cocoa by themselves. The cooperative uses more fertilizers and some pesticides and other management practices that are common for intensive plantations. The independent farmers used very little or no fertilizers as those are expensive.

Boundaries

The footprint is calculated for the chocolate production related land use, GHG and emission to water, including quantification of these three pressure types for the production of the raw materials, the farms and processing and storage facilities. The footprint of the paper and aluminum wrapping is not included because it is the same for both bars. Transport emissions were included for transport (data from True Price LCA).

Location and scale

The cocoa production takes place in Ivory Coast and Ghana. Cocoa is transported to Antwerp in Belgium where it is processed to chocolate. Beet sugar is extracted from Western Europe and cane sugar from Mauritius. Milk via milk powder is extracted from Germany.

Types of pressures

Pressures	Terrestrial	Freshwater	Marine
Land use change	Land use type and intensity	Water flow, depth and N and P content	
Climate change	CO2 equivalent values per GHG emission	Eutrophication via concentration of N and P in inland water bodies	
Pollution	Indirect via land use type and intensity		
Direct exploitation	Cocoa field, Grassland, Sugar beet		
Invasive species			
Other			

Collected data on economic activities, pressures, state and impacts

Primary data	Secondary data	Modelled data
Economic data		
Income related to cocoa production and other side products (honey, meat) produced on cocoa production area. Allocation correction needed for contribution cocoa production only.		
Challenges		
Income side products difficult to get as it is traded partly informal or for own consumption.		
Pressures		
Land use area, GHG, etc information were partly available from LCA report produced for Tony's Chocolonely. N&P emission mainly for milk production and derived from WUR.		GLOBIO dose-response relations for land use, climate change and N and P to water
Challenges		
Water use for chocolate processing in Belgium was not available. Impact of intensification cocoa production is assumed not to have consequences on water use and N and P emission to water (*1).		
State		
		MSA from GLOBIO 3 and GLOBIO aquatic
Challenges		
Impacts		
		Indirect impact via dose response relations pressure / MSA (GLOBIO). For comparison impact is also calculated with ReCiPe (*2)
Challenges		
Impact other pressure types such as Impact Infrastructure, fragmentation and Nitrogen deposition on land not included		

(*1) Water is not an issue for the cocoa production in this humid production area. They extracted water from the adjacent river which has no impact on the river itself due to the relative small amounts extracted and high flow of the river. The lack of information on water use by the processing facility is merely due to time constraint. However, because the processing footprint is expected to be much smaller than the impact of the production of raw materials, the analysis was focused on the most important parts of the value chain and did not inventorize additional data from the corporate company Callebout. Of course there will be some impact but in comparison it will be insignificant. Focus on the main pressures and parts of the value chain is the approach of our Biodiversity Footprint Methodology.

(*2) ReCiPe was used in parallel to investigate if differences would be large. Trends were more or less similar, but results are difficult to compare as the indicators differ significantly. As the ReCiPe method is more generic and does not differentiate in location and intensity of land use, which are by far the most important contribution factors of the footprint we did not include them here. There is a figure with ReCiPe results for the milk sector case in the full report on www.plansup.nl ('Biodiversiteitsvoetafdruk koploperbedrijven', 2016)

What was the role of qualitative information?

A qualitative interpretation was needed for classification of land use and type of energy used. Land use, differentiated by land use intensity, appears to be the most important pressure type on biodiversity for cases that include organic production of raw

materials. Omission of land use intensity factors will result in inaccurate biodiversity footprint results. It is therefore essential to differentiate between organic or extensive agriculture production (in this case for production of cocoa, sugar and milk).

Baseline/reference situation

The baseline in this assessment is the current low productive farming system to which a high productive farming system is compared.

The metric which is applied (MSA, Mean Species Abundance) comes from GLOBIO and measures biodiversity against the reference of a primary untouched ecosystem. MSA is an indicator for naturalness / intactness. The less intact and the higher the use intensity, the lower the MSA.

Required efforts for the measurement

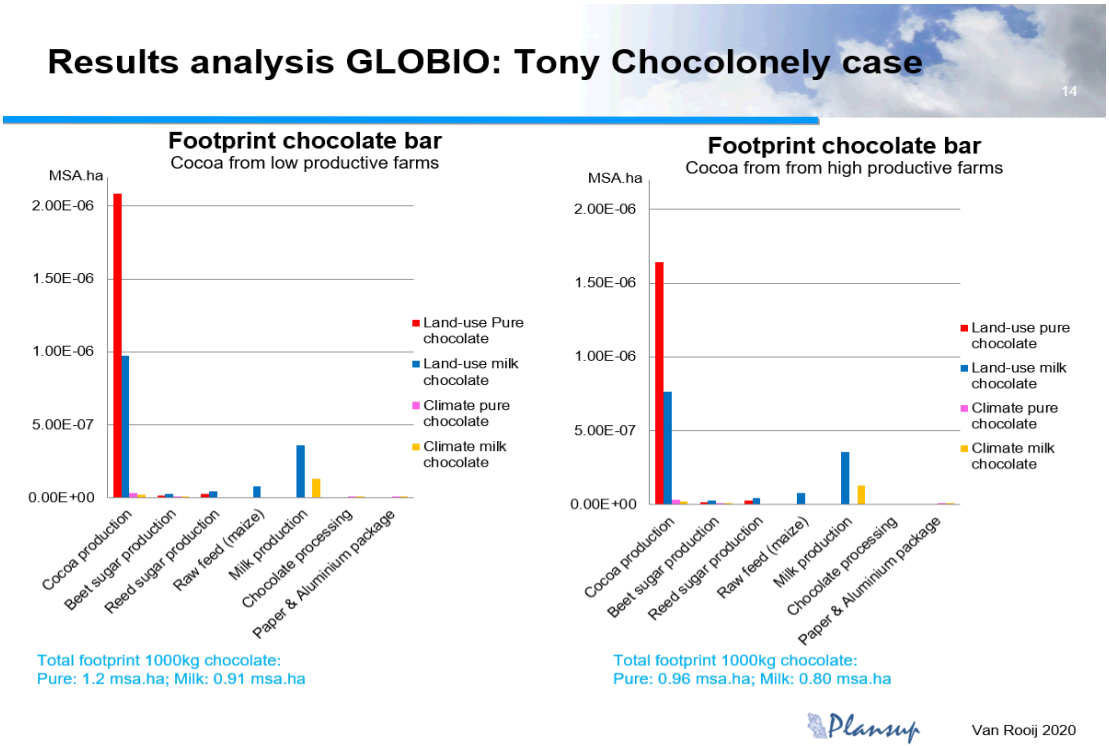
Depends on the availability of data for the product / sector. Once suppliers provide information on land use (type, location and area) and its intensity, like is done for CO2 equivalent reporting, hardly any time is needed to collect these data. But even studying some literature for average production information took much less than a day. Implementing the data in the method, e.g. in the Calculator takes a few minutes. When using the full methodology, first some training is needed on how to work with the dose response equations in an Excel spreadsheet. After that, an analysis can be made within 1 day.

For Tony's Chocolonely, some figures on land use and GHG emission were available from the existing LCA study. However, average production figures can also be extracted per organic product per region from scientific literature. It is assumed that this information can also be requested directly from suppliers in the near future.

Required skills to complete this exercise

The classification of the involved land use type and intensity requires some knowledge about GLOBIO and ecosystems. However, in case of monoculture agriculture, this is straightforward.

Results and application



Detailed results are available in the full report on www.plansup.nl ('Biodiversiteitsvoetafdruk koploperbedrijven', 2016). This case study only provides some main results.

The estimated footprints are calculated for the current mean productivity of cocoa producers (low productivity) and for the situation in which farmers produce under more or less ideal circumstances with the right knowledge and production means (high productivity). While current productivity is on average 450 kg/ha/y Tony's expectation is that cocoa bean productivity could increase to 800 kg/ha/y. The functional unit is the production of 180 g chocolate bar. The area in m2 and CO2 equivalent in kg is calculated for each ingredient in a bar.

Main results:

- From the graphics it is obvious that land use for cocoa production has the highest impact. As low productivity farmers produce less cocoa per ha, more land is needed to produce a chocolate bar than for cocoa from high productivity farmers. For the calculation, it is assumed that half of the required sugar is cane sugar from Mauritius and half is beet sugar from the Netherlands and Germany. Because of the higher productivity, beet sugar production requires less land area than required for cane sugar production. In the production of milk chocolate bars, grassland in Germany is also required for the production of milk powder.
- Greenhouse gas emissions are based on information from an LCA conducted by True Price. Emissions are given for cocoa cultivation, sugar production, milk production and for chocolate manufacture. While the greenhouse gas emissions comprise only a small proportion of the total footprint, CO2 emissions were 350% higher for a milk chocolate bar than for a pure chocolate bar. The climate impact of efficient cocoa production is probably higher due to the use of fertilizers and pesticides.
- As cocoa is grown in high rainfall areas with an abundance of water, water use for cocoa cultivation is not a pressure factor. Water is required for washing the beans and to a lesser extent in processing the liquid chocolate in Belgium. But as sufficient data were not available, the impact is not included in the calculation of the biodiversity footprint.
- Further, little fertiliser is used by the farmers. The low productivity farmers sometimes use manure from their cattle on their cocoa tree plantations. As these are small quantities, it is assumed that the impact of nitrogen and phosphorus emissions in the surrounding water is also limited.
- Overall, a milk chocolate bar made of cocoa from high productive farmers has the smallest footprint and the pure chocolate bar made of cocoa from low productive farmers has the largest footprint. The impact of climate is relatively small because land use is by far the largest contributing factor to the footprint of both types of chocolate bars. More efficient cocoa production reduces the relative impact of land use but increases that of climate. Although climate impact on biodiversity is relatively low, it may be a goal to reduce the company's carbon footprint. Training of low productivity farmers directed to increasing their productivity has the largest positive impact on the footprint. Further, the higher the cocoa content in a chocolate bar, the higher the biodiversity footprint. In addition, use of more beet sugar instead of cane sugar would have a slightly positive impact on the footprint.

Interpretation of results and impact on decision-making

This study brings clarity in how environmental pressures individually and collectively could affect biodiversity and gives insights into their relative impacts.

For Tony's Chocolonely the wellbeing of the cocoa farmers has the highest priority. With some training the smallholders can increase their cocoa productivity which will have a positive impact both for income and biodiversity. Tony's mentioned that they were also thinking of using alternatives for milk in their milk bars to reduce the biodiversity footprint that can be related to the production of milk chocolate bars.

It was concluded that the MSA based methodology for biodiversity footprint calculation enabled the company to test relatively easily the effectiveness of potential measures designed to reduce the future impact on biodiversity. The potential impact as a result of different scenarios can be compared which is helpful for decision making aimed at decreasing a company's biodiversity footprint.

STRENGTHS AND LIMITATIONS OF THE APPLIED MEASUREMENT APPROACH IN THIS SPECIFIC CASE

Self-assessment

Relevance	
Strengths	• Application of the Biodiversity Footprint Methodology provides comprehensive information – although rough estimates - about the potential biodiversity impact of an agricultural commodity and in particular in relation to the way it is produced (farming practices, sourcing location of raw products). • Application of the Biodiversity Footprint Methodology or Calculator (the latter inly for land use and GHG emissions) provides comprehensive information about the biodiversity impact of a product, company or sector and a rapid insight in where in the value chain the highest pressure(s) can be identified and what measures have the highest effectiveness.
Limitations	• MSA (Mean Species Abundance) is not sufficiently refined yet to accurately reflect the real biodiversity footprint related to different farming practices
Opportunities for improvement	• Development of more refined MSA metric scale which reflects much better the actual biodiversity footprint of different agricultural practices.
Completeness	
Strengths	• The cause - effect relations from GLOBIO are based on impact measurements for a representative set of animal and plant species. The three major pressure types are included (Land use, GHG and N&P emission to water)
Limitations	• The impact of Infrastructure, fragmentation, Invasive species and nitrogen deposition is not included in the methodology.
Opportunities for improvement	• For Tony's Chocolonely social aspects of producers are a key focus area. It might be useful to develop footprint approaches that combine social and natural capital aspects. • Furthermore, expand methodology (GLOBIO) with other relevant pressures.
Rigor	
Strengths	• GLOBIO is accepted on a global level and the use of its dose response relations is quite straightforward
Limitations	• The current dose response relations are based on global models. They could be refined for more local situations
Opportunities for improvement	• There is currently no certification yet for the method. This would certainly help the credibility of the footprint calculation outcome
Replicability	
Strengths	• Information on the footprint methodology is open and freely available. The method can be replicated by anyone without the need for expensive software or data bases.
Limitations	• Some basic GLOBIO and ecology skills are needed to make the correct decisions what type and intensity of land use should be used for the calculations.
Opportunities for improvement	
Aggregation	
Strengths	• The Biodiversity Footprint Methodology uses the same indicator (MSA.ha) for each pressure type and results can therefore well be aggregated both horizontally (i.e. over different pressures) and vertically (e.g. from company to sector level)
Limitations	

Opportunities for improvement	• Correction factors should be used for the calculation of the biodiversity footprint of extensive land use, similar to the use of economic allocation factors to correct for multiple use of land (other than for the production of the assessed product).
Communication	
Strengths	• Naturalness in terms of area and quality is an concept that can be easily be communicated
Limitations	• The definition of the used indicator Mean Species Abundance is a bit more difficult to communicate.
Opportunities for improvement	• The absolute MSA.ha figures could be used for benchmarking, but companies involved indicated that it can better be used for internal communication and assessments of the effectiveness of planned and taken biodiversity friendly measures. In that case, a more refined MSA scale needs to be elaborated allowing measurement of progress due to specific biodiversity friendly farming practices.
User friendliness	
Strengths	• The complete Biodiversity Footprint Methodology can be found online and no special software is needed. Required data related to the pressures can be collected either by the companies or suppliers. The Biodiversity Footprint Calculator is a simplified tool that does not require the user to know what and how equations should be used. A few days training will be needed for the full methodology. The Biodiversity footprint calculator can be applied without training in case the user has some understanding of ecosystems.
Limitations	• The concepts of MSA and using the correct land use type and intensity needs to be understood
Opportunities for improvement	• Data on land use should preferably be provided by the suppliers, analogue to information on GHG
Investment	
Strengths	• A short training of own dedicated staff will be sufficient and there are no costs involved in using the methodology or calculator tool
Limitations	• External expertise is needed when there is no staff available who understands the concepts of sustainability and ecology
Opportunities for improvement	

Overall assessment

This assessment of the footprint assessment for the production of chocolate bars has successfully shown which parts of the production chain has the highest impact on biodiversity. It also shows that increasing the productivity, especially for cocoa, leads to a strong decrease in the biodiversity footprint.

The conclusion of Tony's Chocolonely was that the biodiversity footprint methodology has helped them to:

- Gain insight into the pressure factors and company processes that make the largest contribution to their biodiversity footprint taking into account local conditions;
- Determine the difference in footprint between the present and an alternative or future situation;
- Calculate the effectiveness of biodiversity friendly measures.

Case study description and self-assessment carried out by

Wilbert van Rooij Director Plansup Weidemolenlaan 31 7241VG Lochem The Netherlands
E-mail: plansup.consult@gmail.com Tel: +31 6 10163488

More information on the measurement approach can be found here:

www.plansup.nl