LIFE CYCLE BASED ASSESSMENT FOR AGRICULTURAL PRODUCTS: AN AUSTRIAN BEST PRACTICE

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ABSTRACT

This paper presents the GLOBAL 2000 adaptive sustainability assessment approach, with which the environmental performance of agricultural products is measured. The aim of the approach is to arrive at a comprehensive understanding of the environmental impacts of an agricultural products and the connected life cycle. Furthermore, it strives to set incentives for farmers to adopt a more sustainable production mode and to help consumers make deliberative consumption choices, by informing them about the environmental impacts of products along the life cycle.

INTRODUCTION

The following describes the GLOBAL 2000 *adaptive sustainability assessment approach* (ASAP) methodology, as it is currently in use in the *REWE, GLOBAL 2000 and Caritas Sustainability Program* for the REWE Pro Planet label in Austria.

Eco-labeling has been suggested as an approach to manage towards a more sustainable world by several authors and organizations (e.g. de Snoo 2006, Bruce & Laroiya 2006, Rigby et al, UNDP(CSD) 1996). Although approaches to "measure" sustainability have often been criticized we follow the opinion of Gomez-Limon & Sanchez-Fernandez (2010) that the "design and use of such indicators can be extremely useful in that they force those involved in the discussion of sustainability to identify the key aspects of sustainable agriculture and to assign weights to them." In such a context the often very general and theoretic discussions about sustainability are confronted with real world practices and problems and are requested to come up with workable solutions and improvements.

Sustainability is a multidimensional concept. It is therefore necessary to use a set of indicators that cover different important aspects of sustainability. We have chosen to use five field-level indicators and five indicators derived from Material Input Per Service-unit (MIPS) (Hinterberger et al 1997).

METHODS

Our approach rests on four pillars: (1) the involvement of stakeholders in a process that allows for adaptations, (2) use of well-established indicators calculated from on field and production-chain data (3) a set of rules and guidelines and the (4) benchmarking of the indicator values and the subsequent labeling of products. The indicators are calculated on a yearly basis for each product – farmer combination. The data is provided by the farmers and suppliers via an Internet-interface or directly via their farm-management-software.

Field based indicators

The indicators are (1) Humus-, (2) Nitrogen -, (3) and Phosphorus Balance, (4) Pesticide use intensity, which is calculated out of pesticide application data and (5) Energy intensity on the field-level, which tells us how much energy was invested to produce one kilo of the product, considering the energy contents of all inputs. The calculation of humus-, N- and P-balance includes the effects of crop rotation, type of soil, crop grown, inter-crops and underzone crops as well as fertilization and yield. The five field level indicators are calculated with the agricultural model REPRO (Hülsbergen 2003). The data requirements for calculating the indicators largely overlap with the data farmers need to record for GLOBALG.A.P. GLOBALG.A.P is an international widely accepted business to business certification for 'good agricultural practice' and requested by the supermarkets for all producers entering the market.

Material Input Per Service-unit indicators

We use five MIPS indicators: the Carbon Footprint expressed in CO2 eq. / kg product, abiotic and biotic material input (kg / kg product), water used (l/kg product) and land-footprint in m²/kg product. Data is collected on the farm and supplier level by using a questioner developed in a series of scoping studies. It covers the important steps in the production process, so that all relevant resource inputs and infrastructure are recorded. Climate relevant emissions from fertilization and humus-depletion are calculate within REPRO and added to the CO2-rucksack. The contribution to the resource indicators by the retailers logistic and shelf-live was calculated based on data provided by REWE International.

Benchmarking and labeling

After the indicators are calculated the results are benchmarked using either a best practice approach (for pesticide-index, energy-intensity, biotic and a-biotic resource rucksack and CO_2 emissions) or existing national terms of references (nitrogen phosphor and humus-balance). For the water-rucksack a benchmarking approach based on the Water Exploitation Index (EEA 2012) of the watershed was developed to account for local differences in the water availability and the overall situation in a water-shed.

We apply a process that explicitly involves stakeholders (farmers, subcontractors, suppliers, packer and agricultural extension officers) in the refinement and adaptation of monitoring and benchmarking. This participative process also serves as a discussion and knowledge transfer arena, helping the experts to learn from practical experience and the farmers to access information about alternative approaches.

RESULTS

The program was launched in 2010, with Austrian Strawberries being the first labeled product. By now about 550 farmers and their associated suppliers are participating in the program. 30 Products have been screened from which 25 could be labeled. The products are mainly vegetables and fruits produced in Austria. Italian grapes are currently the only international product labeled. Vegetables and citrus from Spain have been screened, but due to the unsustainable water situation have not been labeled yet. Anyway the process initiated in Spain has led to a dialogue on water management practice and might lead to a range of producers to improve their water management. Beside vegetables and fruits eggs also have been labeled.

In terms of creating concrete impact, we achieved reductions in CO_2 emissions and biotic and abiotic resource use for example through showing that the impact of transport packing is much higher than the transport distance which led to an significant increase of reusable transport-boxes. Also through the assessment and adaptation of packaging the environmental footprint of products was reduced.

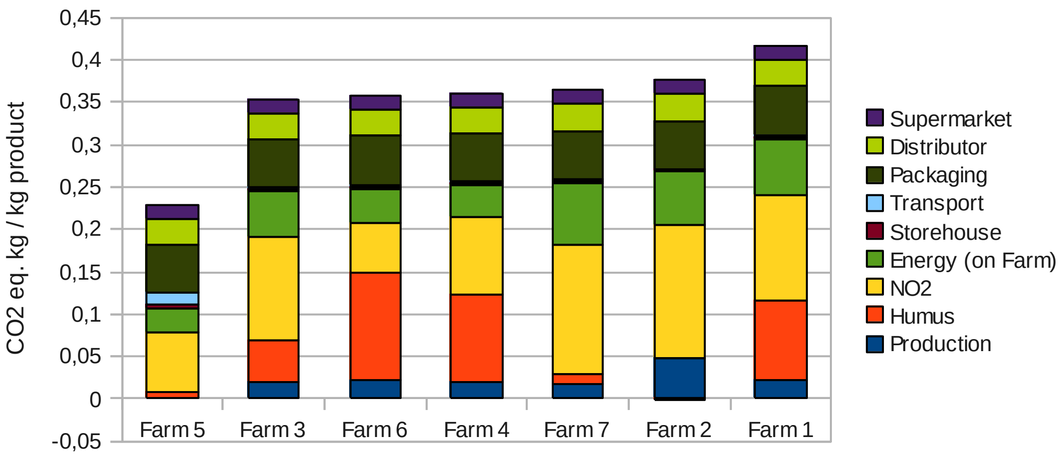

Figure 1: CO2 eq. per kg sweet maize and level od origin. In average soil carbon loss contributes to 16% of total CO2 emissions from field to shelf.

We could also show that in many vegetable production systems reduction of soil carbon content was a considerable contribution to the CO_2 footprint of the product (figure 1). These losses could be traced back to a lack of organic fertilization and insufficient crop-rotation. With the information provided by the program 15 farmers decided to change their crop-rotation or fertilization-management in 2012 to avoid humus loss. The information was also shared with the farm-extension officers that advise the farms.

CONCLUSIONS

Environmental impacts of production and consumption are best linked to production units that are the commonly used by consumers – i.e. kg or pieces. This will make the results useful for the consumers and the retailers at the point of sale and can potentially create a competitive environment around the environmental performance of the products.

A methodology to calculate the environmental impact of products should:

(1) Incorporate indicators that cover both product-specific impacts, in our case: N-, P- and humus-balance, Pesticide-Index, and general impacts like CO_2 emissions, waterfootprint, resource use and land-footprint to allow comparability between diverse product categories.

(2) Rest as much as possible on already available data, which farmers have to record either for certification or subsidies. This also has the additional benefit that external controlling protocols for this data already exist, that ensure the quality and accuracy of the data.

(3) Be as easy to calculate and understand as possible – especially if many small or medium sized businesses are involved. Here the MIPS indicators clearly have an advantage over the product-specific indicators. The models used are often “black-boxes” for all non-experts and can raise distrust and doubt.

(4) Provide information that are also relevant for good management practice like nitrogen-balance, humus-balance and phosphor-balance, which are indicators that farmers are aware of as part of their daily work and which support them in making reasonable economic decisions.

(5) Point to hot spots and enable to easily communicate improvements, if hot spots are solved.

(6) Help decision making by providing information on different aspects of the system and on tradeoffs. For example reducing the heating in a glasshouse production may decrease the direct energy demand but might increase the use of fungicides.

(7) Involve stakeholders in the design and continuing improvement of the process. Discussing results and the methodology with all relevant stakeholders will help to increase the efficiency of the data collection, the acceptance of the process and the development of solutions.

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