

# Resource productivity for higher education in food and nutrition

Holger Rohn<sup>1</sup>, Prof. Dr. Petra Teitscheid<sup>2</sup>

<sup>1</sup> Wuppertal Institute for Climate, Environment and Energy, Wuppertal, Germany / Trifolium –  
Beratungsgesellschaft mbH, Friedberg, Germany

<sup>2</sup> University of Applied Sciences, Münster, Germany/  
iSuN Institute of sustainable nutrition and food production

Speaker: Petra Teitscheid

Corresponding author: Holger Rohn, [holger.rohn@wupperinst.org](mailto:holger.rohn@wupperinst.org)

## Abstract

Sustainability is a central issue in food business and food retailing since approximately 3 years (See Teitscheid 2011). Various influential factors are significant for this development. On the one hand consumers choices are changing (See GFK et al. 2009). They are looking for natural, good and healthy food; they have a longing for home and an intact world (See iSuN 2010). The image of a highly efficient, but often ruthless industrial food production in regards to mankind and nature is not appropriate here. On the other hand, raw materials are scarce and, thus, very valuable. Bad harvests, mostly interpreted as a result of climate change, worldwide increasing consumption and the production of food in favor of energy production instead of nutritional aims, lead to a re-evaluation of agricultural resources and their producers. Within this context, food industry is searching for new forms of cooperation and partnership along the value chain in order to secure their resource basis.

In the light of their significant environmental impact, an increasing number of companies also start to work on the environmental assessment and optimization of their products and value chains. Therefore they need employees with valid knowledge and competencies in sustainability and resources management. Based on this demand, the master's program "Sustainable Services and Nutrition Management" started in 2009 in the University of Applied Sciences in Münster (Germany)<sup>1</sup>.

This text reports about how the topic of resource efficiency in food/nutrition industry has been integrated within the study program, which projects have been worked on and what experience could be gained from them.

*Keywords:* food & nutrition, higher education, resource productivity, ecological backpack, material footprint

## 1 Introduction

Within the field of nutrition numerous important social, ecological and economic aspects are involved: The food industry belongs to the most significant economic sectors worldwide and the increasing population will cause a growing demand on food. Changing lifestyles, especially the global rising consumption of meat and dairy products enhance environmental damage like erosion, soil degradation, biodiversity reduction, climate change etc. Concerning resource consumption, the share of the food sector is worldwide very high – in Germany it amounts to approx. 20%. To work towards sustainability in companies, it is crucial to

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<sup>1</sup> [www.fh-muenster.de/fb8/](http://www.fh-muenster.de/fb8/)

optimize both the products and their ingredients and the production processes along the entire value chain in relation to ecological, social, and economical aspects. More and more companies in the food industry start to take these challenges into account. Improving resource efficiency on a company level is an important starting point nowadays with a win-win situation both economically as well as environmentally.

The University of Applied Sciences in Münster educates experts in nutritional science, who should be able to implement the relevant sustainability strategy of companies. These experts for sustainable nutrition require “thinking in entire value chains” in order to reach the full innovative potential. As “cross-function thinkers” they should be able to check traditional ideas and methods in regards to their reasonableness and generate proposals for changes within the framework of business, politics and society.

**2 The overall design of the master program**

The consecutive Master’s program “Sustainable Services and Nutrition Management” started in 2009 and consists of 120 Credit Points (CP) over a period of 2 years. 50 CP contain no options modules, 30 CP contain optional modules. The rest - 40 CP – include the practically orientated project (5), a case-study (5) and the master thesis (30).

This master program is one of a kind in Germany. It concentrates on one central field of demand– nutrition – and considers through a cross-functional perspective the entire value chain: from the breeding of agricultural raw-materials, processing, consumption and up till recycling/disposal. In addition, the students learn which ecological, economical and social impact the way of food production and consumption has and which political and market driven tools can be used to improve the situation effectively (See overview table 1).

Management orientated courses	Courses about social and ecological framework
<ul style="list-style-type: none"> <li>• Producing sustainably in the food system</li> <li>• Sustainability Management</li> <li>• From Total Quality Management to Sustainable Excellence</li> <li>• Resource efficiency of products and services</li> <li>• Product and concept optimization in the innovation process</li> <li>• Sustainable Product Development</li> <li>• Eco-Marketing</li> <li>• Sustainability in hotels, restaurants and catering services</li> <li>• Sustainable consumption</li> </ul>	<ul style="list-style-type: none"> <li>• Ecology and sustainability</li> <li>• Environment and Justice</li> <li>• Challenges to sustainable food systems from a global perspective</li> <li>• Sustainability in political action spaces</li> <li>• Consumer behavior and food culture</li> <li>• Analysis of social structures, life situations and lifestyles</li> </ul>

**Table 1:** Overview: Courses of the Master’s Programm “Sustainable Services and Nutrition Management”

From the perspective of this master’s program, product development is seen as a central tool for creating and developing innovation and resource preserving food products. Through their supply strategy nutrition companies have a vital impact on ecological performance of the

entire value chain. By specific supply arrangements (low price, convenience, frozen, to go products etc.) the companies are able to affect and manifest vital structures simultaneously, which are necessary for the production and consumption of their products (e.g. equipping households with freezers and microwaves, presenting the goods in stores, infrastructure for the procurement of raw materials) and, thus, simultaneously affect the resource consumption. For this reason the master's program sees the „Product and Service Resource Efficiency” course closely connected to the management and product development courses. The students should learn to assess the consequences of their decisions according to economic and environmental criteria.

### **3 Modules connected to resource productivity**

The topic of resource productivity is anchored throughout various points within the master's program. Amongst the most important are the following:

#### Module “Sustainability Management” (10 CP)

This mandatory module covers the background of sustainable management in companies. Next to the theoretical introduction, specific instruments for companies are presented in order to improve their sustainability performance. Within the area of resource efficiency an overview of company (e.g. PIUS, materials-flow analysis) as well as product related instruments (e.g. product related materials-flow analysis, material footprints) are covered.

#### Module „Resource efficiency of products and services” (5 CP)

In this module students learn the background and selected instruments about the resource efficiency topic of products in more detail and learn how to apply concepts such as the ecological footprint on specific food products, i.e., food groups through case-studies. During the work on the case-studies, students are to learn not only to think in life-cycles and complex value chains, but also to primarily learn how to single-handedly calculate the material footprint for specific products (See Schmidt-Bleek 1994, Ritthoff et al. 2002, Lettenmeier et al. 2009). The identification of optimization potentials and the result reflection conclude the module.

#### Project „Resource efficiency” (5 CP)

Within the project module students work single-handedly on company specific problem statements. Thus, for instance, an analysis about where the highest resource efficiency potentials within the value chain are or which resource use demands purchasing from different cultivation regions or which production requires various technologies.

#### Project „Sustainable and resource efficient product development” (5 CP)

Questions of resource efficiency and „product development should be linked more closely. Usually during the food product design the most important factors are: the recipe, perception (sensor system: taste, smell, texture) and marketing. An analysis of resource use is mostly performed only for packaging. In the framework of projects with companies, the master's students in Münster are developing a product design approach, which combines both perspectives, the traditional and the resources perspective and which includes food products and packaging.

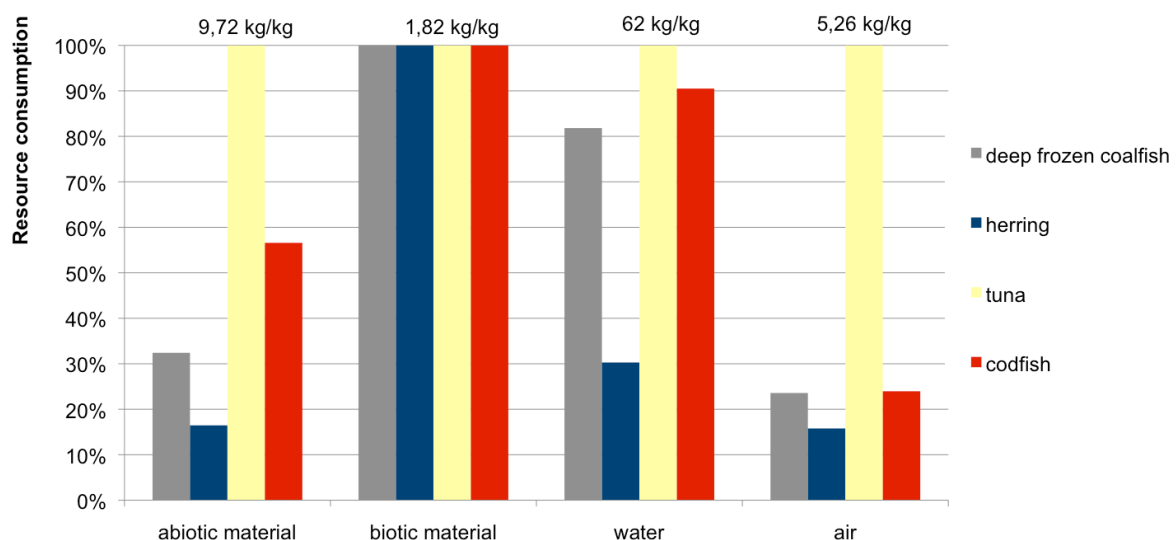
#### 4 Student projects on material footprints for different foodstuffs

As already discussed in part three within the scope of the various modules named, students analyzed different foodstuffs' value chains and calculated their ecological footprints. Some of them have widened their knowledge base within this context through project work. Such projects comprised e.g. the calculation of the material footprint from various tee brands, selected menus from the communal feeding and samples from the fields of fish, fruits and vegetables. The later was conducted within the framework of the research project "material efficiency and resource conservation" (MaRes, see also <http://ressourcen.wupperinst.org>) and will, thus, be shortly described in the following.

In the MaRes project WP 1 "resource efficiency potentials of technologies, products and strategies" main topics which are expected to carry high resource efficiency potential in Germany have been identified. Seven fields of action with "Top20 topics" were worked out including the important field of food for which both production and consumption need to be considered (see Rohn et al. 2010). The analysis of potentials for the "Top20 topics" was carried out in a Diploma Thesis program in the framework of a network of experts along defined consistent guidelines. Together with the University of Applied Sciences in Münster, resource efficiency potentials of food production were analysed with the examples of fish, fruits and vegetables.

Selected results from the analysis with fish are demonstrated in the following:

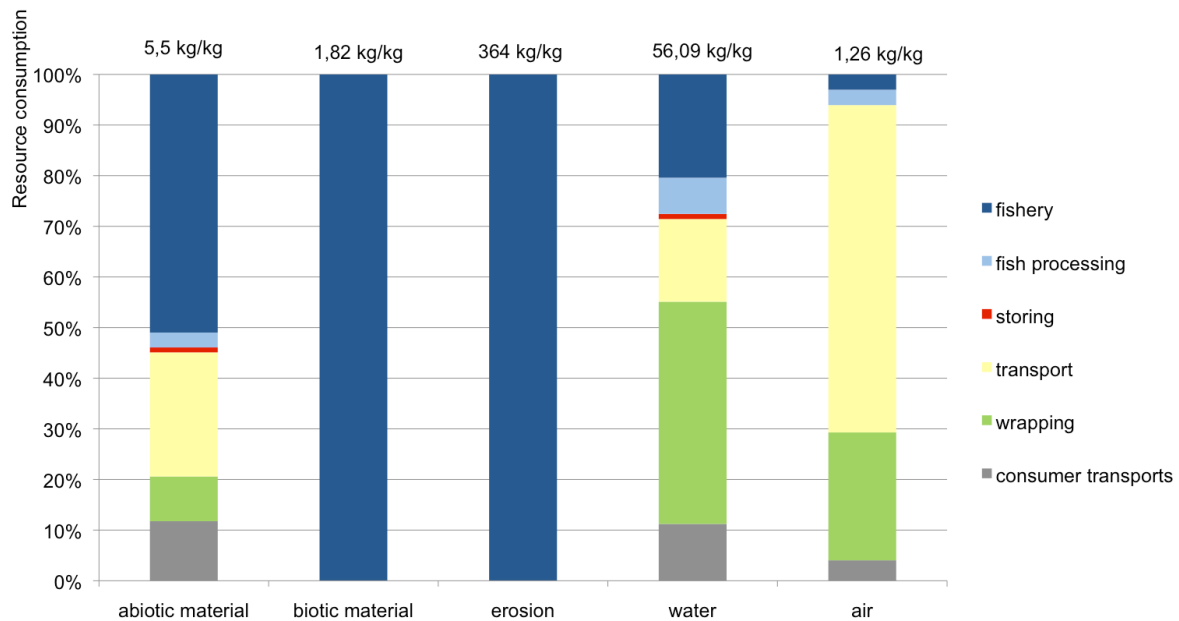
Fish is becoming an ever more important foodstuff as shown by the increasing per head consumption per German citizen of already 15.6kg (fishing weight) in the year 2008. Henceforth, the field of fish as foodstuff was analysed. The aim was to determine resource efficiency potentials with the examples of Alaskan coalfish, herring, codfish, and tuna in various processing stages and fishing regions. Considering the fishing methods (see figure 1) two important factors appear, which have a significant impact on the resource consumption. One factor is the by-catch during fishing comprising approx. 40 % of the whole catch, which is demonstrated by the resource category: biotic material.



**Figure 1:** Comparison of the resource consumption of the different case studies

E.g. figure 2 shows that during conventional codfish fishing methods 1.82 kg biotic material per kilogram are used to produce ready-to-eat codfish. Here the other resource category is

also clearly visible – erosion – whereby through conventional codfish fishing methods 364kg/kg of sea bed is stirred-up and, thus, injured.



**Figure 2:** Codfish: resource consumption for fishing and processing to a deep-frozen filet state

Sustainable fishing methods, which cause less sea-bed movement, could minimize these negative consequences of intervening with the natural eco-system - „sea-bed“. This aspect has only been minimally considered in the scientific discussion and should be analyzed in greater detail in the future. Moreover, the relatively large by-catch amount should be reduced, ideally by using more efficient fishing methods and tools (see Lukas et al. 2010).

## 5 Lessons learned from first 3 years experience with the resource efficiency as part of the master’s program

The overall feedback from students in regards to the topic of resource efficiency within the various modules (See section 3) can be described as very good. This includes not only the selection of optional modules, but also their participation in projects and feedback about the study materials and methods. The following exemplary points have been regarded as especially good: the practical applicability of the topic to future jobs, the close link between ecological and economical aspects, discovering potentials for improvement and studying in terms of value chains i.e. consider complete product life-cycles.

The study material contents reveal the specifications of the analysis of value chains for foodstuffs and the nutritional field as such. Hence, the resource consumption calculation for foodstuff is comparatively difficult in regards to e.g. seasonality, varying cultivation methods, regional differences and harvest volatility. However, compared to use-phase intensive goods such as cars, the calculation is less complex due to simpler consumption i.e. recycling and disposal phases.

Overall, the topic of resource efficiency in food and nutrition demonstrates the imperative link between production and consumption very apparent. Both possess very different yet complementary options for action and potentials. Above all, the nutritional field is exemplary

to show each individual how through their consumption decisions they can make a change, which demonstrates the link to each individual's daily life choices.

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