

The following is the authors' own translation of a conference paper¹ entitled *Klassifikationssysteme für verarbeitete Lebensmittel: Ein Vergleich* presented at the 15th Scientific Conference on Organic Agriculture, held from 5th – 8th March 2019 in Kassel, Germany. Addenda: Supplementary material has been added to the translation and denoted in angle brackets.

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Oral paper: Classification systems of processed food: a comparison

Authors: Lisa Borghoff, Carola Strassner

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Abstract: *Within nutrition science several classification systems for processed food have been developed, e.g. by the IFIC or the IARC. In Germany, Werner Kollath developed a classification system for wholefood nutrition in the 1940s, which was later the basis for the classification system of von Koerber et al. A more recent classification system called NOVA was developed in Brazil and is now used in various public health research studies. The three systems all classify processed food in different ways. This paper gives an overview of the three systems, analyses their similarities and differences and explores their application to organic processed food.*

Introduction

The demand for highly processed food influences the whole food system, from agriculture to the nutritional status of a population. <The grade of processing has different effects: A higher processing grade goes along with a higher impact on the environment, mostly due to the need for energy during processing, but also because of wastes that go along with processing (von Koerber et al. 2004, p. 148-149; Kroyer 1995). The household availability of ultra-processed foods is associated with an increased risk of diet-related non-communicable diseases (Monteiro et al. 2017). Many ultra-processed products are produced by just a handful of producers which leads to a market concentration (Global Panel on Agriculture and Food Systems for Nutrition 2016, p. 91-92).> There are several systems with which processed food can be classified and they all have a different focus, e.g. the classification systems of the International Food Information Council Foundation (IFIC) or the International Agency for Research on Cancer (IARC). In Germany, Kollath developed a table of food

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classification for his “Vollwert-Kost” (wholefood nutrition) prior to the middle of the 20th century. Later von von Koerber, Männle and Leitzmann revised the table of orientation for the "Gießener Vollwerternährung", a form of wholefood nutrition that also includes environmental and social aspects of food. (von Koerber et al. 2004) In international scientific research other food classification systems are used, such as the NOVA classification that was developed in the first years of the new millennium in Brazil (Monteiro 2012). This article presents and compares these three classification systems with particular regard to the role of organic food within the classifications. The results are part of the CORE-organic project *ProOrg*.

Methods

The electronic databases Livivo and Orprints were searched for national and international entries about food classification systems in the ten years between 2008 and 2018. Also, a search with the same parameters was conducted in Google Scholar. The chosen food classification systems were the systems by Kollath and the system of the "Gießener Vollwerternährung", which are popular in German speaking countries. As a third system the NOVA food classification was selected, for it is used worldwide <and is the newest food classification system (2018). These three systems were the most prominent in the search results; other food classification systems were found later on and taken into account in the WP5-Report of the research Project ProOrg.> For the analysis of Kollath’s system and the system of the "Gießener Vollwerternährung" the central references were used, for the NOVA classification the specialized articles found in the literature search were used. Table 1 shows the aspects by which the classification systems were examined.

Table 1: Aspects by which the selected classification systems of food processing were examined

aspect	definition
origin	Historical roots and actuality
criteria	Criteria for food classification into categories and logic
organic	Explicit entry in the classification system or in the associated texts

<Consumers expect organic products to be healthier and more natural (von Alvensleben 2001; Schleenbecker & Hamm 2013, p. 423). If more natural is understood to mean closer to the form occurring in nature then the more processed a food is the less it would correspond. From this it may follow, that organic food products might be found in highly processed forms. Therefore, additionally, the processing grades of some organic food products available in the German organic food market are examined according to the systems.>

Results

Nutrition Table "The Order of our Foods" according to Prof. Werner Kollath (Vollwert-Kost)

Kollath developed his food classification system on the basis of the nutritional writings of the Swiss clinician Bircher-Benner that are linked to the Life Reform movement. He also performed on his own animal feeding experiments. In 1941 he published his research in his main work "Die Ordnung unserer Nahrung" (The order of our food), which was last edited in 1960. Newer editions are featured with commentaries about interim research findings, the

authors of this annex are Watzl and Leitzmann. Kollath distinguishes six stages with increasing degree of processing and correspondingly decreasing value (Table 2 below). He justifies this evaluation with the decreasing content of so-called vital substances (vitamins and minerals) due to processing but at the same time takes into account the better bioavailability of individual nutrients after processing. Kollath recommends eating mainly of the products of the first four value levels. Jam, for example, is designated a conserved food in his table (stage 5), white flour noodles are allocated to prepared food (stage 6). A direct reference to organic food is neither found in Kollath's writing nor in the food classification table. However, he describes the importance of a soil-preserving primary production for the health effect of a food and calls for a resource-saving use of technical innovations. (Kollath 2005) Applying the categories to organic foods we find that organic food products can be found in all six value stages.

Table 2 Food classification categories by Kollath (own table, based on Kollath (2005, pp. 34-35); literal translation)

Living food			Dead food		
natural	changed mechanically	changed by fermentation	heated	conserved	prepared

Table of orientation for wholefood nutrition by von Koerber et al.

This food classification system by von Koerber et al. is a subsequent development of Kollath's table of food classification. It was first published in 1981, the last edited version is from 2004. The wholefood diet considers not only the nutritional value of food, but also environmental, social and economic aspects. In this dietary regimen, food should be environmentally compatible, organic, local, seasonal and as fair as possible, which is not explicitly mentioned in the table of orientation. The classification system comprises four (originally five) stages of value (Table 3 below). According to the proponents, a healthy diet should be based on products from stages one and two in equal parts. Some products of these levels e.g. honey should be consumed only moderately. Higher order processed food should be eaten rarely, because this is often nutritionally unfavourable. Also, these foods may contain additives that can trigger allergic reactions in sensitive people (Schwarz 2004, p. 124). Such products are e.g. nougat spreads or soy meat replacements. The effects on health, costs for consumers and environmental as well as social aspects of this diet have been studied by the University of Giessen. The assessment of nutrient supply according to the guidelines of the DGE was positive and also the costs for this diet are not higher than a standard German diet (von Koerber et al. 2004; Foterek et al. 2009). Application of the classification system to the full organic product range available in Germany today shows that available organic foods can be allocated to each category.

Table 3 Table of orientation for wholefood nutrition (own table, based on von Koerber et al. (2006, pp. 190-191); literal translation)

Highly recommended	Highly recommended	Less recommended	Not recommended
not processed or minimally processed food (not heated)	Moderately processed food (mostly heated)	Highly processed food (mostly conserved food)	Over-processed foods, isolates, supplements

NOVA food classification system

In light of the low importance of food processing in current dietary recommendations, Monteiro et al. developed the NOVA food classification system at the University of São Paulo in Brazil and first published it in 2010 (Monteiro et al. 2010). This system does not focus on nutrients or individual foods, but product groups based on their processing. It comprises four (previously three) levels of value (see Table 4). The basis of a recommended diet are level 1 foods, prepared with level 2 products and supplemented with limited quantities of level 3 products. Level 4 products should be eaten rarely, because they have a negative impact on health, culture, social life and the environment. They cannot be called "real food" (Monteiro et al. 2012, p. 531-532). The influence of the agricultural method or type of breeding system on the nutritional content and taste of the food is recognized by NOVA, but it is deliberately not included in the classification system in order to keep it as simple as possible. Organic agriculture is not mentioned in the literature used (Monteiro et al. 2012, 2016; Moubarac et al. 2014). In the German market food products of levels 1 through to 4 are available in organic quality, e.g. frozen pizza (level 4).

Table 4 The NOVA classification (own table, based on Monteiro et al. 2012)

1 Unprocessed and minimally processed food	2 Processed culinary ingredients	3 Processed food	4 Ultra-processed food and drink products
Animal/vegetable food, mushrooms, seaweed, water	Necessary for meal preparation, e.g. oil	Combination of levels 1 and 2 products; sensory and durability characteristics are changed	They contain substances that are not used for meal preparation in the normal household

Discussion

The three classification systems separate food into different levels of value based on their degree of processing. These three systems assume a consumer perspective. There are some parallels between the table of orientation for wholefood nutrition by von Koerber et al. and the NOVA classification system, while the table of food classification by Kollath differs more. All three systems have in common that they value food by their degree of processing; a higher grade of processing lowers the value of the product. Both Kollath's system and the NOVA classification system no longer refer to the highly processed products as food because they lack the crucial quality for this denomination. Consumers are advised to predominantly eat products with a low level of processing and avoid highly processed foods. The primary production of food is considered in all three systems. The wholefood nutrition by von Koerber et al. gives the strongest advice on organic food; only within this diet is the term "organic food" mentioned and it is highly recommended. <However, organic foods are found in all categories of processing in all three classification systems. Therefore, we cannot conclude that an organic product is always recommendable with regard to these classification systems. For example, within the NOVA classification system, an organic ultra-processed food will still be an ultra-processed food that should be avoided. So, consumers who aim for a healthy diet cannot only focus on the organic quality of a product, they still have to consider the processing grade of the product, if they follow one of these classification systems. The question remains open, whether an organic product with a high processing grade is still a better choice than a non-organic one, for consumers expect

organic products to be healthier (see above). The EU Organic Regulation states that processing shall be done with care and should not alter a product in a way that would be misleading regarding the true nature of the product. The same goes for additives, which are restricted in number (EC 2007). So, according to this regulation, processed organic food should be a better choice within the three classification systems, but here possible processing differences need to be examined to verify this.>

Conclusion

<It seems likely that the processing of food will be a relevant topic in public health in the near future and that the NOVA food classification system could play an important part.> It reached a political dimension in 2014, when it was integrated into the Brazilian dietary guidelines. <Within these guidelines, a diet based on minimally processed plant food is recommended. Animal products shall only be an addition to the plant-based foods, because this is healthier and better for the environment as well as the local communities. Here the advice is given to prefer organic foods because in this way the consumer supports sustainable food production. (Ministry of Health of Brazil 2014, pp.26-32) Until now (July 2019) there is no other dietary recommendation that uses the NOVA food classification system in the same way as the Brazilian Guidelines do, but several can be found wherein it is said that ultra-processed products should be avoided, e.g. the recommendations of France, Belgium, Uruguay and Ecuador. (Santé publique France 2019; FAO 2019) French consumers can already use an app to scan food products and find out which processing grade of the NOVA food classification system these have (Michail 2018). The developer of this app states that it is also a help for producers to improve the quality of their products through reformulation based on the concept of ultra-processed products. The processing grade may also become relevant within the organic food processing sector, because of the special expectations consumers have (see above).> To support the organic sector, a guideline for the careful processing of organic food will be developed in the ProOrg project.

References

- Kollath W (2005): Die Ordnung unserer Nahrung. 17., unveränderte Auflage, Haug-Verlag, Stuttgart.
- von Koerber K, Männle T & Leitzmann C (2004): Vollwert-Ernährung. Konzeption einer zeitgemäßen und nachhaltigen Ernährung: mit 63 Tabellen und 16 Übersichten. 10., vollst. neu bearb. und erw. Aufl. Haug, Stuttgart.
- Monteiro CA, Cannon G, Levy RB, Claro R, Moubarac J-C, Martins AP, Louzada ML, Baraldi L, Canella D (2012): The food system. Ultra-processing. The big issue for nutrition, disease, health, well-being. *World Nutrition* 3(12):527-569.
- Monteiro CA, Cannon G, Levy R, Moubarac J-C, Jaime P, Martins AP, Canella D, Louzada M, Parra D, Ricardo C, Calixto G, Machado P, Martins C, Martinez E, Baraldi L, Garzillo J, Sattamini I (2016): NOVA. The star shines bright. *World Nutrition* 7 (1-3): 28–38.
- Moubarac J-C, Parra DC, Cannon G, Monteiro CA (2014): Food classification systems based on food processing: significance and implications for policies and actions: a systematic literature review and assessment. *Current Obesity Reports* 3(2): 256–272.

Added Sources

- EC (2007): Council Regulation (EC) No 834/2007 of 28 June 2007 on organic production and labelling of organic products and repealing Regulation (EEC) No 2092/91
- Food and Agriculture Organization of the United Nations FAO (2019): Food-based dietary guidelines. Online available at <http://www.fao.org/nutrition/nutrition-education/food-dietary-guidelines/en/> [26.07.2019].
- Foterek K, Mertens E, Schneider K, Claupein E, Spiller A, Hoffmann I (2009): Kostenvergleich von Ernährungsweisen mit einem unterschiedlichen Anteil pflanzlicher Lebensmittel. Poster auf dem 46. Wissenschaftlichen Kongress der Deutschen Gesellschaft für Ernährung, Gießen, März 2009 Proc. Germ. Nutr. Soc. Vol. 13, 38, 2009.
- Global Panel on Agriculture and Food Systems for Nutrition (2016): Food systems and diets: Facing the challenges of the 21st century. London, UK.
- Kroyer G Th (1995): Impact of Food Processing on the Environment – an Overview. *Lebensmittelwissenschaft und Technologie* 28: 547-552.
- Michail N (2018): ScanUp: The app that tells consumers of food is 'ultra-processed' and helps manufacturers reformulate. *Food Navigator*, 04-Dec-2018, last updated on 14-Dec-2018. Online available at <https://www.foodnavigator.com/Article/2018/12/04/ScanUp-The-app-that-tells-consumers-if-food-is-ultra-processed-and-helps-manufacturers-reformulate> [26.07.2019].
- Ministry of Health of Brazil (2014): Dietary Guidelines for the Brazilian population / Ministry of Health of Brazil, Secretariat of Health Care, Primary Health Care Department; translated by Carlos Augusto Monteiro – Brasília.
- Monteiro CA, Cannon G, Moubarac J-C, Levy RB, Louzada MLC, Jaime PC (2017): Household availability of ultra-processed foods and obesity in nineteen European countries. *Public Health Nutrition* 21(1): 18-26.
- Monteiro CA, Levy RB, Claro RM, de Castro IRR, Cannon G (2010): A new classification of foods based on the extent and purpose of their processing. *Cad. Saúde Pública*, Rio de Janeiro, 26(11):2039-2049.
- Santé publique France (2019): Recommandations sur l'Alimentation, l'Activité physique & la Sédentarité pour les Adultes. Dossier pédagogique. Online available at <https://www.santepubliquefrance.fr/content/download/35744/683783> [26.07.2019].
- Schleenbecker R & Hamm U (2013): Consumers' perception of organic product characteristics. A review. *Appetite* 71: 420-429.
- Scharz M (2004): Vermeidung von Nahrungsmitteln mit Zusatzstoffen. In: von Koerber, K et al. (2004): *Vollwert-Ernährung. Konzeption einer zeitgemäßen und nachhaltigen Ernährung: mit 63 Tabellen und 16 Übersichten*. 10., vollst. neu bearb. und erw. Aufl. Haug, Stuttgart.
- von Alvensleben R (2001): Beliefs Associated with Food Production Methods. In: Frewer LJ, Risvik E, Schifferstein H (eds): *Food, People and Society*. Springer, Berlin: 381-399.