RMMA

Initiative zur Erforschung einer umweltverträglichen nachhaltigen Ressourcenbewirtschaftung

Ressourcen Management Agentur

“Natürlich gut Teller” – impact analysis

(Research project: NGT - W)

Final report


„wir sind“
Klimabündnis
Betrieb

RRRRMMMMAAA

Initiative zur Erforschung einer umweltverträglichen nachhaltigen Ressourcenbewirtschaftung

Ressourcen Management Agentur

“Natürlich gut Teller” – impact analysis

(Research project: NGT - W)

Final report

(Vers. 1.0)

Hans Daxbeck
Franziska Schindler
Alexandra Weintraud
Nadine Müller
Stefan Neumayer

On behalf of
ÖkoKauf Wien

Vienna, December 2017

Project management:
Hans Daxbeck

Project administration:
Hans Daxbeck
Franziska Schindler
Alexandra Weintraud
Nadine Müller
Stefan Neumayer

Responsible for content:
Resource Management Agency (RMA)
Initiative for promotion of environmentally compatible and sustainable resource management

Argentinierstraße 48/2nd floor
1040 Vienna
Tel.: +43 (0)1/913 22 52.0
Fax: +43 (0)1/913 22 52.22
office@rma.at; www.rma.at

Summary

The “natürlich gut Teller” (NGT), as an important key project of Municipal Department 22 – Environmental Protection and ÖkoKauf Wien, was developed in 2010 in cooperation with “die Umweltberatung”. The goal of the “natürlich gut Teller” is to identify those dishes that stand out through their environmental friendliness and (organic) quality and thus make a contribution to the sustainable development of communal catering in Vienna. The “natürlich gut Teller” also helps to implement the UN’s Sustainable Development Goals, the Milan Urban Food Policy Pact and the Austrian health targets in Vienna.

A “natürlich gut Teller” meal MUST contain organic and seasonal ingredients and is characterised by a reduced amount of meat (which must be organic) as well as fish from sustainable fishing. In addition, two of 6 TARGET criteria must be met: mainly plant-based, regional, fair, low processing level (max. convenience level “ready-to-cook”), no portion packaging and innovative. At present (2017), approximately 16,000 NGT portions are served each week in 35 canteen kitchens.

After 7 years, the effects achieved by using the “natürlich gut Teller” will be determined for the period 2011 – 2016. The impact analysis covers the areas of the economy, environment and society. For the criteria, basic and background information is researched which is necessary to quantify and describe the economic, ecological and social impacts arising from the use of the “natürlich gut Teller”. The raw data on the number and composition of “natürlich gut Teller” dishes comes from the annual final reports of “die Umweltberatung”. Furthermore, it also comes from users who provide data and, if necessary, evaluations on their purchase of food and food consumption during the evaluation period.

During the project period of the “natürlich gut Teller” it was not intended to collect or regularly record data in a structured manner for an accompanying or retrospective impact analysis. Therefore the available data is incomplete and very heterogeneous with regard to the information necessary to quantify the impacts of the “natürlich gut Teller”. Missing but necessary information is estimated or interpolated on the basis of existing individual results. Overall, as a result, the impacts of the “natürlich gut Teller” are rather underestimated in the present study.

Around 20% of guests choose the “natürlich gut Teller” (NGT). With a total of around 4.4 million lunches, this means around 800,000 NGT meals a year and 2,000 NGT meals a day. In the period 2011 – 2016, around 4.4 million “natürlich gut Teller” meals were therefore served. Of these, in terms of the number of meals, 56% are vegetarian, 24% contain fish and 20% contain meat.

In terms of mass, the “natürlich gut Teller” consists of 87% vegetables, salad and fruit. This confirms compliance with the target criterion that at least 2/3 plant-based ingredients are to be used. Furthermore, the purchasing figures show that the entire share of vegetables, fruit and meat comes from organic production. This mandatory criterion is also confirmed with

40% fresh fish from local production and 60% MSC-certified fish. Between 60% and 80% of the fruit and vegetables are bought seasonally, around 40% to 60% of the food used comes from the region.

The awareness-raising effect of the NGT criteria on changes in the overall purchasing behaviour of kitchens is clear. In the case of fruit and vegetables, more than twice as many goods from organic production are purchased than are necessary for the NGT. In the case of meat, this is three to four times the amount. A similar situation can be expected for regional and seasonal purchasing. Meat portions have generally been reduced by between 22% and 50%, even though afterwards they often exceed the 90 g limit and are therefore not relevant for labelling as “natürlich gut Teller”. And based on calculations it would be possible to prepare the NGT entirely with local fish. The consumption of convenience products was halved during the project period.

Between 2011 and 2016, around 1,420,000 kg of fruit and vegetables and 79,000 kg of meat from organic farming were processed[1]. This ensured the continued existence of 2-3 organic farms and 63 cows, 374 pigs and 6,600 chickens were kept in species-appropriate conditions. Through the seasonal purchase of 1,140,000 kg of fruit and vegetables, up to 870 million tkm of truck trips were avoided and 78,000 t $CO_{2\ eq.}$ of greenhouse gases were prevented. The criterion “reduced meat portions” saved up to 53,000 kg of meat and thus saved up to 317 cows from slaughter. This reduction in livestock saved around 1,390,000 m^3 of virtual water. The purchase of local fish secured a pond culture with about € 900,000. The purchase of MSC fish prevented around 30,000 kg in bycatch.

With the impact analysis, the following conclusions can be drawn for the “natürlich gut Teller” (NGT):

- The existing criteria are easy to apply and yet effective and are respected and often exceeded.
- The NGT has an awareness-raising effect that fundamentally influences the procurement behaviour of the kitchens beyond the NGT dishes. As a result, the effects multiplied by a factor of 2 to 4.
- When adjusting the criteria list, it must be ensured that the simple applicability of the criteria is maintained. The criteria for fish (unsuitable according to MSC; being revised by ÖkoKauf) and for reduced meat portions (90 g not very practical) seem to need revision. Criteria that are difficult to quantify (e.g. innovative meals) should be clarified or replaced by criteria on current sustainability issues (palm fat, rice from dry cultivation, no use of tropical fruits, evaluation of energy-intensive cooking processes such as cook & chill).
- Consultation in the initial phase should help ensure the correct use of the NGT but subsequently, in addition to ongoing quality control, should support the long-term

[1] and a further 1,500,000 kg of organic fruit and vegetables as well as 300,000 kg of organic meat were purchased which were processed into dishes without the “natürlich gut Teller” label.

modification of the menu and purchasing with the goal of sustainability and climate protection.

For the further development of the NGT, the following appear possible, for instance:
Coordination with similar labelling systems in the other federal provinces,
Criteria list for giving the NGT label to a weekly menu,
Extension to gastronomy For an ongoing and recurring impact analysis, it is helpful to request the necessary data from the participating kitchens on an annual basis. For this, the development of a data catalogue is necessary. It must be checked to what extent this data and its evaluations can be generated by the IT-supported ordering and warehouse management systems. The impact analyses drawn up from the data should also be made available to users on an annual basis so they can determine their own status and to help them communicate their successes to the outside world.

Contents

1 Introduction

The “natürlich gut Teller” is an important key project of Municipal Department 22 – Environmental Protection and of ÖkoKauf Wien. It was developed in 2010 in cooperation with “die Umweltberatung” and has been successfully tested in 3 canteen kitchens. The goal of the “natürlich gut Teller” is to identify those dishes that stand out through their environmental friendliness and (organic) quality and thus make a contribution to the sustainable development of communal catering in Vienna. With the help of sustainable food procurement and menu design there should be a positive impact on municipal food supply. The main reason for this is the targeted selection of food, e.g. the selection of food from organic farming where food is produced according to certain production methods that are intended to ensure environmentally compatible production and animal welfare. For the sake of simplicity, these foodstuffs are described in the following with the colloquial term “food from organic agriculture” or “from organic farming”, which is used synonymously here. The use of food from organic agriculture triggers a multitude of indirect effects. Compared to conventional agriculture, emissions to soil, air and water are significantly lower. The use of organic food increases the quality of agricultural soils and makes a positive contribution to biodiversity. The reduction of the meat content prevents the contamination of groundwater. At the same time, reducing the amount of meat in combination with an increased proportion of plant-based ingredients has a positive effect on human health and animal welfare. The “natürlich gut Teller” therefore makes a contribution to the goals “To provide access to a healthy diet for all” and “To secure air, water and soil and healthy environments for future generations” of the Austrian health targets [Bundesministerium für Gesundheit und Frauen (BMGF), 2012]. Through the regional and seasonal purchase of fruit and vegetables, an important contribution is made to strengthening local producers. In addition, there is a direct influence through a reduction in greenhouse gas emissions, especially CO_2, in the production of meals.

The “natürlich gut Teller” also makes an important contribution to achieving the UN’s Sustainable Development Goals, in particular Goals 2 “End hunger, achieve food security and improved nutrition and promote sustainable agriculture”. 8 “Promote inclusive and sustainable economic growth, employment and decent work for all”. 11 “Make cities inclusive, safe, resilient and sustainable”. 12 “Ensure sustainable consumption and production patterns” and Goal 14 “Conserve and sustainably use the oceans, seas and marine resources”. The following points are given as examples:

8.4: Improve progressively, through 2030, global resource efficiency in consumption and production and endeavour to decouple economic growth from environmental degradation, in accordance with the 10-year framework of programmes on sustainable consumption and production, with developed countries taking the lead.
11.8: Support positive economic, social and environmental links between urban, peri-urban and rural areas by strengthening national and regional development planning.
12.2: By 2030, achieve the sustainable management and efficient use of natural resources.
12.4: By 2020, achieve the environmentally sound management of chemicals and all wastes throughout their life cycle, in accordance with agreed international

frameworks, and significantly reduce their release to air, water and soil in order to minimize their adverse impacts on human health and the environment.

12.7: Promote public procurement practices that are sustainable, in accordance with national policies and priorities.

12.8: By 2030, ensure that people everywhere have the relevant information and awareness for sustainable development and lifestyles in harmony with nature.

12.10: Develop and implement tools to monitor sustainable development impacts for sustainable tourism that creates jobs and promotes local culture and products.

14.10: Enhance the conservation and sustainable use of oceans and their resources by implementing international law as reflected in UNCLOS, which provides the legal framework for the conservation and sustainable use of oceans and their resources, as recalled in paragraph 158 of The Future We Want.

Finally, there is reference to the Milan Urban Food Policy Pact. In this document there are several points of reference where the implementation of the “natürlich gut Teller” has a positive effect.

Since 2014 it has also been possible for catering companies to make environmentally friendly dishes visible at events with this quality label.

In order to achieve this goal, a criteria list has been developed. The cornerstones of the “natürlich gut Teller” are the promotion of organic food, the consideration of regionality, seasonality and lower meat consumption. Naturally organic, naturally seasonal, naturally less meat and naturally sustainable fish are the focuses of the “natürlich gut Teller”.

Criteria for canteen kitchens: 4 MANDATORY and 6 TARGET criteria

MANDATORY (quoted from the website[1]):

- naturally **organic**: At least one part of the dish is from organic agriculture. Organic farmers do not use chemical pesticides or fertilisers.
- naturally **seasonal**: Fruit and vegetables are only used when they are in season here. This reduces CO_2 for long transport routes and saves on heating for greenhouses.
- naturally **less meat**: And if meat is put on the plate, it is from organic agriculture because animal-friendly husbandry is obligatory here.
- naturally **sustainable fish**: If fish is put on the plate, it is only from Austria, organic or from sustainable fishing.

TARGET (quoted from the website[2]); two of the criteria must be fulfilled:

- naturally **plant-based**: The dish consists of 2/3 plant-based ingredients.
- naturally **regional**: In terms of quantity, the ingredients consist of 1/3 regional food.

[1] http://www.umweltberatung.at/ngt-kriterien-grosskueche/der-natuerlich-gut-teller-muss-kriterien

[2] http://www.umweltberatung.at/ngt-kriterien-grosskueche/soll-kriterien

- naturally **fair**: At least one component of the meal is FAIRTRADE-certified.
- naturally **self-made**: It does not contain any highly processed ingredients (convenience products).
- naturally **less packaging**: No portion packaging is used for the meals.
- naturally **innovative**: Creativity is required – to differ from typical Austrian home cooking.

Catering criteria: 8 MANDATORY criteria and 1 TARGET criterion[1]

MANDATORY:

- The catering company has the Austrian Ecolabel.
- In terms of value, the buffet contains at least a 1/3 share of organic products.
- Not more than 1/3 of the meals contain meat or the meat comes exclusively from local, organic agriculture.
- Fish comes exclusively from local or sustainable fishing.
- It is served on reusable dishes.
- Drinks must be offered in returnable containers, if available.
- Measures are taken to prevent food waste.
- At least 2/3 of the fruit and vegetable ingredients correspond to the season in Austria.

TARGET: one criterion must be fulfilled:

- The offer is preferably plant-based.
- In terms of value, at least a 30% share of regional products.
- Fair products are offered.
- No convenience products.

Currently (2017) 2 hospitals (Hospital Hietzing with Neurological Centre Rosenhügel (KHR), Socio-Medical Centre South – Kaiser Franz Josef Hospital (KFJ)), Therapeutic Centre Ybbs, 30 kitchens of the Retirement Homes Fund of the City of Vienna (KWP), Tommi Hirsch Catering and the College of Management and Services Industry Straßergasse (HLW 19) are working with the “natürlich gut Teller”. A total of around 16,000 “natürlich gut Teller” portions are currently served each week in these establishments.

After 7 years, the “natürlich gut Teller” will be subjected to an impact analysis.

[1] http://www.umweltberatung.at/ngt-kriterien-catering

2 Objective

The aim is to carry out an impact analysis of the “natürlich gut Teller”. For this purpose, the effects achieved in the last 7 years through the implementation of the “natürlich gut Teller” are determined. The impact analysis covers the areas of the environment, society and the economy.

The goal is to be achieved by determining the difference between a baseline without using a “natürlich gut Teller” and the current situation using the “natürlich gut Teller”. In order to assess the contribution of the “natürlich gut Teller” to sustainable development in the field of catering including communal catering, various sustainability indicators, such as those mentioned in the starting point, are used.

In addition, on the basis of the results of the impact analysis, suggestions are made – if necessary – for any further development of the “natürlich gut Teller”.

3 Methodological procedure

The starting point is the criteria for the “natürlich gut Teller” in communal catering [Knieli & Homolka, 2015]:

Mandatory criteria of the “natürlich gut Teller”

1. **Organic component:** The dish should contain at least one main component consisting of organic ingredients
2. **Seasonality**: The vegetables contained in the “natürlich gut Teller” must correspond to the seasonal calendar of the fresh vegetables cooperative LGV Frischgemüse in Vienna or the seasonal calendar of “die Umweltberatung”.
3. **Reduced meat portion:** The “natürlich gut Teller” may contain a maximum gross weight of 90 g of meat per portion. If meat is used, it must come from organic agriculture.
4. **Fish** only from organic fish farming, local fish or MSC fish

Target criteria of the “natürlich gut Teller”

Two of these target criteria must be met

1. **Preference for plant-based food:** 2/3 of the ingredients are plant-based. Animal foods, such as eggs, dairy products, cheese and animal fats are limited to 1/3.
2. **Regionality**: The dish consists of 1/3 regional ingredients.
3. **Fair products**: contains at least one FAIRTRADE-certified component.
4. **No convenience products:** Only products that have been prepared up to the ready-to-cook stage may be used.
5. **No portion packaging**
6. **Innovative meals**: innovative character, different from typical Austrian home cooking

For the above-mentioned criteria, indicators are researched and selected with which the economic, ecological and social impacts arising from the use of the “natürlich gut Teller” can be described. Where necessary, the impacts are quantified by comparison with the original meal (baseline) used before using the “natürlich gut Teller”. If a quantitative representation of the effect of the “natürlich gut Teller” is not possible with the available data, a qualitative representation is made with the help of existing studies and research results. The focus of the impact analysis is on the MANDATORY criteria of the “natürlich gut Teller”.

For catering, separate evaluation criteria in the system of the “natürlich gut Teller” were not drawn up until 2014. The label is currently only used by one establishment. Therefore, the focus of the impact analysis will be on the effects achieved by communal catering.

The raw data on the number and composition of the “natürlich gut Teller” comes from “die Umweltberatung” and the final reports published annually since 2010 by “die Umweltberatung” with exemplary data and information on the “natürlich gut Teller”. Users also provide data on the purchase of food, recipes and food consumption. Some additional

questions sent to the kitchen managers supplement the data and help interpret it. The available data is explained in more detail in chapter 4.

In the following chapters, for each criterion of the “natürlich gut Teller”, possible indicators for the description of the impact are shown and, finally, those indicators are selected which will be used for quantifying the effects.

3.1 Research of possible indicators to quantify the impact of the “natürlich gut Teller”

Mandatory criteria of the “natürlich gut Teller”

3.1.1 “Increased use of organic food” (mandatory criterion)

The “natürlich gut Teller” should contain at least one main component consisting of organic ingredients. Organic agriculture is subject to strict legal requirements, and compliance with these is regularly monitored by authorised inspection bodies. The use of pesticides is as strictly prohibited as the use of genetically modified organisms. Organic agriculture also does not use synthetic mineral fertilisers and instead uses organic fertilisers such as compost or animal manure.

What are the characteristics of organic agriculture?

Organic agriculture is a holistic system of land management based on the ethical principles of health, ecology, fairness and care. [IFOAM Internationale Vereinigung der ökologischen Landbaubewegungen, 2005]

All directions of organic farming are based on a holistic, cyclical view of life. The aim is to achieve a closed entity of soil, plant, animal, farm and production as far as possible, while avoiding far-reaching, violent disturbances of the natural material and energy cycles. The organisation of all organic farms also reflects the principle of closed material and energy cycles as far as possible. In contrast to conventional farming, the supply of foreign matter in organic farming is limited to an essential minimum. In addition, all technical cultivation efforts in organic farming focus on the soil, on active care, promotion and improvement of soil fertility [Diercks, 1986].

The challenge is to increase global food production in an environmentally sustainable way on account of population growth, urbanisation and changing eating habits. This can be achieved by integrating natural and organic approaches that are specifically adapted to the region and its conditions [Gollner & Starz, 2015]. Through the increased consumption of organic products, each individual consumer can make his or her active contribution to climate protection.

Comparison of conventional and organic agriculture		
	Conventional agriculture	**Organic agriculture**
Yield	100%	75-87% [Seufert et al., 2012]
Crop rotation	Monocultures, simplified crop rotations; high cereal and root crop content; catch crops	Varied, extended crop rotations[1], catch crop and nurse crop mixture
Fertilisation	Easily soluble mineral fertilisers; farm fertilisers	Farm fertilisers, green manure (legumes); easily soluble mineral fertilisers prohibited
Crop protection	Synthetic chemical pesticides allowed	Cultivation of less susceptible varieties, use of beneficial organisms; synthetic chemical pesticides prohibited
Weed control	Herbicides allowed; mechanical	Mechanical e.g. hoeing, torching
Animal husbandry	As a rule, all year round in the stable, no compulsory run; some cattle on pasture	Species-appropriate, area-based stocking, run required; as a rule, pasture feeding for cattle
Feeding	Convent. special feed, genetically modified feed permitted	100%[2] organic feed, preferably farm-grown; genetically modified feed prohibited
Antibiotics – animal husbandry	Preventive medication allowed	Individual animal treatment; no preventive medication allowed
Milk yield kg cow/year	Average 7,200 kg	Average 6,500 kg
CO_2 binding/ soil protection	Negative to low humus formation	As a rule positive; pronounced humus management

Table 3-1: Comparison of conventional and organic agriculture according to [Gollner & Starz, 2015]

3.1.1.1 Economic effects of the increased use of organic food

Higher purchasing costs – they include follow-up costs

Offering organic food in canteen kitchens for communal catering promotes awareness of nature and the shopping behaviour of consumers and, overall, offers benefits for society as a whole.

[1] Extended crop rotation: large time interval for growing the same fruit at the same location; an interval of several years supports the death of specific pathogens and thus reduces the risk of pathogens accumulating in the soil. [Huss, 2012]

[2] according to [Biokontrollservice Österreich, 2014]

Negative environmental impacts of conventional agriculture generate costs (e.g. medical costs) which usually have to be borne by society (= external costs) because the polluter pays principle is not consistently applied.

Compared to conventional agriculture, organic agriculture generates lower social costs (e.g. costs of environmental pollution caused by agriculture, pesticides in food) and higher social benefits (e.g. for environmental and climate protection or regional added value) [Schlatzer & Lindenthal, 2018].

If the polluter pays principle were applied and the low prices paid for conventional products were subject to surcharges for environmental and social follow-up costs, the price of environmentally friendly organic food would hardly differ from that of conventional food [Koerber, 2000].

Fewer losses due to drought conditions in organic farming

Studies of the Research Institute of Organic Agriculture (FiBL) show that the yield on organic soils is 20% lower. Large amounts of microbial biomass and an active soil life provide an excellent base for a high crop yield. However, the paradox is that the yields in organic farming are on average still 20% lower. This is due to the lack of adapted varieties in organic farming and the avoidance of chemical plant protection agents and synthetic fertilisers as well as herbicides. However, there is mounting evidence that organic farming systems using adapted varieties produce more stable yields in drought conditions.

[FiBL et al., 2017].

Image/advertising

Healthy lifestyles are modern, organic food follows the trend of city dwellers. With an initiative like the “natürlich gut Teller”, the City of Vienna is promoting its image.

There are a variety of quality labels and organic labels. Global 2000, in cooperation with the Südwind Association, has reviewed various quality labels for organic, fair trade and others and evaluated them according to a traffic light system for their positive effects on ecology, social affairs, animal welfare and soundness [Global 2000, 2017]. In [Greenpeace in Zentral- und Osteuropa, 2018] other labels, such as those relating to fisheries (MSC, ASC), are also dealt with and evaluated.

3.1.1.2 Ecological effects of the increased use of organic food

Effects of conventional agriculture on soil quality

The worldwide loss of valuable arable land and global warming call for sustainable solutions in agriculture in view of the growing world population. Examples from history show that already in ancient times advanced civilisations disappeared due to deforestation and intensive land use or overuse by domestic animals [Rogall, 2008]. In the last 40 years about one third of the world’s fertile arable land has been destroyed by erosion. And this

development is progressing almost unnoticed. Deep ploughing breaks down valuable humus in the soil and the carbon it contains escapes as CO_2, the most important greenhouse gas. On average, this gradual process leads to an annual soil loss of about 1 mm due to erosion and contributes to global warming. In contrast, the formation of new soil from topsoil is much lower. However, many other agricultural practices such as monocultures, intensive irrigation, unilateral fertilisation with individual nutrients, the burning or discharge of crop residues and the improper use of pesticides also affect the soil.

Organic agriculture, on the other hand, leads to a higher proportion of soil organisms in the soil, preserves the soil structure, and thereby reduces erosion losses and increases the soil's capacity to absorb water. Furthermore, soil fertility is maintained by organic fertilisers, nurse crops and crop rotations.

Reduction of erosion through organic farming

One problem of agricultural crop production is the erosion of valuable soil material. Extreme contamination can lead to soil degradation. For row crops (e.g. maize) and long-term fallow, 76 t/ha (7.6 kg/m²) are removed annually by water [Diercks, 1986].

The erosion tendency is lower in areas that are organically farmed. The reasons for this are: the higher proportion of erosion-reducing crops, the increased cultivation of catch crops, crop rotations and nurse crops as well as the effects of mechanical weed control and solid manure fertilisation on soil structure [Schöne & Zerger, 2002].

Techniques that counteract soil erosion in organic farming significantly reduce the diffuse input of phosphate into surface waters, thus significantly reducing the risk of eutrophication of surface waters. Eutrophication is the undesirable increase in nutrients in a body of water, which leads to the formation of algae, among other things [Schlatzer & Lindenthal, 2018].

Increase in soil organisms due to organic farming

On average, organically farmed soils contain 59 percent more biomass from microorganisms, which are also up to 84 percent more active than under conventional cultivation. A global FiBL metastudy, which includes 57 systematically selected publications worldwide (149 pair comparisons) and was recently published in the specialist journal PLOS ONE [Lori et al., 2017], shows this. Other results of the study:

- The metabolism of microbes is much more active in soils that are farmed organically. This allows microbes to convert organic matter such as compost more quickly into nutrients that the plants can absorb.
- The positive effect of organic farming on microbial activity in warm and dry climates is even more pronounced compared to conventional farming.
- Organic fertilisers, diverse crop rotation and the inclusion of legumes in the crop rotation have positive effects on the frequency and activity of soil microbes.
- Organic farming has a positive influence on pH and soil carbon, which in turn has a positive effect on microbes.

- The higher biomass in the soil is also important for the climate: organically farmed soils store more high-quality humus compounds – and are thus able to bind the greenhouse gas CO_2 from the air in the soil.

Increased humus formation through organic farming

The trial in Frick, which started in 2002, showed very good results after an initial decline in yields. “The results from this long-term experiment are very encouraging,” says a pleased Paul Mäder, study director and soil specialist at the FiBL. “The less cultivated soils had 17 percent more humus and 37 percent more soil microorganisms.” Yields also rose after an initial decline: “the yield security is improved,” says Mäder. The increase in the humus content in the soil corresponds to a climate reduction potential of 2 t of carbon dioxide equivalent per hectare and year [FiBL et al., 2017].

A main objective of organic farming is a form of land use that promotes the activity of soil life. Maintaining soil health and fertility through careful soil cultivation, natural fertilisers and balanced crop rotation is an important objective in organic farming. The measures taken to achieve these objectives have a positive impact on the soil structure. In conventional agriculture, the soil structure is influenced slightly more negatively. Care is also taken to avoid soil compaction, for example. However, the aim is less to promote the activity of soil life than to optimise yield.

Reduction of nitrate and phosphate pollution in groundwater through organic farming

Synthetic chemical fertilisers contain plant nutrients such as copper, phosphorus, magnesium, potassium and nitrogen in pure, easily soluble form and can thus compensate for a lack of nutrients in the soil. However, the use of such fertilisers is not permitted in organic agriculture because nutrients introduced in isolation can disturb the balance of soil organisms. [öko-fair, s.a.]

In seepage water analyses under agriculturally cultivated land, organic farms had an average of 27 mg of nitrate per litre, while conventional livestock farms had 79 mg of nitrate per litre [Weiger & Willer, 1997]. In Austria, a limit value of 50 mg/l of nitrate applies according to the Drinking Water Ordinance (Trinkwasserverordnung) [BGBl. II Nr. 304/2001, 2001]. If this value is exceeded more than once, the water is classified as not suitable for drinking water purposes.

An excess of easily soluble nitrogen is washed out of the soil as nitrate just like phosphate and is more concentrated in brooks, lakes or groundwater, where eutrophication of the water bodies occurs [öko-fair, s.a.]

The use of mineral nitrogen fertiliser and easily soluble phosphate is prohibited in organic farming. Instead, the regular application of organic fertiliser (manure and compost), crop rotation with legumes in order to increase nitrogen fixation in the soil and the application of preventive plant protection measures (finger weeders, resistant varieties, torching, plant

protection agents that are permitted in organic farming and meet the strict criteria) [Barański et al., 2014].

Organic farms have significantly lower N inputs into groundwater and surface waters and lower phosphorus balances than conventional farms. Due to the lower soil erosion and the lower phosphorus content in the soils, organic agriculture contributes significantly to a reduced eutrophication of water bodies [Schlatzer & Lindenthal, 2018].

Residues of heavy metals in food in conventional versus organic farming

Synthetic chemical commercial fertilisers, organic fertilisers from intensive animal husbandry (cage husbandry, fully slatted systems, poultry manure from barn husbandry without a run) or landless animal husbandry, as well as unauthorised, synthetic chemical pesticides and herbicides are not used in the (note: organic) farm (also no remaining stocks stored!) [Biokontrollservice Österreich, 2014].

Heavy metal residues (e.g. cadmium) in agricultural products produced in accordance with organic farming standards are considerably lower than in conventional production. The reason for the reduced residues in organic farming is that phosphate-containing fertilisers are avoided as far as possible and the higher humus content reduces the plant availability of cadmium [Mie et al., 2016].

Pesticides and pesticide residues in conventional versus organic farming

In organic farming, it is largely prohibited to use non-natural, synthetic chemical pesticides, growth regulators or wilting agents.

In conventional farming, growth regulators influence the growth of crops and weeds. In crop plants, for example, this results in the ripening of the fruit being synchronised or longitudinal growth being restricted. In cereals, for example, it prevents the plant from falling down. Wilting agents are chemical substances used to accelerate wilting. There are only a few exceptions to the ban on the use of these substances in organic farming. It can therefore be assumed that all the consequences attributed to the use of these products are not caused by organic cultivation [Daxbeck et al., 2005a].

The term pesticides stands for plant protection products or pest killers which are used against destructive or unwelcome animals, plants and microorganisms in agriculture, the environment or directly on the body of living organisms. Depending on their sphere of action, a distinction is made, for example, between:

- Fungicides against fungi
- Herbicides against weeds
- Bactericides against bacteria
- Insecticides against insects

The long-term effects or environmental damage of pesticides have not always been adequately examined. Pesticides were often underestimated in terms of their hazard potential when they were approved. This is shown by the subsequent withdrawal of

authorisations for three plant protection products previously popular in Austria [Katalyse, 2004].

As was found with DDT, this chemical substance does not degrade in human tissue, so that DDT could even be detected in breast milk. Above all, however, these so-called persistent pesticides ultimately accumulate in the soil. Persistence is generally understood as the length of time a chemical substance remains in an environmental area such as air, soil or water. The greater the persistence of a pesticide, the greater the concern about its input into the environment [Meyers Lexikonredaktion, 1997]. As a result, these residues have different toxic effects on flora and fauna.

Herbicides can influence the metabolic physiology of the crop and increase susceptibility to pathogens, e.g. of maize to corn smut [Diercks, 1986].

Beneficial arthropods can also be directly damaged by herbicides and fungicides, either through reduced hatching rate and parasitisation or feeding levels or also through increased mortality [Diercks, 1986].

The annual environmental quality monitoring shows that products from organic farming are not contaminated or only very slightly contaminated (note: with pesticide residues). This alone reduces the probability of health consequences. From conventional cultivation, 86 to 100 percent of all soft fruit, grape and peach samples are contaminated with several (up to 19) pesticides. Organic products are recommended here for prevention reasons alone. [Reuter, 2012].

Air transport of pollutants applied in conventional farming

"Within 24 hours after pesticide application, evaporation losses (pesticide drift) of 40%, 50% to 90% of the applied pesticides may occur" [Velimirov, 2003]. This statement refers exclusively to herbicides, which account for approximately 60% of the total amount of pesticides. However, it shows the extent to which the air can be polluted by the use of pesticides. Ecosystems that are far away from any application of chemicals are among the areas most polluted with pesticides and other chemicals today because pesticides that are not photochemically degraded in a few weeks are transported over long distances and condense in cooler areas such as mountains and polar regions [Velimirov, 2003].

Increased production of greenhouse gases through conventional farming

In land cultivation and animal husbandry, considerable amounts of the greenhouse gases methane (CH_4), nitrous oxide (N_2O), ammonia (NH_3) and carbon dioxide (CO_2) are being released into the atmosphere worldwide. 50% of methane emissions are caused by agriculture [Schlatzer & Lindenthal, 2018].

Both mineral nitrogen fertilisers and synthetic chemical pesticides are used in conventional agriculture. Both are characterised by high energy use, emitting CO_2 and other compounds that contribute to global warming. Both the production and the transport are causative

factors. Ammonia is required for the production of mineral nitrogen fertilisers [Meyers Lexikonredaktion, 1997]. This in turn is produced from the elements nitrogen and hydrogen. Today the hydrogen required for the reaction is mostly obtained by partial oxidation of natural gas, nitrogen is taken directly from the air as already in the original process. The resulting ammonia is then processed into fertiliser in further steps. The problem with regard to environmental pollution is the use of fossil resources and the costly production process.

Organic farming emits 10 – 35% less greenhouse gases per kg of food than conventional agriculture. This is largely due to the low level of soy feed imports used in organic farming and the reduced use of pesticides [Schlatzer & Lindenthal, 2018].

Fehler! Verweisquelle konnte nicht gefunden werden. illustrates the energy consumption of conventional agriculture compared to organic agriculture in graphic form. Organic agriculture consumes 62% less energy here.

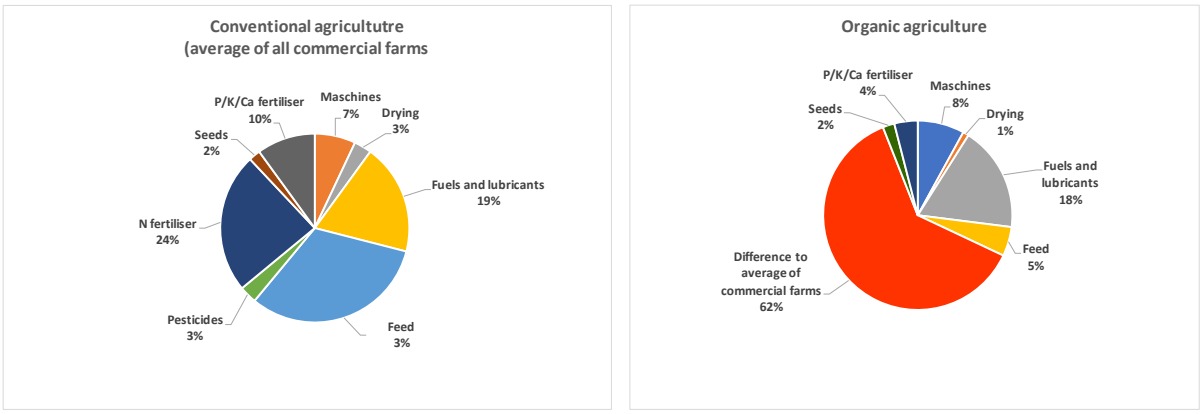

Figure 3-1: Energy consumption of conventional/organic agriculture [Weiger & Willer, 1997].

Biodiversity in conventional versus organic farming

Diversity is the characteristic of being different from each other and is an essential function of any biological system. An important goal of organic farming is to promote natural regulation mechanisms and self-healing processes in intact ecosystems. This goal promotes above all animal species which are called beneficial organisms.

In general, biodiversity, also known as biological diversity, refers to the diversity of life. Since life is organised at different hierarchical levels, biodiversity can also be seen at all of these levels. These are interlinked so that the exchange of substances (e.g. nutrients) and information (e.g. the signalling effect of flower colours on insects) can occur. A distinction is made between the following levels of biodiversity:

- genetic diversity (e.g. different genetic information in individuals of a species)
- species diversity (e.g. the variety of species in a defined habitat)
- and habitat diversity (e.g. the number and diverseness of habitats)

In addition to these three “classic” hierarchical levels of biological diversity (genes, species, ecosystems), the level of organisms (individuals) and the level of the population are also differentiated, depending on the approach taken:

- diversity of the individuals (e.g. plants or animals of a species differ in size, behaviour, appearance, due to their age, their individual experiences, characters etc., in the case of plants in particular due to their very specific location)
- diversity of the populations (e.g. difference in red deer populations due to their behaviour)

[Umweltbundesamt, 2004]

The large-scale intensification of agricultural use plays a decisive role in the decline in the species diversity of typical flora and fauna in cultivated land. Figure 3-2 shows the impacts of the form of agricultural land use on the cultivation area. What is striking here is that the organically farmed area has structures – bushes, trees, borders and is integrated into the landscape instead of replacing it. This makes it possible to preserve not only cultivated land but also a habitat for beneficial organisms and other organisms, thus contributing to an intact and functioning ecosystem.

With conventional farming, on the other hand, monocultures can have undesirable consequences. For example, certain fungi and pests can spread quickly in the monotonous, tidy production landscapes due to a lack of natural enemies and cause massive plant protection problems. The intensive use of pesticides, in turn, can lead to the development of resistance in many pests. The consequences of these developments for nature, the landscape and the environment are serious and often irreversible [Weiger & Willer, 1997].

Many wildlife populations are already affected by the use of chemical pesticides. Consequences include thyroid dysfunction, reduced fertility, reduced reproduction performance, severe malformations in offspring, metabolic abnormalities and a weakened immune system [Velimirov, 2003].

Figure 3-2: Comparison between a conventional (left) and an organic (right) cultivated area [Daxbeck et al., 2005a]

Genetic engineering

If we ask consumers about the use of genetically modified foods, the answer is usually clear. Consumers reject such products. The fact that consumers' opinions should be taken into account by food producers is a so-called "ethical criterion" [Lindenthal, 2003]. In other words, it is a sign of good custom and morals if the opinion of the majority of the population is respected.

However, the use of transgenic crops is already commonplace in feed production, at least when looked at globally. GMOs (genetically modified organisms) are grown in the EU.

Studies have shown that GMOs compete successfully with microorganisms from disturbed ecosystems. Unlike chemicals, genes can multiply in nature. Modified genes can be passed on to other microorganisms and thus influence the turnover of biomass. They can also have ecological effects on biocoenoses and habitats. Further possible effects are, for example, the wild development of cultivated plants and the displacement of natural populations, which means the loss of varieties and breeds. The use of genetic engineering can lead to unforeseeable, permanent and difficult to contain damage in the agroecosystem. This means that once GMOs are released, they can no longer be removed easily from the environment. This makes genetic engineering a technology that stands out due to its extreme error-unfriendliness [Lindenthal, 2003].

It must also be borne in mind that the use of genetic engineering in agriculture leads to problems of increasing monopolisation in plant and animal breeding. Increased dependence on seed companies and the breeding industry is the logical consequence of the use of genetic engineering. In practice, this problem means a reduction of the farmer's autonomy as well as one-sided pricing of agricultural products on the market. It should also be noted that there are monopolies of knowledge with regard to genetic engineering [Lindenthal, 2003].

It should be emphasised that the spread of genetically modified organisms may not have a direct effect on the environment, but may have indirect, delayed effects. However, a concrete evaluation of these impacts is difficult due to the still insufficient knowledge [Umweltbundesamt, 2001b], [Umweltbundesamt GmbH, 2004].

Since the risks are not offset by any discernible ecological benefit, Environment Agency Austria advises against use in Austria from the perspective of environmental protection. It is recommended that the data and information gaps should be bridged in order to ensure forward-looking environmental protection in the agricultural sector in line with the precautionary principle. [Umweltbundesamt, 2001a]

3.1.1.3 Social effects of the increased use of organic food

Animal welfare in organic farming

On organic farms, the rules for animal husbandry are stricter, attempts are made to enable farm animals to live a life appropriate for their species. Every animal must have permanent access to the open air and the herbivorous farm animals must be allowed to graze during the vegetation period. Possible diseases should be prevented and individual animal treatments should be reduced. Suitable bedding material must be provided and stables with fully slatted floors are not permitted in organic livestock farming. When feeding the animals, the farm's own organic feed is primarily used and performance enhancers are deliberately avoided. In contrast to conventional agriculture, organic agriculture does not involve large-scale livestock farming [Gollner & Starz, 2015].

Administration of drugs in organic farming

The use of medication in organic animal husbandry is strictly regulated. For example, the preventive use of coccidiostats and other artificial growth promoters or performance enhancers or hormones or similar substances to control reproduction is prohibited.

In the event of illness, the specified waiting periods for synthetic chemical drugs must be doubled. If no statutory waiting period has been fixed, the waiting period shall be at least 48 hours.

The number of treatments per animal is also limited. An organic animal may not be treated more than three times within one year with synthetic chemical allopathic drugs. Organic animals whose productive life cycle is less than one year may only be treated once with synthetic chemical allopathic drugs. If animals are treated more often, they must be marketed conventionally [Hofer, 2017].

Resistance due to increased use of antibiotics in conventional farming

Antibiotics are vital drugs that can cure diseases which would be fatal without intervention. However, antibiotics are used too often and/or incorrectly in both human and veterinary medicine. This fact causes bacteria to prepare themselves and develop resistance to the

drug. The WHO warns against antibiotic-resistant germs, which can also be absorbed into the human organism through our food. Approx. 25,000 people die each year due to resistance [Schubert-Zsilavecz, 2015].

According to the environmental medicine expert Hans Hutter, it was already observed in the 1980s that in livestock husbandry there is a development of resistance that can be passed on. “There are specific indicators, or some very distinctive gene sequences, of which we can then say very clearly: if humans have this particular bacterial species, with this specific characteristic, then we know that it comes from livestock farming. This also clearly demonstrated that these resistances arising in livestock farming are indeed a problem for humans and their treatment” [Help ORF, 2014].

Considerable amounts of antibiotics are used in Austria’s livestock buildings. According to the Austrian Agency for Health and Nutrition AGES, in total this was 44.41 tonnes per year in 2016. Of the antibiotics administered in 2016, approximately 72% were for pigs, 22% for cattle and 6% for poultry [Fuchs & Fuchs, 2017].

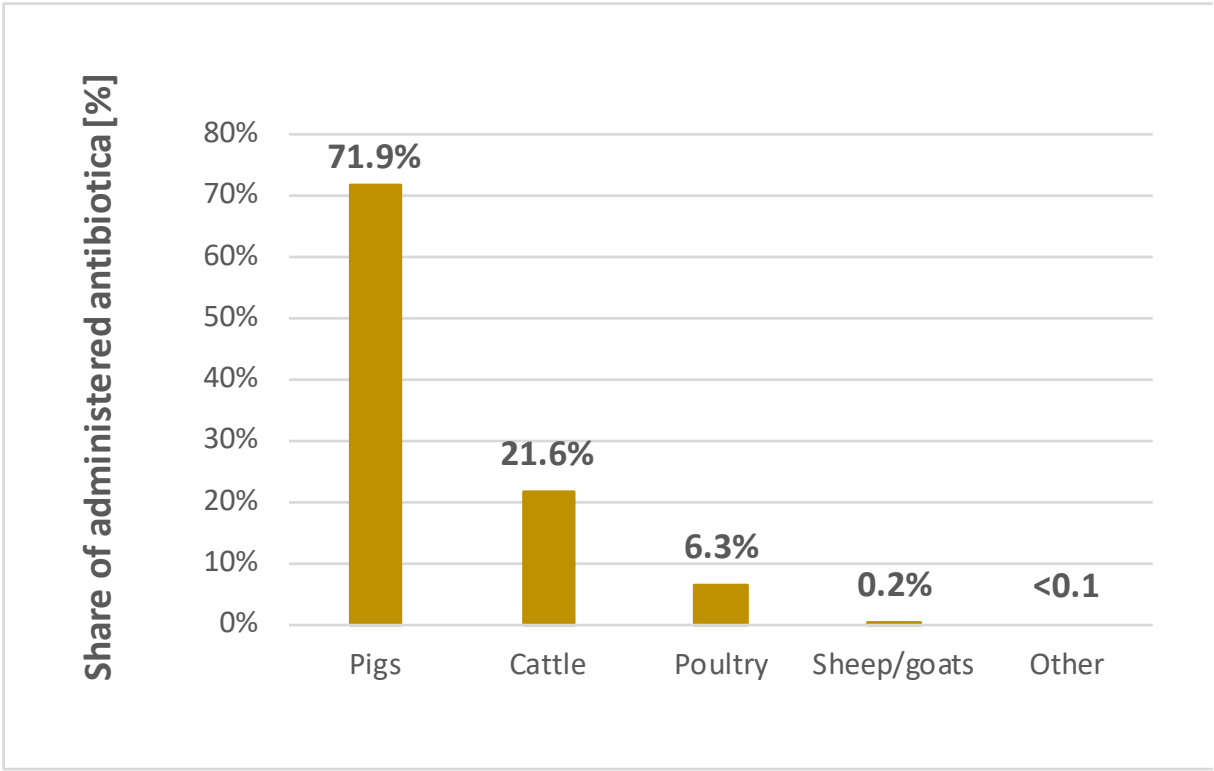

Figure 3-3: Percentage of antibiotics administered by animal species in Austria in 2016 [Fuchs & Fuchs, 2017].

The use of antibiotics is significantly lower in organic animal husbandry: if the legal regulations are not observed, the meat may no longer be sold as organic meat. Therefore, unlike in conventional agriculture, only actually diseased individual animals are treated and not the entire herd/flock [Help ORF, 2014].

The influence of organic and conventional farming on people's health & quality of life

In a FiBL study, 24 organic farms were asked about their motives for organic farming. A frequently cited reason was not to use pesticides near one's own children [Home, 2015]. Too many people are still exposed to the side effects of pesticides. From German winegrowing regions comes the term "Winzerkrankheit" (winegrower's disease) for liver cancer, which occurs conspicuously strongly among (non-organic) winegrowers who work intensively with pesticides. One of the few long-term studies of agricultural workers was presented by the Cancer Registry of Central California in 2002. According to the study, 59 percent more farm workers contracted leukaemia, 63 percent more contracted cervical cancer, 68 percent more contracted uterine cancer and 69 percent more contracted stomach cancer compared to the control group. The fact that the majority of those surveyed were seasonal workers of Hispanic descent also highlights the social component of pesticide-related health risks. In third world countries, active substances are used that have long been classified as too dangerous in Europe and have disappeared from use. The WHO estimates that approximately 20,000 people die each year from the effects of pesticides from conventional agriculture [Schlumberger & Krautter, 2003].

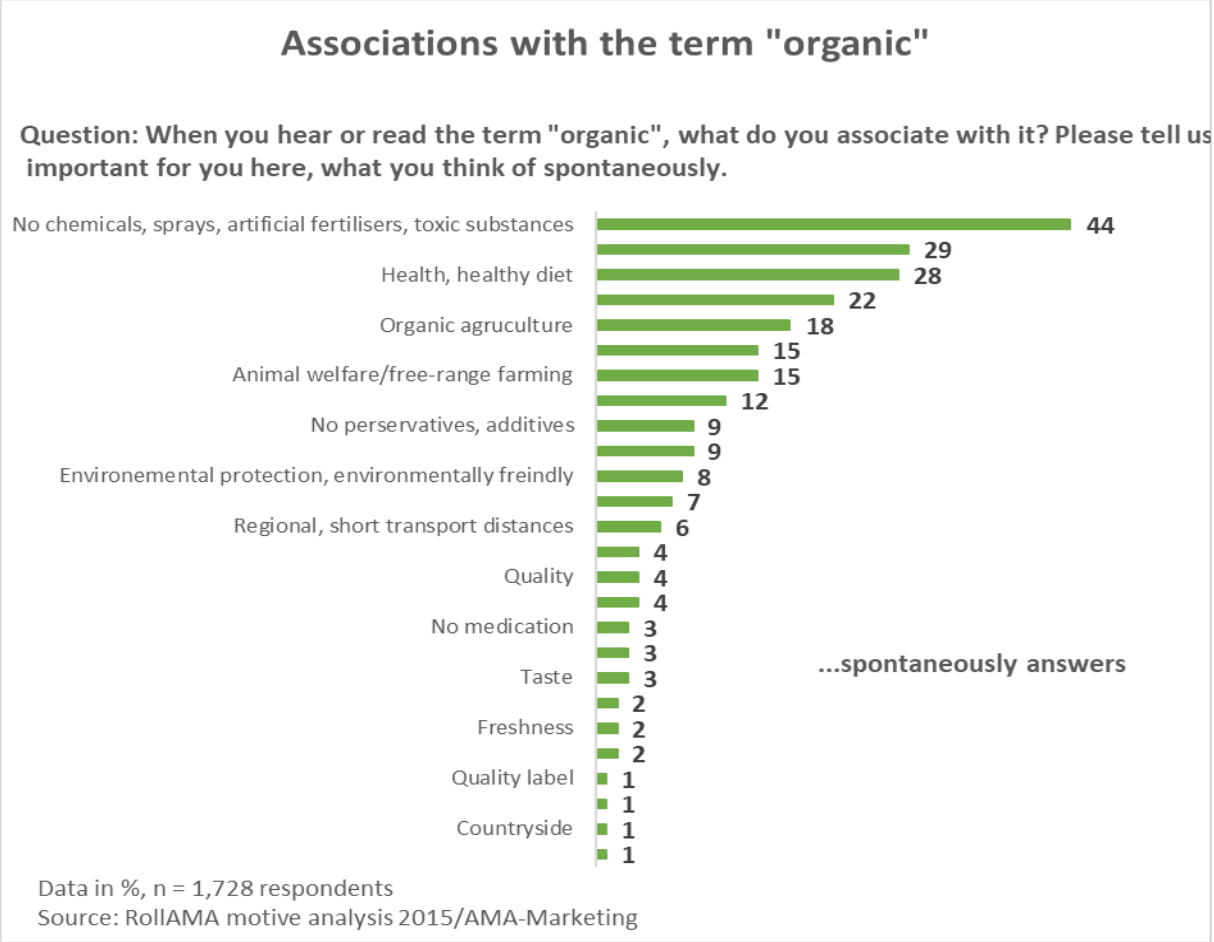

Figure 3-4: Survey in 2015 on association with the term "organic" [RollAMA motive analysis 2015]

The results of a survey conducted by AMA in 2015 show that consumers associate the term organic with environmental compatibility, nature and health (see Figure 3-4). Figure 3-5 shows that 26% of the respondents rate organic food as generally important in relation to their purchasing decisions. This is a share that could be increased through public awareness raising [RollAMA motive analysis September/October 2016].

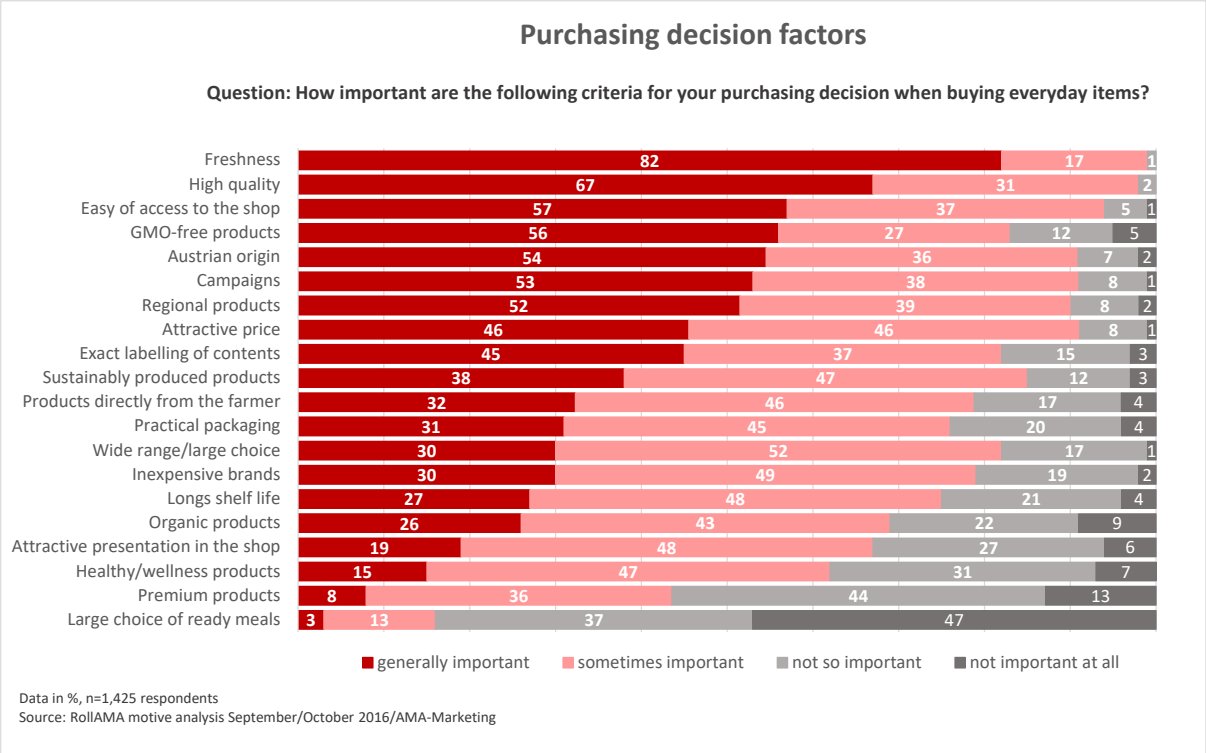

Figure 3-5: AMA survey in 2016 on general purchasing decisions for food [RollAMA motive analysis September/October 2016]

Summary

The understanding of the concept of quality in organic farming is broader than that of conventional farming. What is meant here is “overall” quality. This includes moral, ethical and socio-psychological aspects. The dimension of the concept of quality means that in this case the value of the whole production process and system in which it takes place is assessed in terms of impact on the environment.

3.1.1.4 Possible quantitative indicators

The following can be used as indicators of the increased use of organic food for assessing the “natürlich gut Teller”:

- the total amount of food of organic quality used by users of the “natürlich gut Teller” (primarily at least in the product groups vegetables, fruit, meat, eggs, milk, curd) before and after the introduction of the “natürlich gut Teller”.

- the proportion of food of organic quality in the total food used.
- the agricultural area that is farmed organically in order to produce the quantity of food of organic quality used.
- people who are employed in organic agriculture as a result.

3.1.2 "Increased use of seasonal food" (mandatory criterion)

The vegetables contained in the "natürlich gut Teller" must correspond to the seasonal calendar of the fresh vegetables cooperative LGV Frischgemüse in Vienna or the seasonal calendar of "die Umweltberatung". Frozen vegetables are only allowed from November to April.

Fresh fruits produced locally are to be used preferentially. In the months of November to May fruit preserves from local fruits are permitted. Fresh exotic fruits may only be offered if the local supply is too low in winter. [Knieli & Homolka, 2015].

Food in season

Seasonal foods are agricultural products that are offered for sale shortly after harvesting or ripening, without being stored over a long period. These are fruit and vegetables.

The discussion about seasonality is also very closely linked to the question of regionality. Foods which are offered outside the harvest season then come from those regions where there are currently favourable climatic conditions. In addition, there are of course foods that are never in season on the market where they are sold, such as tropical fruits. The consequence of this is that in some cases considerable transport routes are required. The transport of non-regional food leads to relevant emissions and thus represents a non-negligible environmental impact.

If there is no transport in order to be able to offer food that is out of season, storage is necessary. This storage involves the use of energy and resources. Today, for example, it is customary to offer Austrian apples in summer. This has only become possible through the further development of storage technology. The shelf life depends very much on the type of fruit – while soft fruits only last a few days, apples are stored for up to a year under special conditions until they arrive on the market.

3.1.2.1 Economic effects of the increased use of seasonal food

Depending on the season, fruit and vegetables are subject to strong price fluctuations. The following tables show the influence of seasonality on the price using selected examples. The change in prices per kg during one year is shown (the calculations are based on the prices paid by a Vienna Hospital Association (KAV) kitchen in 2004) [Daxbeck et al., 2005c].

Effect of seasonality on the price of courgettes as an example

As can be seen from Figure 3-6, vegetables are subject to price fluctuations over the year, depending on whether they are in season or not. Courgettes are in season in Austria from the end of June to the end of October. This is reflected in the prices and availability of regional organic products. Above all it can be seen that in the months July – September, the vegetable is available in organic quality at the same price as from conventional cultivation.

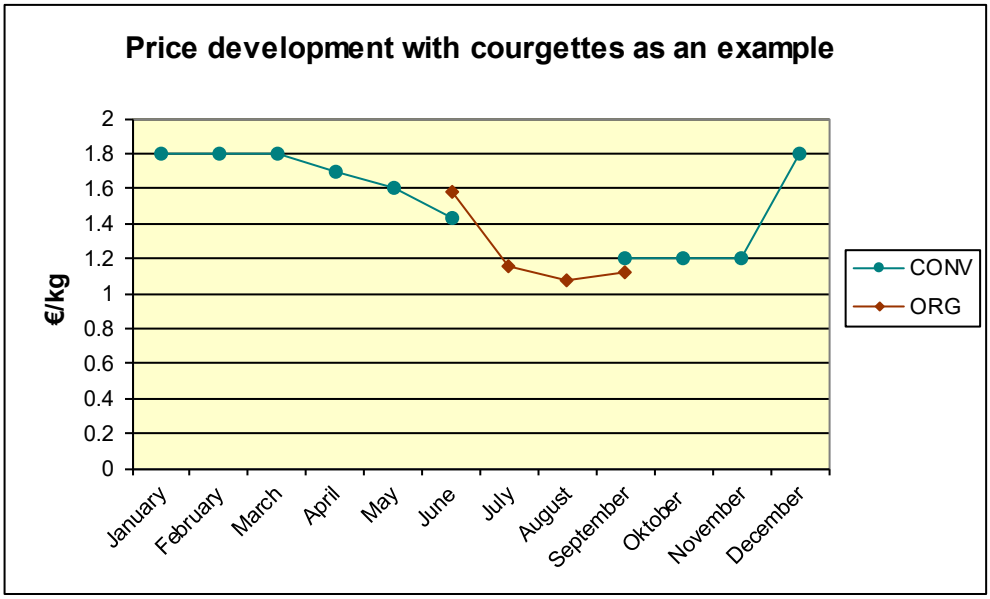

Figure 3-6: Price development for 1 kg of courgettes in 2004 [Daxbeck et al., 2005c]

3.1.2.2 Ecological effects of the increased use of seasonal food

Energy consumption – production in heated greenhouses:

The example of tomatoes can be used to show the ecological effects of observing or not observing seasonality. 80% of the tomatoes available in Austria come from abroad (mainly from Spain and Holland). The demand for summer vegetables – even in the winter months – is on the rise. In order to meet the demand, it is necessary to increase the heated greenhouse areas. The production of vegetables in heated greenhouses is extremely energy-intensive. Table 3-2 shows the CO_2 equivalents corresponding to the energy required to produce 1 kg of tomatoes [Salmhofer et al., 2001], [Daxbeck et al., 2005c].

Table 3-2: CO_2 equivalents of the energy required to produce 1 kg of tomatoes in each system [Salmhofer et al., 2001]

	Open land, conventional	Heated greenhouse, conventional	Open land, organic	Heated greenhouse, organic
CO_2 equivalents	0.086 kg	9.3 kg	0.034 kg	9.2 kg

Outdoor tomatoes require only 0.9% of the energy required by tomatoes from greenhouses. If the outdoor tomatoes originate from controlled organic farming, their energy requirement even drops to 0.4% compared to tomatoes ripened in greenhouses. A comparison of tomatoes grown conventionally and organically in greenhouses shows that their energy requirements are roughly the same.

In order to be able to offer summer vegetables also in winter, a disproportionately high amount of energy is necessary to operate heated greenhouses and polytunnels. Therefore, the question arises whether it makes sense to buy all kinds of vegetables all year round or whether it would not make more sense to do without certain foods at certain times of the year and switch to winter vegetables. The issue is complex – there are also greenhouses which are operated with renewable energy, and polytunnels and greenhouses which are not heated and therefore have no increased energy demand. There are even lettuces – the “Asian lettuces” – which can be harvested all year round in unheated polytunnels in Austria. It therefore seems sensible to adjust the menu according to the seasons and to do without summer vegetables in winter if they cover long distances or are produced with high energy consumption [Daxbeck et al., 2005c].

Vitamin and nutrient losses due to storage and preservation:

The processes used to preserve foods with a high water content, such as fruit and vegetables, include drying, or storage at low temperatures. Dry goods are not taken into consideration here and the focus is on storage at low temperatures. The food should be stored only as long as a certain quality is guaranteed up to a certain point in time. Modern food technology aims at optimising the process of refrigerated storage and keeping vitamin and nutrient losses as low as possible. Chemical and enzymatic reactions continue to occur during storage and can only be further slowed down by immobilising the water by freezing it [Belitz & Grosch, 2013].

The loss rate of different vitamins is different. In the case of vitamin C and other water-soluble vitamins, a vitamin loss of up to approx. 70% can occur if vegetables are stored over the winter until the spring harvest when fresh produce is available [Belitz & Grosch, 2013].

Preparing food impairs the nutritional value only to a minor extent. However, preservation by heating under pressure can destroy nutrients and cause chemical changes. Seasonal vegetables that are available as fresh or stocked goods contain the most vitamins and nutrients shortly after harvest [Cremer, 1951].

3.1.2.3 Social effects of the increased use of seasonal food

The loss rate of different vitamins is different. In the case of vitamin C and other water-soluble vitamins, a vitamin loss of up to approx. 70% can occur if vegetables are stored over the winter until the spring harvest when fresh produce is available [Belitz & Grosch, 2013].

Preparing food impairs the nutritional value only to a minor extent. However, preservation by heating under pressure can destroy nutrients and cause chemical changes. Seasonal vegetables that are available as fresh or stocked goods contain the most vitamins and nutrients shortly after harvest [Cremer, 1951].

Globalisation

As globalisation progresses, however, the target is a global division of labour. But this global division of labour leads to major problems such as the emergence of huge monocultures of fodder plants, loss of habitats and increased CO_2 emissions due to longer transport distances [Berghofer et al., 2016].

In Austria, half of the animal feed for our meat consumption comes from developing countries. The agricultural production areas thus displace the food production for the local population [Moidl et al., 2013].

In addition, many food producers at home and abroad have a hard time making a living from their cultivation activities because they are not paid enough as supermarkets want to ensure that their products are sold more cheaply.

Traditional dishes & speciality weeks

Traditional recipes are often a good indication of seasonality because at the time the dishes were created there was hardly any possibility of buying non-regional food at affordable prices. Thus regional dishes were created from regional food and became traditional dishes. These dishes are generally well received by consumers. Examples of traditional Austrian dishes are: apricot dumplings, old Viennese-style cabbage.

Speciality weeks have been common for a long time in gastronomy. Seasonal foods are a priority here and are processed into specialities.
The menus, which are normally set 8-12 weeks in advance for canteen kitchens, are supplemented by seasonal specialities.

With this in mind, there are foods which, seasonally, are available only for a short time, for example:

Asparagus is in season from April to the end of June.
Cherries are in season from May to June.
Strawberries are in season from May to July.
Pumpkins are in season from June to October.
Mushrooms are in season from September to November.
Game: pheasant, hare, red deer are in season from October to December.

This is a good opportunity for the canteen kitchen to get to know regional producers and to network directly.

Seasonal calendar for fruit and vegetables

Seasonal calendar for vegetables

Öko Kauf Wien – Für Umwelt- und Klimaschutz – www.oekokauf.wien.at

Der natürlich gut Teller

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Oyster mushrooms	■	■	■	■	■	■	■	■	■	■	■	■
Wild garlic			■	■								
Batavia lettuce				■	■	■	■	■	■	■	■	
Brossoli						■	■	■	■	■	■	■
Mushrooms	■	■	■	■	■	■	■	■	■	■	■	■
Chicory	■	■	■	■	■	■	■	■	■	■	■	■
Chinese cabbage	■	■	■					■	■	■	■	■
Oak leafe lettuce					■	■	■	■	■	■	■	
Chanterelle							■	■	■			
Iceberg lettuce				■	■	■	■	■	■	■	■	
Endives							■	■	■	■	■	■
Peas						■	■	■				
Potatoes	■	■	■	■	■	■	■	■	■	■	■	■
Fiels-gorn cucumbers						■	■	■				
Fennel						■	■	■	■	■	■	
Green beans						■	■	■	■			
Frisée lettuce							■	■	■	■	■	■
Yellow turnips	■	■	■	■		■	■	■	■	■	■	■
Cucumbers						■	■	■	■	■		
Early potatoes						■	■	■				
Spring onions				■	■	■	■	■	■	■	■	
Cauliflower					■	■	■	■	■	■	■	■
Carrots	■	■	■	■	■	■	■	■	■	■	■	■
Romaine lettuce									■	■		
Cabbage	■	■	■			■	■	■	■	■	■	■
Kohlrabi				■	■	■	■	■	■	■	■	
Brussels sprouts	■	■							■	■	■	■
Lettuce			■	■	■	■	■	■	■	■	■	
Herbs, fresh				■	■	■	■	■	■	■	■	
Horseradish	■	■	■	■	■	■	■	■	■	■	■	■
Pumpkin	■	■	■					■	■	■	■	■
Lollo rosso			■	■	■	■	■	■	■	■		
Maize							■	■	■			
Chard					■	■	■	■	■	■	■	
Aubergine							■	■	■	■		
Bell pepper						■	■	■	■	■	■	
Tomatoes						■	■	■	■	■		
Parsnips	■	■	■	■					■	■	■	■
Parsley root	■	■	■	■	■	■	■	■	■	■	■	■
Chilli pepper						■	■	■	■	■		
Leek	■	■	■	■		■	■	■	■	■	■	■
Red endive							■	■	■	■	■	■
Radish				■	■	■	■	■	■	■	■	
White radish				■	■	■	■	■	■	■	■	
Romanesco broccoli											■	■
Beetroot	■	■	■	■	■	■	■	■	■	■	■	■
Rocket salad				■	■	■	■	■	■	■	■	
Shallots	■	■	■	■				■	■	■	■	■
Black salsifies	■	■	■	■						■	■	■
Celery root	■	■	■	■	■	■	■	■	■	■	■	■
Shiitake mushrooms	■	■	■	■	■	■	■	■	■	■	■	■
Soya bean/bean sprouts	■	■	■	■	■	■	■	■	■	■	■	■
Asparagus				■	■	■						
Spinach				■	■	■	■		■	■	■	
Celery						■	■	■	■	■	■	
Cepes					■	■	■	■	■	■		
Jerusalem artichoke	■	■	■							■	■	■
Corn salad	■	■	■	■					■	■	■	■
White cabbage	■	■	■			■	■	■	■	■	■	■
Courgette						■	■	■	■	■		
Sugar loaf	■	■							■	■	■	■
Onion	■	■	■	■	■	■	■	■	■	■	■	■

The following are available all year:

Dried herbs and mushrooms
Dried legumes: runner beans, kidney beans, lentils, chick peas, soya beans
Pickles vegetables: sauerkraut, gherkins, chilli peppers, tomatoes, black salsifies

Info at www.umweltberatung.at/natuerlichgutTeller

Figure 3-7: Seasonal calendar for vegetables of the "natürlich gut Teller"

Seasonal calendar for fruits

Ökokauf Wien – Für Umwelt- und Klimaschutz – www.oekokauf.wien.at

Der natürlich gut Teller

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Apples	■	■	■	■	■		■	■	■	■	■	■
Pears	■	■	■				■	■	■	■	■	■
Blackberries							■	■	■	■		
Strawberries					■	■	■	■				
Blueberries							■	■	■			
Raspberries							■	■	■	■		
Elderberries								■	■	■		
Cherries					■	■	■					
Apricots							■	■				
Chestnuts									■	■		
Melons							■	■				
Medlars											■	■
Nectarines							■	■	■			
Nuts, seeds	■	■	■	■	■	■	■	■	■	■	■	■
Peaches							■	■	■			
Physalis							■	■	■	■	■	
Lingonberries								■	■	■		
Quinces										■		
Rhubarb				■	■	■	■					
Currants						■	■	■				
Greengages								■				
Gooseberries						■	■	■				
Sour cherries						■	■	■				
Grapes									■	■		
Plums								■	■	■		

The following are available all year:
Dried fruits, nuts and seeds.

Info at www.umweltberatung.at/natuerlichgutTeller

Figure 3-8: Seasonal calendar for fruit of the "natürlich gut Teller"

Figure 3-7 and Figure 3-8 show the seasonality of fruit and vegetables in Austria. The seasonal calendars show that from November to March there are few vegetables available, which makes meal planning with only seasonal foods more difficult.

Here it is important that, accordingly, winter vegetables are used in meals and that the reason is communicated to the consumer, which leads to an increase in awareness, and this can also have an effect on consumption habits beyond communal catering.

Summary

The term seasonality refers to foods that are regionally available at a certain time of the year from outdoor production or stocked goods. Due to globalisation it is possible to buy fruit and vegetables all year round, even if it is not the season in the kitchen's location.

3.1.2.4 Possible quantitative indicators

The following can be used as indicators of the increased use of seasonal food for assessing the "natürlich gut Teller":

- the annual quantity of frozen vegetables purchased from March to November before and after the introduction of the “natürlich gut Teller” (from November to March the use of frozen vegetables is permitted).
- the annual quantity of tropical fruits (kiwis, oranges, mandarins, bananas, pineapples) before and after the introduction of the “natürlich gut Teller”
- share of total fruit before and after the introduction of the “natürlich gut Teller”.
- agricultural area used for the cultivation of local fruit for the production of fruit used in the kitchens.
- saved transport kilometres due to seasonal foodstuffs

3.1.3 “Reduced meat portions” (mandatory criterion)

The “natürlich gut Teller” may contain a maximum gross weight of 90 g of meat per portion. If meat is used, it must come from organic agriculture [Knieli & Homolka, 2015].

Austrians consume a lot of meat and often occupy top positions in the rankings of the countries that consume the most meat. This fact has many environmental effects.

- The groundwater is polluted by liquid manure spread on the fields.
- Climate-relevant gases are produced: above all CO_2. Cattle also produce methane.
- Cultivation areas have food for human consumption taken away from them in order to cultivate feed for animal husbandry. Only about one third of the nutritional value of animal feed benefits humans in the form of animal food.
- Soya that is used as feed in cattle breeding comes mainly from South America.

3.1.3.1 Economic effects of reduced meat portions

Hidden costs

Due to subsidies, the cost of meat to be borne by consumers is currently only one fifth to one tenth of the cost required for the production of animal feed. It is therefore easy to turn to meat and sausages in view of the temptingly low price [Holler, 2004].

3.1.3.2 Ecological effects of reduced meat portions

Water pollution

In Germany there are massive problems of nitrate pollution of groundwater; in Lower Saxony, Baden-Wuerttemberg and North Rhine-Westphalia the nitrate pollution of groundwater on account of too much liquid manure on the fields near livestock farms is so high that wells

already have to be closed and the drinking water supply of the population is, in some cases, ensured by stopgap solutions which cannot be maintained. The European Commission is therefore considering taking Germany to the European Court of Justice [Vorholz, 2014].

The situation in Austria is not yet so precarious. In 2009, the nitrate value was exceeded at 11.5% of the measuring points in Austria, at 227 of 1,980 measuring points.

According to the Austrian Drinking Water Ordinance (Federal Law Gazette II 2001/304 as amended), the limit value (surveyed 11.12.2017) for nitrate in drinking water is 50 mg/l. Nitrate can be dangerous for infants and the elderly in particular. Nitrate can occasionally lead to the formation of nitrite in infants and thus lead to sudden infant death syndrome by suffocation, and nitrite can also form in people with attacked intestinal flora. Nitrosamine, which can also be formed from nitrate, leads to an increased risk of cancer in animal studies; no clinical evidence has yet been found in humans. The nitrate value is generally regarded as an indicator value for general organic water pollution [Krell, 2009].

3.1.3.3 Social effects of reduced meat portions

Health

The Austrian Nutrition Society (ÖGE) recommends eating a maximum of 100 – 150 g of meat and sausage products 3 times a week, i.e. a maximum of 300 – 450 g per week [ÖGE Österreichische Gesellschaft für Ernährung, 2017].

Table 3-3: Supply balance sheet for meat by species in 2016, carcass weight in tonnes. Source: [Statistik Austria, 2016a].

Supply balance sheet for meat by species in 2016 carcass weight in tonnes								
Balance sheet item	**Cattle/calves**	**Pigs**	**Sheep and goats**	**Horses**	**Offal**	**Poultry**	**Other**	**Total**
Gross indigenous production	**221,243.0**	**478,437.0**	**7,270.0**	**308.0**	**67,521.0**	**128,787.0**	**6,955.0**	**910,520.0**
Imports of live animals	25,003.0	37,745.0	2.0	6.0	7,405.0	24,849.0	-	95,010.0
Exports of live animals	17,192.0	1,291.0	293.0	199.0	3,249.0	6,798.0	-	29,740.0
Net production	**228,335.0**	**514,891.0**	**6,979.0**	**116.0**	**71,676.0**	**146,838.0**	**6,955.0**	**975,790.0**
Opening stock	-	-	-	-	-	-	-	-
Closing stock	-	-	-	-	-	-	-	-
Imports	55,561.0	190,633.0	3,008.0	158.0	12,659.0	117,652.0	4,656.0	384,325.0
Exports	127,128.0	231,925.0	106.0	1.0	75,405.0	75,905.0	2,746.0	513,218.0
Domestic consumption	**156,767.0**	**473,599.0**	**9,880.0**	**272.0**	**8,930.0**	**188,584.0**	**8,865.0**	**846,898.0**
Per capita in kg	17.9	54.2	1.1	0.0	1.0	21.6	1.0	96.9
Degree of self-sufficiency in %	**141.0**	**101.0**	**74.0**	**113.0**	**756.0**	**68.0**	**78.0**	**108.0**
Human consumption	105,034.0	333,887.0	6,570.0	191.0	3,233.0	112,207.0	5,984.0	566,196.0
Per capita in kg	12.0	38.2	0.8	0.0	0.3	12.8	0.7	64.8

Source: STATISTICS AUSTRIA, supply balance sheets. Drawn up on 31.08.2017. – Comments: The gross indigenous production comprises all animals produced in Austria, irrespective of whether slaughtered in Austria or abroad. It is calculated from the number of animals slaughtered in Austria (commercial slaughtering and home slaughtering) minus the imported and plus the exported animals for slaughter, farm animals and breeding animals. The item "Offal" also contains edible slaughter by-products.

The ÖGE recommends that the annual consumption of meat should not exceed 15.6 kg to 23.4 kg per capita per year. Table 3-3 shows that the average Austrian consumed a total of 64.8 kg of meat in 2016. This is almost three times (2.7 times) the maximum quantity of meat recommended by the ÖGE.

The production of meat is very resource-consuming because a high amount of specially cultivated plant-based feed is used for meat production. At the same time, the steadily increasing consumption of meat is held responsible for the increased incidence of health problems among consumers. If we consider the overall high consumption of meat, the associated imports of feed and food, and take into account the fact that a not insignificant part of the expensively produced food is disposed of unused, a large number of negative social effects can be associated with meat consumption [Daxbeck et al., 2005b].

Cautious trend towards less meat in Austria

It is modern and in the social mainstream to be vegetarian. In a survey in Austria, 9% of the interviewees had a vegetarian diet, among the under 40-year-olds the figure was even 17%. These results do not reflect actual behaviour, but at least a small trend towards meat reduction can be seen, as shown in Figure 3-9 [Berghofer et al., 2015].

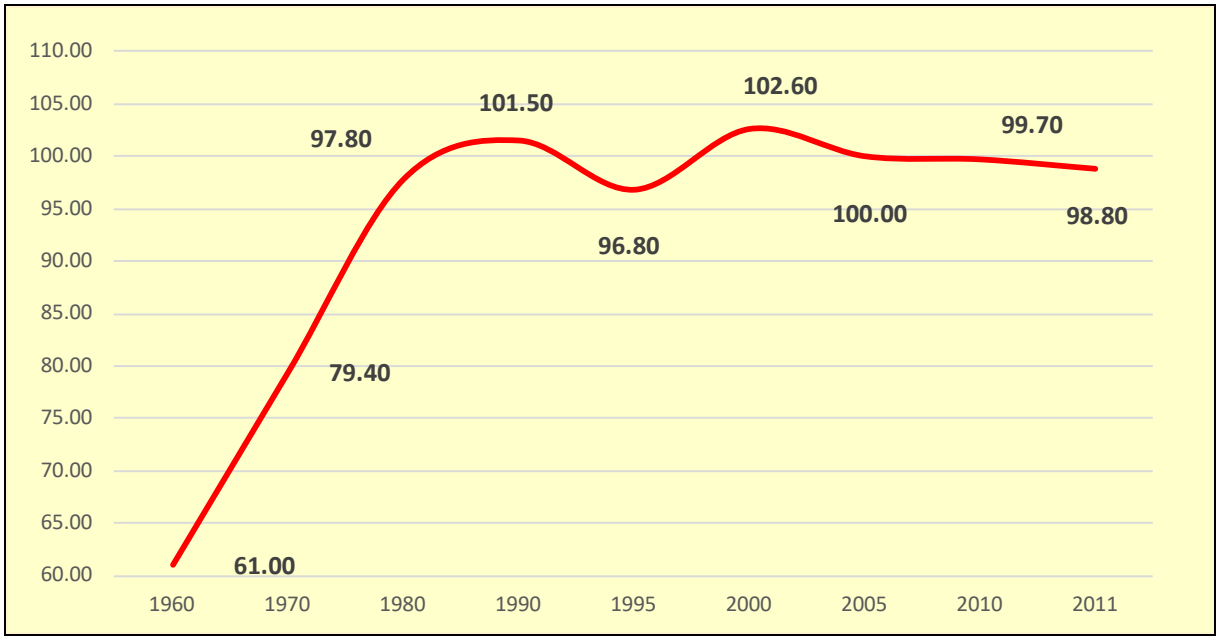

Figure 3-9: Development of meat consumption in Austria per capita and year in kg [Berghofer et al., 2015]

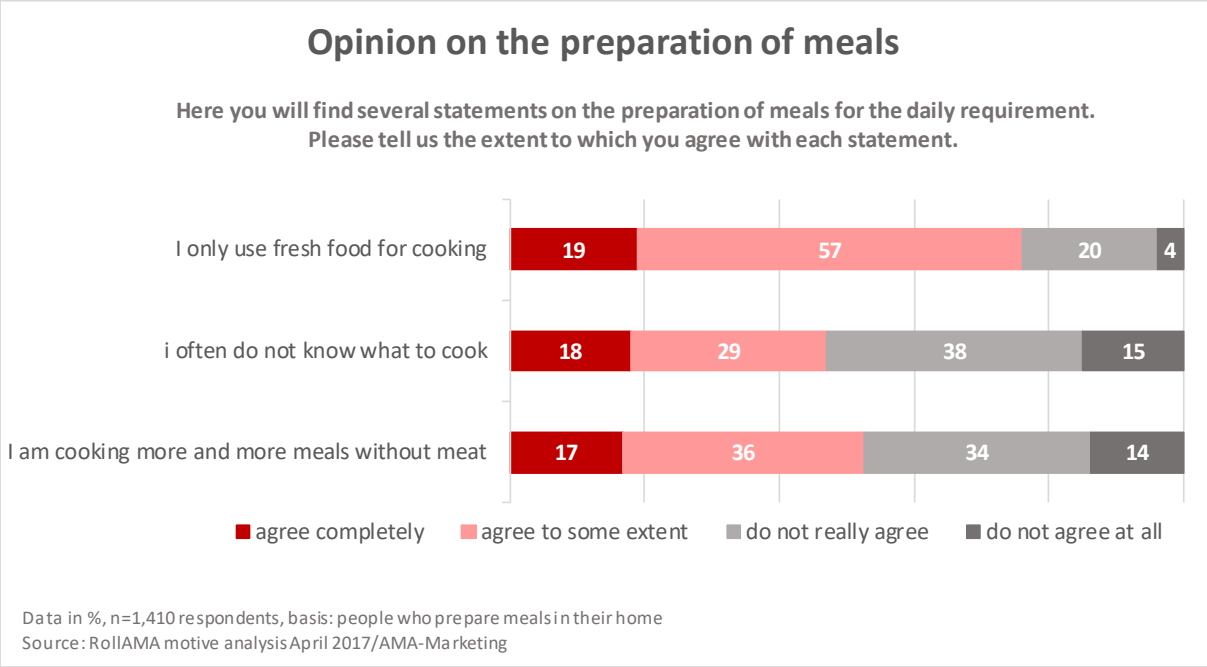

Figure 3-10: 53% of respondents say they are increasingly preparing meatless dishes [RollAMA motive analysis April 2017]

Figure 3-10 shows the results of the survey of Roll AMA. The respondents increasingly prepare dishes without meat. Communal catering could play a pioneering role with reduced use of meat.

Graz Provincial Hospital has introduced one meatless day per week in patient care. This decision was taken together with the hospital's dieticians and introduced without further ado.

Summary

Meat production consumes a great deal of resources, it requires a lot of water and feed that could otherwise be used to feed humans. If the meat portions are reduced to the prescribed 90 g, depending on the type of meat low to moderate extra costs can be incurred to convert to meat of organic quality, thus reducing the effect of the price difference to some extent.

3.1.3.4 Possible quantitative indicators

The following can be used as indicators of reduced meat use for assessing the "natürlich gut Teller":

- the total amount of meat used per year by the users of the "natürlich gut Teller" before and after introduction.
- the proportion of organic meat in relation to conventional meat before and after introduction.

- livestock units that are “saved” by the reduced meat consumption and thus the saved amount of soya, water and pasture and cultivation area for animal feed.
- animal welfare: number of animals farmed organically instead of conventionally (in livestock units).
- the proportion of vegetarian dishes in relation to dishes with fish or meat.

3.1.4 “Fish from sustainable sources” (mandatory criterion)

3.1.4.1 Economic effects of fish from sustainable sources

There is indeed an offer of local fish on which it is possible to focus: carp, zander, tench, pike, catfish and trout. In Austria there is a niche for organic fish farming. Carp ponds in particular are increasingly switching to organic production. Fish is generally expensive and fish from Austria in organic quality is correspondingly more expensive.

The price of fish from non-certified aquacultures, or caught wild with invasive fishing methods – such as trawls with a lot of bycatch – does not include the costs arising for the community from the negative environmental impacts [Daxbeck et al., 2005a].

3.1.4.2 Ecological effects of fish from sustainable sources

Aquacultures and their environmental effects

Fish farming in aquacultures has a negative environmental impact, just like large-scale livestock farming. The aquacultures are designed as open systems and antibiotics, nutrients, fungicides and faeces can enter rivers and seas, diseases can spread quickly due to the dense stocking and the open system and the wild population is weakened genetically by breeding animals that escape [Wack, 2010].

When fish are fed and overfed with pellets in aquacultures, more nutrients enter the water than when they are fed with fishmeal. If fish are overfed with pellets, the water and sediment quality is significantly reduced. Control measures are very important; the stocking, feeding and number of facilities must be regulated. Environmental impacts must be countered at the facility level, above all with effective use of feed and good management [Food and Agriculture Organisation (FAO) of the United Nations, 2014].

Most fish that are perceived as high quality are predatory fish. These can only be fed a vegetarian diet with a loss of quality and with the addition of medication. So even fish in organic quality are fed with feed containing fishmeal. However, fish bred in aquacultures consume about 2/3 less than fish in the wild. Fish that are lower in the food chain are more resource-efficient to produce. Another advantage is that environmental toxins accumulate less in them than in predatory fish that are higher up the food chain. Examples which are produced in Austria are carp and tench [Mößmer, 2015].

MSC, ASC, organic and other quality labels

Fishing has many environmental impacts which are difficult to quantify. None of the kitchens studied uses aquaculture fish that have been awarded the 'Aquaculture Stewardship Council' (ASC) label. For this reason, here the ecological impacts focus on the Marine Stewardship Council (MSC) label.

The MSC has no clearly defined certification requirements in figures. In non-certified fishing there are many creatures that fall victim to bycatch, mammals, reptiles and birds drown in the nets. Even fish that do not end up for sale and are thrown back into the sea often do not survive this [Food and Agriculture Organisation (FAO) of the United Nations, 2014].

Alaska pollack is the most popular fish for human consumption among the users who have provided data. It lives in the open water. The most sustainable fishing quotas that can be met by fisheries are achieved with quotas of 99% pollack and 1% bycatch.[1] In a global comparison, there is an average bycatch quota of 40% in fishing. This value is used as a comparative value.

The degree of self-sufficiency of fish in Austria is low at 6% (see **Fehler! Verweisquelle konnte nicht gefunden werden.**); there is room for improvement here. Austria has no sea – so sea fish cannot be offered regionally. In order to keep the environmental impacts of the purchased fish as low as possible and to guarantee a sustainable supply of fish, it is advisable to pay attention to quality labels.

Fish from organic production from enterprises certified with the EU organic farming logo, MSC label (wild caught fish) and ASC label (aquaculture) meet environmental standards. MSC and ASC labels do not contain any separate social standards. However, there are indeed private law labels which also contain social standards.

The World Wildlife Fund (WWF) has published a purchasing guide for fish[2]. The guide classifies fish and seafood as "good choice", "second choice" or "avoid" on the basis of labels and origin (organic, MSC, ASC). The assessment is based on the environmental impacts here. Such a system is helpful for the customer and a similar system, at least with reference to labels and why they should be preferred, enables quick orientation for the sustainably oriented consumer.

As part of the "ÖkoKauf Wien" project, the City of Vienna published a position paper on the use of fish and fish products in 2012. The results of "ÖkoKauf Wien" are binding. As a

[1] http://www.fao.org/docrep/003/t4890e/t4890e03.htm
https://www.alaska-seelachs.de/nachhaltigkeit-und-nachhaltige-fischerei/fangmethoden-beifang/

[2] http://www.wwf.de/aktiv-werden/tipps-fuer-den-alltag/vernuenftig-einkaufen/einkaufsratgeber-fisch/einkaufsratgeber-fisch/

prerequisite for purchasing, the labels must contain the following information: trade name, production method and origin. Fish from the green list must be selected, fish from the yellow list will be accepted in exceptional cases [Ökokauf Wien, 2012].

When preparing this study, the assessment of the various food labels of [Greenpeace in Zentral- und Osteuropa, 2018] was published, which revealed serious shortcomings in the MSC and ASC labels. This has also led to a current fundamental reassessment and revision of the criteria for the sustainable procurement of fish in the Working Group Food of ÖkoKauf, with the involvement of external experts. These results, which are still open, will in future also be incorporated into the criteria for the "natürlich gut Teller".

The interim results show that for the sustainable purchase of sea fish from the wild, both the exact fishing area and the time of the catch must be taken into account. It also became clear that the aquacultures near the coast differ fundamentally from the local aquacultures for breeding local freshwater fish. Therefore, the KWP kitchens have decided to exclusively use local fish from controlled fish farming (aquaculture) until the new criteria are available. (For quantities see chapter 4.2.5)

3.1.4.3 Social effects of fish from sustainable sources

The Austrian Nutrition Society (ÖGE) recommends eating a maximum of 300 g of fish, divided into 2 portions of 150 g each [ÖGE Österreichische Gesellschaft für Ernährung, 2017].

Table 3-4: Supply balance sheet for fish from 2011 to 2016 in tonnes, source: [Statistik Austria, 2016b]

Balance sheet item	2011	2012	2013	2014	2015	2016
Production	**3 300**	**3 500**	**3 700**	**3 800**	**3 800**	**4 000**
Imports	65 295	66 150	69 978	69 369	69 863	72 882
Exports	4 252	4 779	4 707	4 818	5 254	7 960
Food consumption	**64 343**	**64 871**	**68 971**	**68 351**	**68 409**	**68 921**
Per capita in kg	7.6	7.7	8.1	8.0	7.9	7.9
Degree of self-sufficiency in %	***5***	***5***	***5***	***6***	***6***	***6***

Source: STATISTICS AUSTRIA, supply balance sheets. Drawn up on 31.08.2017.

The ÖGE recommends that the annual consumption of fish should not exceed 15.6 kg per capita per year. As Table 3-4 shows, the average Austrian consumed 7.9 kg of fish in 2016, around 50% of the maximum recommended by the ÖGE.

The degree of self-sufficiency is low here at 6%; there is room for improvement here. Austria has no sea – so sea fish cannot be offered regionally. Since the degree of self-sufficiency of fish in Austria is 6%, the ecological, economic and social impacts of Austrian fish

consumption are far away. That is why, if purchasing is not done regionally, it is important here to pay attention to quality labels that guarantee certain environmental and social standards because the effects are not visible.

Antibiotics

It is particularly alarming that antibiotics are used in fish farming which are only used in human medicine when other antibiotics do not show the desired effect [Daxbeck et al., 2005b]. One of these antibiotics, chloramphenicol, which is mainly used in the breeding of shrimps, may cause aplastic anaemia or reversible bone marrow damage as a side effect [Greenpeace, 2003], [Daxbeck et al., 2005b], [Daschner & Mutter, 2001].

Summary

Since the degree of self-sufficiency of fish in Austria is 6%, the ecological, economic and social impacts of Austrian fish consumption are far away. That is why, if purchasing is not done regionally, it is important here to pay attention to quality labels that guarantee certain environmental and social standards.

3.1.4.4 The following indicators are under discussion

The following can be used as indicators of fish from sustainable sources to assess the "natürlich gut Teller":

- the total amount of fish used per year by the users of the "natürlich gut Teller" before and after introduction.
- the proportion of fish purchased with a quality label (ASC, MSC [1)], organic) among the total amount of fish.
- number of fish ponds, jobs, size of turnover in the region through the purchase of regional fish before and after the introduction of the "natürlich gut Teller".
- saved transport kilometres due to the use of regional fish
- ratio of the quantity of chilled to frozen fish
- the proportion of vegetarian dishes in relation to dishes with fish or meat.

[1)] The value of the MSC and ASC quality labels was strongly questioned by the investigations of [Greenpeace in Zentral- und Osteuropa, 2018]. For this reason, the criteria for the sustainable purchase of fish are being fundamentally revised in ÖkoKauf. Since the criteria of the "natürlich gut Teller" in the years 2011 – 2016 included the MSC/ASC label

as a characteristic of sustainable fish purchasing, in the evaluations the fish consumption of MSC fish is also assessed as sustainable.

Target criteria of the “natürlich gut Teller”

3.1.5 “Preference for plant-based food” (target criterion)

A total of 2/3 of the meal contained in the “natürlich gut Teller” should consist of plant-based ingredients. Animal foods, such as eggs, dairy products, cheese and animal fats should be limited to 1/3 [Knieli & Homolka, 2015].

3.1.5.1 Economic effect of the preference for plant-based food

Plant-based food is cheaper to buy than meat, and the cultivation of plant-based food also causes far less damage to the environment than animal husbandry. Therefore, society as a whole can expect low follow-up costs, which must be incurred for drinking water treatment and environmental restoration work.

It is important to pay attention to seasonal, regional and organically grown fruit, vegetables and cereals in a plant-based diet.

From a medical perspective, the much healthier plant-based diet has the advantage over a meat-based diet in that it prevents heart disease. Our current diet with a lot of meat causes high additional health costs due to secondary diseases alone.

3.1.5.2 Ecological effect of the preference for plant-based food

A predominantly plant-based diet has several ecological advantages. Plant-based foods have lower CO_2 emissions, require less cropland and less water to produce than meat.

The average water footprint indicates how much water is consumed on average in the production of a wide variety of foods. The values vary between the different types of production.

Table 3-5: Water footprint of selected foods of the Water Footprint Network [Hoekstra et al., 2016]

Food	Average water footprint
Tomato	214 l/kg
Lettuce	237 l /kg
Cucumber	353 l / kg
Apple	822 l / kg
Noodles	1,849 l / kg
Rice	2,497 l / kg
Cheese	3,178 l / kg

Food	Average water footprint
Chicken	4,300 l / kg
Pork	6,000 l / kg
Beef	15,400 l / kg

3.1.5.3 Social effect of the preference for plant-based food

Health

In Austria's canteen kitchens meat consumption is too high, and this unhealthy diet leads to various diseases. Studies are regularly carried out on this.

At the medical university Karolinska Institute in Stockholm the effects of meat consumption on life expectancy were studied. People were divided into 5 control groups according to the amount of meat consumed daily. "At the end of the observation period it turned out that the mortality rate in the group with the highest meat consumption (over 117 grammes per day) was 21 percent higher than in the group with the lowest meat consumption (under 46 grammes per day)," explained Kurt Widhalm, President of the Austrian Academic Institute for Nutritional Medicine ÖAIE. "In particular, deaths from cardiovascular diseases such as heart attacks and strokes were significantly more common among people with high meat consumption" [APA, 2017].

An American study (Sinha study "Meat Intake and Mortality"), whose results show the negative effects of meat consumption on human health, was examined for its relevance by the German Federal Institute for Risk Assessment. Its statement on this explains: "The evidence from this study for a link between the consumption of red meat and processed meat and an increased mortality rate, especially from cancer, is part of a large number of empirical studies from different countries [...], in which a statistically significant link between high consumption of red meat and cancer, especially colorectal cancer, was also demonstrated. In the meantime, this link has also been proven by a number of meta-analyses" [Bundesinstitut für Risikobewertung, 2009].

3.1.5.4 Possible quantitative indicators

The following can be used as indicators of a preference for plant-based food for assessing the "natürlich gut Teller":

- proportion of plant-based food and food of animal origin in the recipes of the 10 most popular "natürlich gut Teller".
- the ratio of vegetarian dishes to dishes containing meat or fish among the 10 most popular "natürlich gut Teller".
- number of vegetarian dishes per week to choose from on the menu before and after the introduction of the "natürlich gut Teller".

3.1.6 “Increased use of regional food” (target criterion)

Regional foods are those foods that are produced “from the region for the region”. The main advantage of using regional foods is that they have shorter transport routes than other foods.

In the “natürlich gut Teller”, in terms of quantity, 1/3 of the ingredients should have been produced in the region. The region comprises the provinces of Vienna, Lower Austria, Burgenland, Styria and Upper Austria. The remaining ingredients must in any case come from Europe in order to fulfil the criterion of regionality. The purchase of regional products promotes jobs in the region and prevents long transport distances. The majority of agricultural products are available within a radius of 300 km [Knieli & Homolka, 2015].

3.1.6.1 Economic effect of the increased use of regional food

The apparent economic advantage of “cheap” food that has travelled a long way and does not come from the region conceals the massive ecological disadvantages. If the ecological consequences were assessed economically, products that have travelled a long way would be many times more expensive. At the moment, transports and the associated environmental consequences do not correspond to the true costs [Gupfinger et al., 2000].

3.1.6.2 Ecological effect of the increased use of regional food

The Kyoto Protocol of 1997, in which Austria committed itself to reducing greenhouse gas emissions by 13% by 2012, could not be fulfilled. The Paris Climate Agreement was signed in 2015 and Austria has thus committed itself to achieving climate-related targets by 2030. Among other things, this also means a reduction in greenhouse gases of around 40 percent compared with 1990 levels.

The use of food from the region leads to a reduced volume of traffic due to shorter transport routes and thus to lower CO_2 emissions.

Life cycle assessments are a possible tool for carrying out an ecological evaluation. With the help of a life cycle assessment, an evaluation can be carried out according to various criteria. Examples of parameters are: energy consumption, global warming potential (GWP), acidification potential of soil, eutrophication potential of water or soil, human toxicity potential, resource consumption of land or water, and ecotoxicity potential. The studies show that the environmentally relevant effects of regional food products are lower than comparable products with a long transport route [Demmeler, 2008].

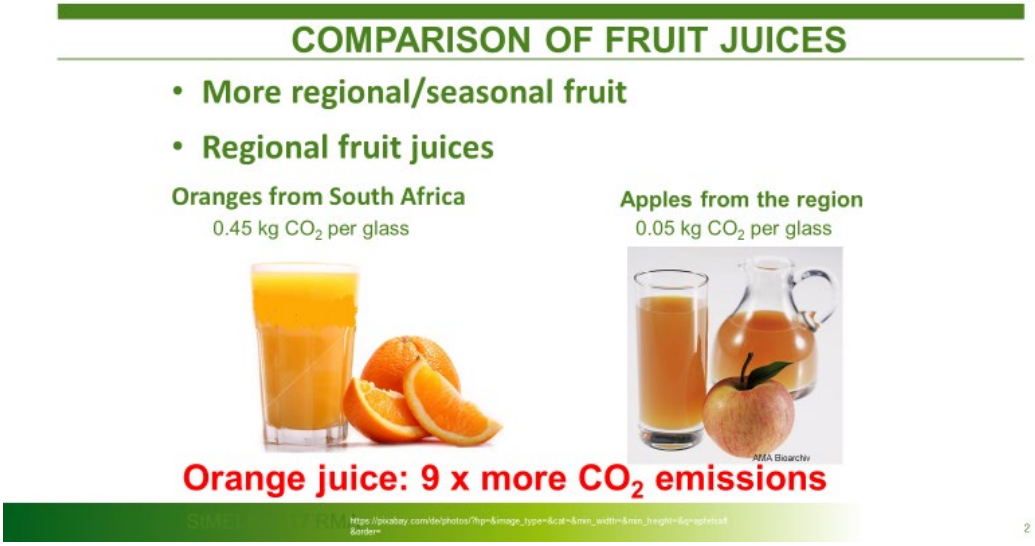

Figure 3-11: Comparison of two fruit juices with regard to their CO_2 emissions, ENKÜ (Energy-Efficient Kitchen) project [Daxbeck et al., 2017a].

3.1.6.3 Social effect of the increased use of regional food

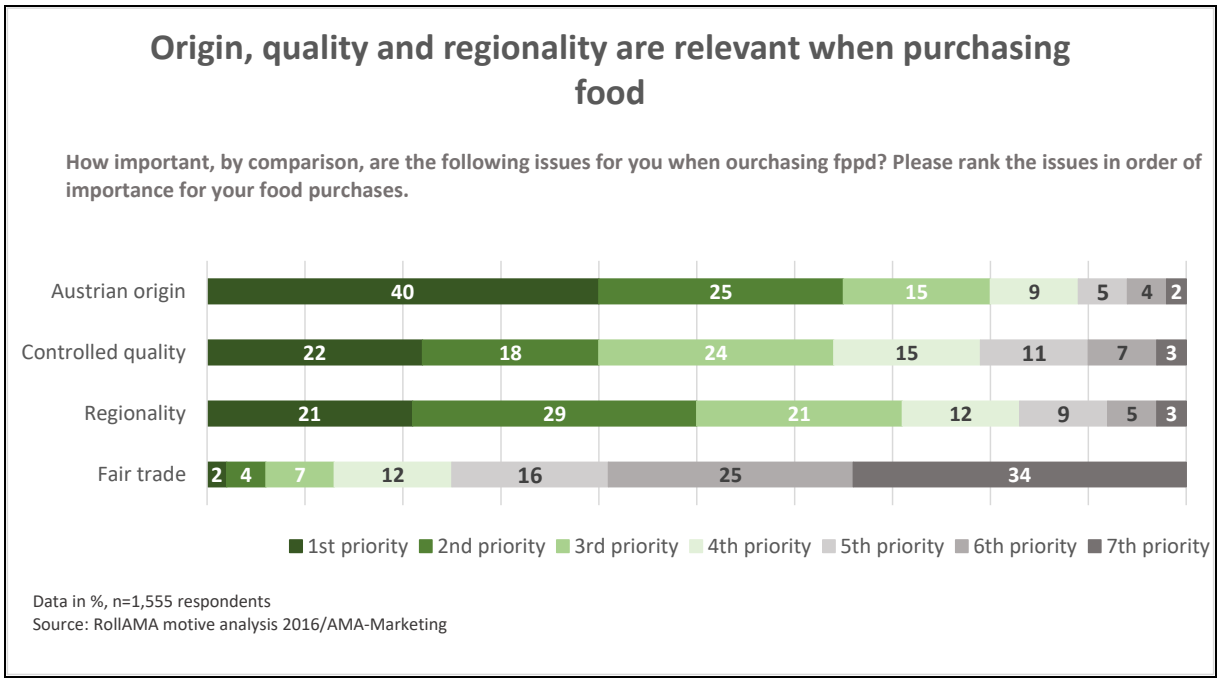

Figure 3-12: AMA survey on origin, quality and regionality, RollAMA motive analysis 2016

In addition to ecological and economic aspects, social aspects also play an important role. One reason why imported products are “cheap” is that they are usually produced under antisocial conditions. If a litre of orange juice costs about € 0.70, a Brazilian picker gets an

average of only one hundredth of that. Furthermore, development and human rights organisations denounce the fact that child labour is also practised in fruit plantations [Gupfinger et al., 2000].

Austrian origin and regionality are very important to Austrians. 80% of the respondents place food of Austrian origin in the top 3 places on an importance scale. Only 20% do not pay attention to Austrian origin. 71% of the respondents even pay attention to the regionality of the food they buy.

3.1.6.4 Possible quantitative indicators

The following can be used as indicators of the increased use of regional food for assessing the “natürlich gut Teller”:

- share by quantity and cost of regional food purchased from producers in the region in the total amount of food used.
- saved transport kilometres due to the use of regional fish
- based on this, a calculation of the CO_2 emissions saved by shorter transport routes.
- number of jobs, size of value added by regional purchasing in the region.

3.1.7 “Use of fair products” (target criterion)

Exotic foods and luxury foods and drinks such as tea, coffee, cocoa, cane sugar and tropical fruits are not available from regional growers. The use of products that meet Fairtrade standards ensures compliance with minimum social, ecological and economic standards in the producing countries. These standards include regulated working conditions, a ban on child labour, a ban on dangerous pesticides and the use of genetically modified seeds, payment of minimum prices to producing farmers, etc. [Fairtrade Österreich, 2017].

3.1.7.1 Possible quantitative indicators

The following can be used as indicators of the use of fair products for assessing the “natürlich gut Teller”:

- quantity and costs of the purchased products with a Fairtrade certificate before and after introduction of the “natürlich gut Teller”.
- share by quantity and costs of the purchased products with a Fairtrade certificate before and after introduction of the “natürlich gut Teller”.

3.1.8 “No convenience products” (target criterion)

The “natürlich gut Teller” should not contain any highly processed ingredients. Only products that have been prepared up to the ready-to-cook stage may be used [Knieli & Homolka, 2015].

The following are permitted:

Convenience level	Definition	Examples
Base level	Untreated goods	Half carcasses, vegetables (unwashed)
Ready-for-kitchen	Food still needs to be prepared before cooking	Boned, cut meat, cleaned vegetables
Ready-to-cook	Can be cooked without further preparation	Fillets, pasta, breaded, spiced meat

[Knieli & Homolka, 2015]

The use of food which, as far as possible, is unprocessed creates employment in the local kitchen. Working with fresh food motivates the employees. They can apply their profession and skills in a variety of ways, instead of simply unpacking and warming up largely ready-made food.

Convenience products are usually more elaborately packaged and provided with protective gas to protect them from spoilage and oxidation. This means that more packaging material is produced when they are used and this requires disposal. In addition, cutting to portion sizes causes a larger transport volume.

Convenience products are often refrigerated or deep-frozen when transported and stored. This results in higher energy consumption than the use of fresh, unprocessed food.

3.1.8.1 Possible quantitative indicators

The following can be used as indicators of non-use of convenience products for assessing the “natürlich gut Teller”:

- quantity and proportion of frozen products and instant soups before and after the introduction of the “natürlich gut Teller”.
- quantity of convenience products which are replaced by fresh products with the introduction of the “natürlich gut Teller”.

3.1.9 “No portion packaging” (target criterion)

Waste is avoided by dispensing with portion packaging. Although the packaging could mainly be collected as used materials, in reality this disposable packaging predominantly ends up in

the residual waste, either because it is not completely emptied or for logistical reasons. Compared to bulk packs, the packaging proportion of portion packs is many times higher. Due to the larger transport volume required, these also have a correspondingly greater negative impact on the environment through transport.

Furthermore, portion packaging does not allow individual eating habits to be taken into account. Smaller portions than the ready-made size are not possible. The part that is not consumed thus becomes waste.

3.1.9.1 Possible quantitative indicators

The following can be used as indicators of non-use of portion packaging for assessing the "natürlich gut Teller":

- quantity and proportion of food in portion packs before and after the introduction of the "natürlich gut Teller".
- amount of substituted portion packs

3.1.10 "Innovative meals" (target criterion)

The meal contained in the "natürlich gut Teller" should have an innovative character, different from typical Austrian home cooking. Examples are colourful summer salads, vegetable skewers, vegetarian curries, Mediterranean vegetable stir-fries. [Knieli & Homolka, 2015].

The criterion of the "innovative meal" motivates and rewards the kitchen management for implementing the above-mentioned mandatory and target criteria with the help of new creations. This criterion does not make an additional contribution to the economic, ecological and social impacts, but promotes compliance with the above criteria.

3.1.11 Summary of possible indicators to quantify the impact of the "natürlich gut Teller"

The previously researched and discussed indicators are summarised below. After the evaluation of the data availability and the preparation of the data in chapter 4, the effects of the "natürlich gut Teller" are finally presented with those selected indicators which can actually be calculated with the help of the available data.

Increased organic (see chapter 3.1.1.4)

- the **total annual amount of food of organic quality** used by users of the "natürlich gut Teller" (primarily at least in the product groups vegetables, fruit, meat, eggs, milk, curd) before and after the introduction of the "natürlich gut Teller".

- the proportion of food of organic quality in the total food used (**organic share of the kitchen by quantity and costs**).
- the **agricultural area** that is farmed organically in order to produce the quantity of food of organic quality used.
- **number of people** who are employed in organic agriculture as a result.

Increased seasonal (see chapter 3.1.2.4)

- the **annual quantity** of frozen vegetables purchased from March to November before and after the introduction of the “natürlich gut Teller” (from November to March the use of frozen vegetables is permitted).
- the **annual quantity of tropical fruits** (kiwis, oranges, mandarins, bananas, pineapples) before and after the introduction of the “natürlich gut Teller”
- **share of total fruit** before and after the introduction of the “natürlich gut Teller”.
- **agricultural area** used for the cultivation of local fruit for the production of fruit used in the kitchens.
- **saved transport kilometres** due to seasonal foodstuffs

Reduced meat portions (see chapter 3.1.3.4)

- the total **amount of meat** used per year by the users of the “natürlich gut Teller” before and after introduction.
- the **proportion of organic meat** in relation to conventional meat before and after introduction.
- **livestock units** that are “saved” by the reduced meat consumption and thus the saved **amount of soya, water** and **pasture and cultivation area** for animal feed.
- Animal welfare: **number of animals** farmed organically instead of conventionally (in livestock units).
- the **proportion of vegetarian dishes** in relation to dishes with fish or meat.

Fish from sustainable sources (see chapter 3.1.4.4)

- the **total amount** of fish **used per year** by the users of the “natürlich gut Teller” before and after introduction.
- the **proportion of fish** purchased **with a quality label** (ASC, MSC, organic) among the total amount of fish.
- number of **fish ponds, jobs, size of turnover** in the region through the purchase of regional fish before and after the introduction of the “natürlich gut Teller”.
- **saved transport kilometres** due to the use of regional fish

- ratio of the quantity of **chilled to frozen** fish
- the **proportion of vegetarian dishes** in relation to dishes with fish or meat.

Preference for plant-based food (see chapter 3.1.5.4)

- **ratio of** plant-based **food** and food of animal origin in the recipes of the 10 most popular “natürlich gut Teller”.
- the **ratio of consumed** vegetarian **dishes** to dishes containing meat or fish among the 10 most popular “natürlich gut Teller”.
- **number, share of vegetarian dishes per week** to choose from on the menu before and after the introduction of the “natürlich gut Teller”.

Increased regional food (see chapter 3.1.6.4)

- **share by quantity and cost** of regional food purchased from producers in the region in the total amount of food used.
- **saved transport kilometres** due to the use of regional fish
- based on this, a calculation of the **CO_2 emissions saved** by shorter transport routes.
- **number of jobs, size of value added** by regional purchasing in the region.

Use of fair products (see chapter 3.1.7.1)

- **quantity and costs** of the purchased products with a Fairtrade certificate before and after introduction of the “natürlich gut Teller”.
- **share by quantity and costs** of the purchased products with a Fairtrade certificate before and after introduction of the “natürlich gut Teller”.

No convenience products (see chapter 3.1.8.1)

- **quantity and proportion of frozen products** and **instant soups** before and after the introduction of the “natürlich gut Teller”.
- **quantity of convenience products which are replaced** by fresh products with the introduction of the “natürlich gut Teller”.

No portion packaging (see chapter 3.1.9.1)

- **quantity and proportion** of food in **portion packs** before and after the introduction of the “natürlich gut Teller”.
- **amount of substituted portion packs** replaced by unpacked products with the introduction of the “natürlich gut Teller”.

3.2 Indicators used to quantify the impact of the “natürlich gut Teller”

After assessing the data availability in chapter 4, finally the following indicators are selected to quantify the impacts of the “natürlich gut Teller”, as these can be calculated using the available data.

The following indicators are calculated to quantify the impacts of the mandatory criteria:

Increased use of organic food

- quantity of organic vegetables, quantity of organic fruit
- size of organically farmed area for vegetables, for fruit
- number of employees in organic agriculture

- quantity of organic meat (beef, pork, chicken)
- number of cattle, pigs and chickens kept in an appropriate manner

Increased use of seasonal food

- quantity of seasonally purchased fruit and vegetables
- quantity of tropical fruits
- cost savings through seasonal purchasing
- saved transport kilometres due to seasonal purchasing
- saved greenhouse gas emissions due to seasonal purchasing

Reduced meat portions

- saved amount of meat
- cost savings due to less meat
- reduced water consumption – saved virtual water
- number of animals not slaughtered

Fish from sustainable sources

- quantity of fish
- quantity of fish from Austria
- quantity of MSC-certified fish
- added value due to Austrian fish
- employees in Austrian pond culture
- amount of avoided bycatch with MSC fish

In the case of the target criteria, the description of the impact is mainly qualitative as the available data is incomplete. The following indicators can be used to quantify the impacts:

Preference for plant-based food

- share of fruit and vegetables in the quantity of food (was able to be implemented)
- water saving compared to the meals with more meat
- degree of use of the calories produced in the field
- cost comparison to meals with more meat

Increased use of regional food

- share of regional food in the “natürlich gut Teller” (was able to be estimated) / in the total purchases of the kitchen
- added value in the region
- employees in the region
- saved transport kilometres due to regional purchasing
- saved greenhouse gas emissions due to regional purchasing

Use of fair products

- quantity of fair trade products in the “natürlich gut Teller” / in the total purchases of the kitchen
- change in quantity of fair trade products in the “natürlich gut Teller” / in the total purchases of the kitchen
-

No convenience products

- quantity of convenience products in the “natürlich gut Teller” / in the total purchases of the kitchen
- change in quantity of convenience products in the “natürlich gut Teller” / in the total purchases of the kitchen (was able to be estimated)
- cost savings due to the use of fresh foods with little processing
- reduced greenhouse gas emissions by dispensing with refrigeration, deep-freezing, pre-processing, transport
- number of additional employees due to the use of fresh food with little processing in the kitchen

No portion packaging

- quantity of avoided packaging
- quantity / cost comparison of the consumed food quantity in portion packs vs. bulk packs

Innovative meals

- number / share of innovative meals served among all “natürlich gut Teller”

4 Data and data preparation for the “natürlich gut Teller”

4.1 Availability and quality of data

Data on use of goods and consumption of the “natürlich gut Teller”

“Die Umweltberatung” is contacted and asked to send data collected over the years for the evaluation of the “natürlich gut Teller”. Furthermore, those users who offered the “natürlich gut Teller” in 2016 are contacted and asked to provide data on their purchases, the most popular “natürlich gut Teller” dishes, recipes and consumption. Questions are sent to the kitchen managers of the participating canteen kitchens to make it easier to interpret the data.

On the part of users, data is received from the Retirement Homes Fund of the City of Vienna (KWP), the Socio-Medical Centre South – Kaiser Franz Josef Hospital with the Gottfried von Preyer Children’s Hospital (KFJ) and Hospital Hietzing with Neurological Centre Rosenhügel (KHR). These users together cover about 95% of the total served “natürlich gut Teller”.

The next work concentrates on evaluating the data. Indicators are defined to help describe the impact of the “natürlich gut Teller”. Where possible, indicators are calculated using the provided data.

Reference to the situation before the introduction of the “natürlich gut Teller”

The impacts of the “natürlich gut Teller” can be described only by showing the relationship to a situation without the “natürlich gut Teller”. These reference points can be: the situation before the introduction of the “natürlich gut Teller”, comparison to other canteen kitchens, comparison to other product groups. Depending on the criterion and the available data, this reference point is selected individually

Quality of data and reliability of results

During the project duration of the “natürlich gut Teller” it was not required and therefore not intended to collect or continuously record data in a structured manner for an accompanying or retrospective presentation of the effects from the use of the “natürlich gut Teller”. Basic information, such as the number of natürlich gut Teller served, has been collected, processed and published by “die Umweltberatung” for reporting purposes as part of the annual final reports since 2010. In addition, the final reports only contain random results and analyses of the “natürlich gut Teller” for individual users in the year in question. A consistent time series for all users therefore cannot be reconstructed from the annual final reports.

On the part of the users there were no requirements or obligations to survey, collect or document specific information on the “natürlich gut Teller”. Necessary information from previous years could only be reconstructed and provided incompletely or not at all by the

users. For example in the KWP, due to a system change, data from before 2013 is no longer available.

To sum up, it must be explained that the available data is incomplete and very heterogeneous with regard to the information necessary to quantify the impacts of the "natürlich gut Teller". Missing but necessary information is estimated or interpolated on the basis of existing individual results.

Here it must be clearly stated that overall the impacts of the "natürlich gut Teller" are underestimated in the present study. For example, since no data is available from the KWP from before 2013, the impacts of the switch to the "natürlich gut Teller", which are largest at the beginning, cannot be determined.

The scope and quality of the data provided by the users are described in chapter 4.1 below.

4.1.1 Umweltberatung

"Die Umweltberatung" provides figures from surveys on the average number of "natürlich gut Teller" selected per meal, the average "natürlich gut Teller" offered per week and, based on this, estimates of the actually selected "natürlich gut Teller" per year for a majority of users for the years 2010 – 2016. In addition, the final reports published annually since 2010 with exemplary data and information on the "natürlich gut Teller" as well as supplementary evaluations of internal data are provided.

Data provided by "die Umweltberatung"

- average number of meals served per user per day for the years 2011, 2012, 2014, 2015 and 2016
- average number of "natürlich gut Teller" served per user per day for the years 2011, 2012, 2014, 2015 and 2016

4.1.2 Retirement Homes Fund of the City of Vienna (KWP)

One home of the KWP, Haus Schmelz, was one of the three pilot homes in which the "natürlich gut Teller" was tested in 2010. All KWP homes were gradually added. In 2011 there were 15 homes and from 2012 all 30 (formerly 31) KWP homes were participating.

Due to a new inventory management system introduced in the KWP in 2013, only data from 2013 onwards is available. From 2010 – 2012 several of the KWP's homes and from 2012 all of the KWP's homes offered the "natürlich gut Teller". This therefore does not cover the first year, in which, according to observations from other users, the impacts on the quantity and type of food used are greatest. At the KWP, the impacts of the "natürlich gut Teller" thus tend to be underestimated.

Data provided by the KWP

- part of vegetables purchased (quantity for one home) calendar week 3 – 13 KWP
- fish purchased in September 2011
- fish purchased in April 2016
- list of product groups from 2013 – 2016: meat, organic meat, fish, organic fish, vegetables, organic vegetables, fruit, organic fruit, frozen fruit, frozen vegetables, convenience products.
- top 10 “natürlich gut Teller” and meals they replaced, recipes

4.1.3 Socio-Medical Centre South, Kaiser Franz Josef Hospital (KFJ)

The KFJ offered the “natürlich gut Teller” for the first time in 2016. The fact that the KFJ has offered the “natürlich gut Teller” for only one year means that it is not yet possible to use the provided data to estimate the impacts that the use of the “natürlich gut Teller” in the KFJ has on the purchasing behaviour and consumption of goods.

Data

- monthly consumption throughout the year from 2012 – 2016. precise breakdown and list of individual foodstuffs with quantities, unit price and total amount.

4.1.4 KAV Hospital Hietzing with Neurological Centre Rosenhügel (KHR)

The KHR was one of the three pilot users that tested the “natürlich gut Teller” from the start in 2010. Since then, the KHR has offered the “natürlich gut Teller” the whole time. A lot of data was able to be provided for all years between 2009 and 2016. For some criteria, only figures for 2009 and 2016 are available.

Data

- monthly consumption throughout the year from 2009 and 2016. Precise breakdown and list of individual foodstuffs with quantities, unit price and total amount.
- consumption/year from 2009 – 2016 in selected product groups: organic diced soya, organic soya granules, meat, fish, fresh vegetables, frozen vegetables, ready meals, fruit in pieces and kg, salads, spicy vegetables and legumes
- organic share in percent from 2009 – 2016 by month + average organic share/year
- list of convenience products used from 2009 – 2016 and quantities

4.2 Determination of basic data on the “natürlich gut Teller”

The transmitted consumption data of the users refers to the entire meal production of the kitchen. The users were unable to limit the data exclusively to the “natürlich gut Teller”. Thus,

on the basis of this data and with the help of evaluations and assumptions, those proportions are estimated that can be assigned to the “natürlich gut Teller”.

4.2.1 Number and composition of consumed “natürlich gut Teller”

4.2.1.1 Number of consumed “natürlich gut Teller”

In the data of “die Umweltberatung”, the annual meals served and the proportion of “natürlich gut Teller” per participant are estimated on the basis of information provided by the users (average daily number of food participants, average number of “natürlich gut Teller” consumed weekly) and own surveys. Table 4.1 shows the total of all users of the respective year. Since no data is available for 2013, the consumption figures from 2012 will be extrapolated. Since these are estimates, the variation of the data is the result of users leaving and joining the “natürlich gut Teller” programme. In 2011, 15 KWP homes, the Erste Bank company restaurants, Hospital Hietzing (KHR) and the KAV Therapeutic Centre Ybbs took part. In 2012 all of the KWP homes participated, in 2015 the Erste Bank company restaurants left and in 2015 and 2016 first of all the Secondary School for Economic Professions (HLW) and then Socio-Medical Centre South (KFJ) joined.

Table 4-1: Total number of meals served and share of “natürlich gut Teller” of all users

	2011	2012	2013	2014	2015	2016
Number of users	18	33	33	32	33	34
Number of served meals	3,237,545	4,977,500	4,977,500	4,067,195	4,079,195	4,626,695
of which NGT	605,538	823,361	823,361	641,785	666,082	830,332
Share of NGT	18.7%	16.5%	16.5%	15.8%	16.3%	17.9%

Table 4.1 shows that, on average, just under 20% of guests opt for the “natürlich gut Teller”. With a total of around 5 million lunches, this means around 800,000 meals a year and 2,200 meals a day. In the period 2011 – 2016, around 4.4 million “natürlich gut Teller” were therefore served.

At short notice the users KWP, KHR and KFJ were able to provide data and information on goods consumption and purchasing behaviour of the past years with regard to the use of the “natürlich gut Teller”. On the basis of this individual information, assumptions and parameters are derived and defined for the impact analysis. As Table 4.2 shows, the three users KWP, KHR and KFJ account for more than 90% of the “natürlich gut Teller”, so the main users are covered with them. It is therefore assumed in a first approximation that the changes and effects quantified for one user with the introduction of the “natürlich gut Teller” have also been or can be achieved for all other users.

Table 4-2: The share of users that have provided data among the total number of served "natürlich gut Teller" in percent

User	2015	2016
KWP (all homes)	64.9%	52.1%
Therapeutic Centre Ybbs	9.3%	7.5%
Hospital Hietzing (KHR)	25.4%	20.4%
Socio-Medical Centre South (KFJ)	did not participate	19.8%
Secondary School for Economic Professions (HLW)	0.3%	0.3%
Total of KWP, KHR, KFJ	**90.3%**	**92.3%**

4.2.1.2 Average composition of a "natürlich gut Teller"

According to the final report on the "natürlich gut Teller" from 2012 [Knieli, 2013], 56% of the offered "natürlich gut Teller" are vegetarian, 24% of the dishes contain fish and 20% of the natürlich gut Teller contain meat. For the estimation of the main components meat, fish and vegetables by weight, an average weight of a main course of 370 g is chosen. The survey by [Daxbeck et al., 2017b] on the portion sizes of a wide variety of communal catering kitchens in Graz shows a weight of 580 g – 830 g for a lunch (see Table 4-3).

Table 4-3: Average weight of the components of a lunch in communal catering [Daxbeck et al., 2017b]

Weight of the components of a lunch in communal catering	
Component	**Average weight [g]**
Soup	200 – 250
Main course	200- 400
Salad	100
of which dressing	30
Dessert	80
Total of lunch	580 - 830
Total (without soup & dessert)	**300 - 500**

For the evaluation of the "natürlich gut Teller", only the main course and salad without dressing from Table 4-3 are used because these components contain the essential constituent parts for the impact analysis, meat, vegetables and fruit. With an average main course weight of 300 g, the average total weight of a main course is 370 g for a "natürlich gut Teller". The meat content of 90 g in meat dishes is a requirement of the "natürlich gut Teller". The fish content of 120 g is a value from practice of [Daxbeck et al., 2017b] (see Table 4-4).

Table 4-4: Average weight of components of the main course of the "natürlich gut Teller"

Component [g]	Meat dish	Fish dish	Vegetarian dish
Meat/fish	90	120	
Vegetables/side dish/salad	280	250	370
Total	**370**	**370**	**370**

With the assumptions made above, the consumed "natürlich gut Teller" according to Table 4-1 can be divided according to number and weight as follows:

Table 4-5: Number and composition of consumed "natürlich gut Teller" from 2011 – 2016

Year	Consumed NGT [units]	NGT meat dishes [units]	NGT fish dishes [units]	NGT vegetarian [units]	Meat content of NGT [kg]	Fish content of NGT [kg]	Vegetable content of NGT [kg]	Total weight of NGT [kg]
2011	605,538	121,108	145,329	339,101	10,900	17,439	195,710	**224,049**
2012	823,361	164,672	197,607	461,082	14,820	23,713	266,110	**304,644**
2013	823,361	164,672	197,607	461,082	14,820	23,713	266,110	**304,644**
2014	641,785	128,357	154,028	359,400	11,552	18,483	207,425	**237,460**
2015	666,082	133,216	159,860	373,006	11,989	19,183	215,278	**246,450**
2016	830,332	166,066	199,280	464,986	14,946	23,914	268,363	**307,223**
Total	**4,390,459**	**878,092**	**1,053,710**	**2,458,657**	**79,028**	**126,445**	**1,418,996**	**1,624,470**
Share	**100%**	**20%**	**24%**	**56%**	**5%**	**8%**	**87%**	**100%**

With the conversion to masses in Table 4-5, the high proportion of vegetarian components, fruit, vegetables and salad, becomes clear at 87%. This confirms compliance with the target criterion that at least 2/3 plant-based ingredients are to be used.

In the homes of the KWP the total quantity of meat is divided into 45% pork, 40% beef and 15% chicken. The quantity of meat of the "natürlich gut Teller" in Table 4-5 can therefore be broken down as follows:

Table 4-6: Quantity of types of meat in the "natürlich gut Teller" from 2011 – 2016

Year	Organic meat in NGT [kg]	Organic pork in NGT [kg]	Organic beef in NGT [kg]	Organic chicken in NGT [kg]
2011	10,900	4,905	4,360	1,635
2012	14,820	6,669	5,928	2,223
2013	14,820	6,669	5,928	2,223
2014	11,552	5,198	4,621	1,733
2015	11,989	5,395	4,796	1,798
2016	14,946	6,726	5,978	2,242
Total	**79,027**	**35,562**	**31,611**	**11,854**
Share	**100%**	**45%**	**40%**	**15%**

4.2.2 Quantity of organically purchased food

The amount of vegetables, fruit and meat from organic production used by users has increased. In the KWP, 57% more vegetables, 16% more fruit and 11% more meat from organic agriculture were purchased in 2016 than in 2012. The KHR data also shows an increase in organic fruit and vegetables during the use of the “natürlich gut Teller”. Organic m eat is not used by the KHR. (see Figure 4-1, Table 4-7)

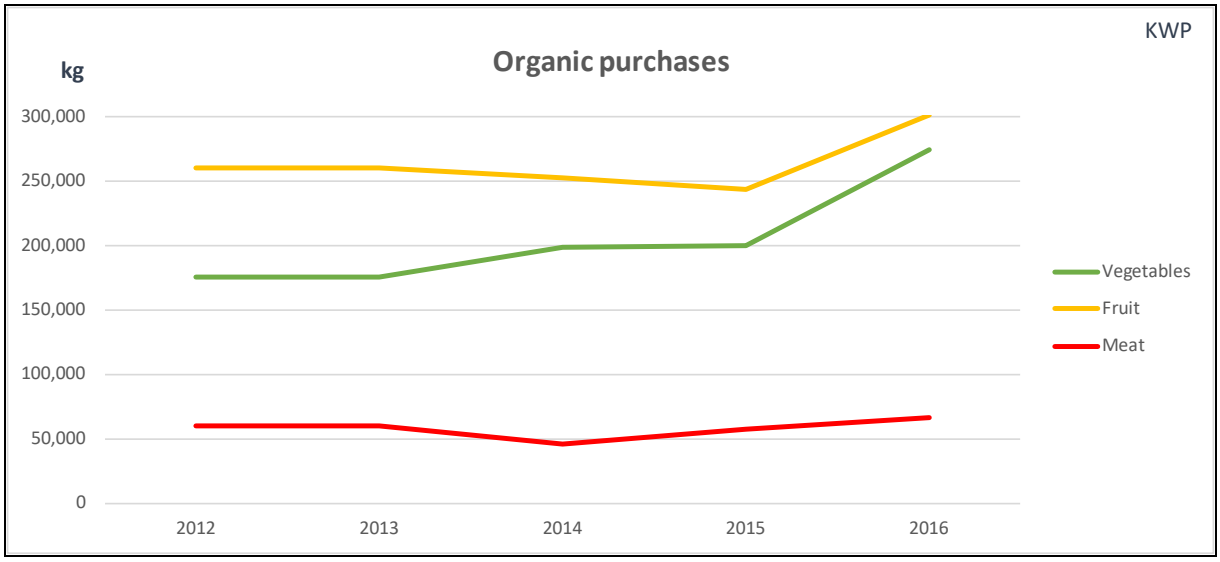

Figure 4-1: Total purchased quantities of vegetables, fruit, meat from organic production in the KWP homes (source: KWP)

Table 4-7: Purchased quantity of organic food during the use of the “natürlich gut Teller” in the KWP, KHR, KFJ

[kg]	Organic food purchased by KWP			Organic food purchased by KHR		Organic food purchased by KFJ		
	Vegetables	Fruit	Meat	Vegetables	Fruit	Vegetables	Fruit	Meat
2009				67,756	19,451			
2010								
2011								
2012	175,188	260,859	59,901					
2013	175,188	260,859	59,901					
2014	199,395	253,328	45,340					
2015	199,809	243,248	56,790			52,091	57	15,765
2016	275,161	301,390	66,513	68,229	22,095	58,421	83	13,336
Total	**1,024,741**	**1,319,684**	**288,445**	**135,985**	**41,545**	**110,513**	**140**	**29,101**

If we compare the total quantities of purchased food from Table 4-7 with the calculated food requirements for the production of the “natürlich gut Teller” in Table 4-5, it can be seen that the quantities of organic food purchased far exceed the requirements (see 4-8). In the case

of fruit and vegetables, more than twice as many goods from organic production are purchased than are necessary for the “natürlich gut Teller”. In the case of meat, this is even three to four times the amount.

Table 4-8: Comparison of purchased quantity of organic food with the requirement for the “natürlich gut Teller”

[kg]	Total organic food purchased		Total organic requirement of NGT		Difference between food purchased and requirement	
	Fruit and vegetables	Meat	Fruit and vegetables	Meat	Fruit and vegetables	Meat
2011[1)]	404,420	58,292	**195,710**	**10,900**	208,710	47,393
2012	436,047	59,901	**266,110**	**14,820**	169,937	45,081
2013	436,047	59,901	**266,110**	**14,820**	169,937	45,081
2014	452,723	45,340	**207,425**	**11,552**	245,298	33,788
2015	495,205	72,555	**215,278**	**11,989**	279,927	60,566
2016	725,379	79,849	**268,363**	**14,946**	457,016	64,903
Total	**2,949,821**	**375,838**	**1,418,996**	**79,028**	**1,530,825**	**296,810**

1) Quantities for 2011 were estimated

For the impact analysis, it is therefore assumed that the entire share of vegetables, fruit and meat comes from organic production.

Furthermore, this shows that the criterion of the use of organic components also has effects on those dishes that cannot be given the “natürlich gut Teller” label. The high proportion of organic meat for dishes outside the “natürlich gut Teller” is an indicator of the very selective effect of the criterion of the reduced meat portion and its limit of 90 g.

4.2.3 Quantity of seasonally, regionally purchased food

For seasonality, tomatoes and courgettes are used as indicators because they are popular for cooking and, unlike other popular vegetables, have a very limited shelf life. If these appear predominantly on the menu in summer, seasonality is also assumed to be taken into account with other fruit and vegetables.

In order to assess the development of regionality when purchasing goods, the purchase quantities of tropical fruits are used as an example for fruit because these certainly cannot be procured regionally. The share of tropical fruits in the total fruit consumption is used as a reference value for consideration of regionality in purchasing.

4.2.3.1 Seasonality

Figure 4-2 to Figure 4-5 show the quantities purchased and the price per kilogramme per month for the purchase of courgettes and tomatoes in the KHR for 2009 and 2016. The

comparison shows the changes due to the increased consideration of seasonality in purchasing. In 2009, 40% of the quantity of courgettes was purchased in season, in 2016 the ratio reversed and 59% of the quantity was purchased seasonally. The seasonal share of tomatoes rose from 40% (2009) to 83% (2016).

Seasonal purchasing also has an impact on costs. In 2016, the annual average price per kilogramme for courgettes was 73% of the 2009 price. In the case of tomatoes, the price was even as low as only 45%. This means that for courgettes and tomatoes alone, a saving of around € 11,000 per year was possible through seasonal purchasing in the KHR.

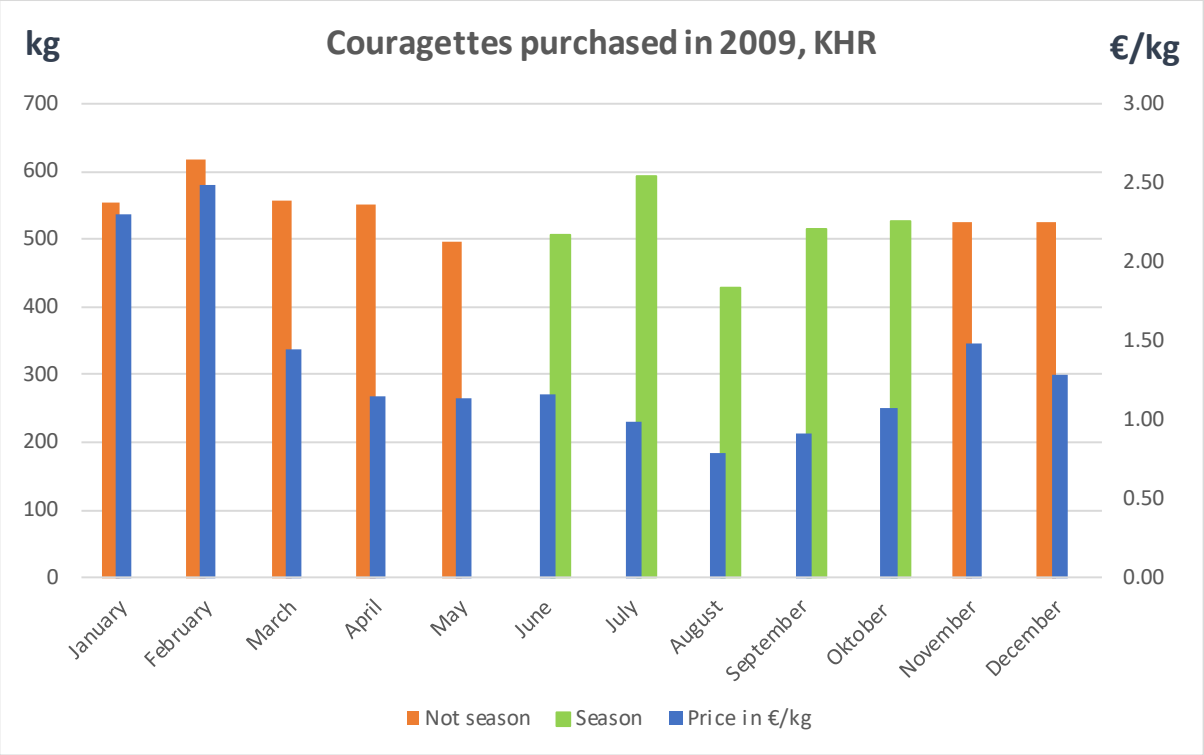

Figure 4-2: Monthly quantity and price per kilogramme for courgettes in the KHR, 2009 (source: KHR)

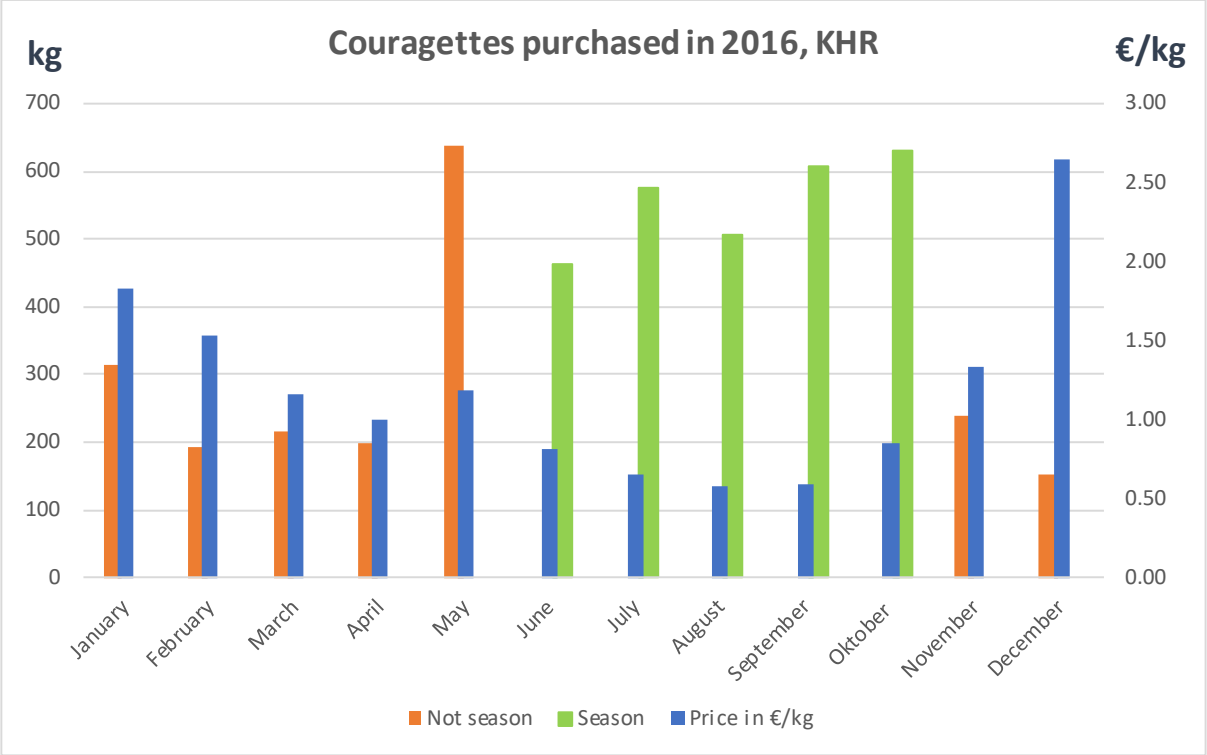

Figure 4-3: Monthly quantity and price per kilogramme for courgettes in the KHR, 2016 (source: KHR)

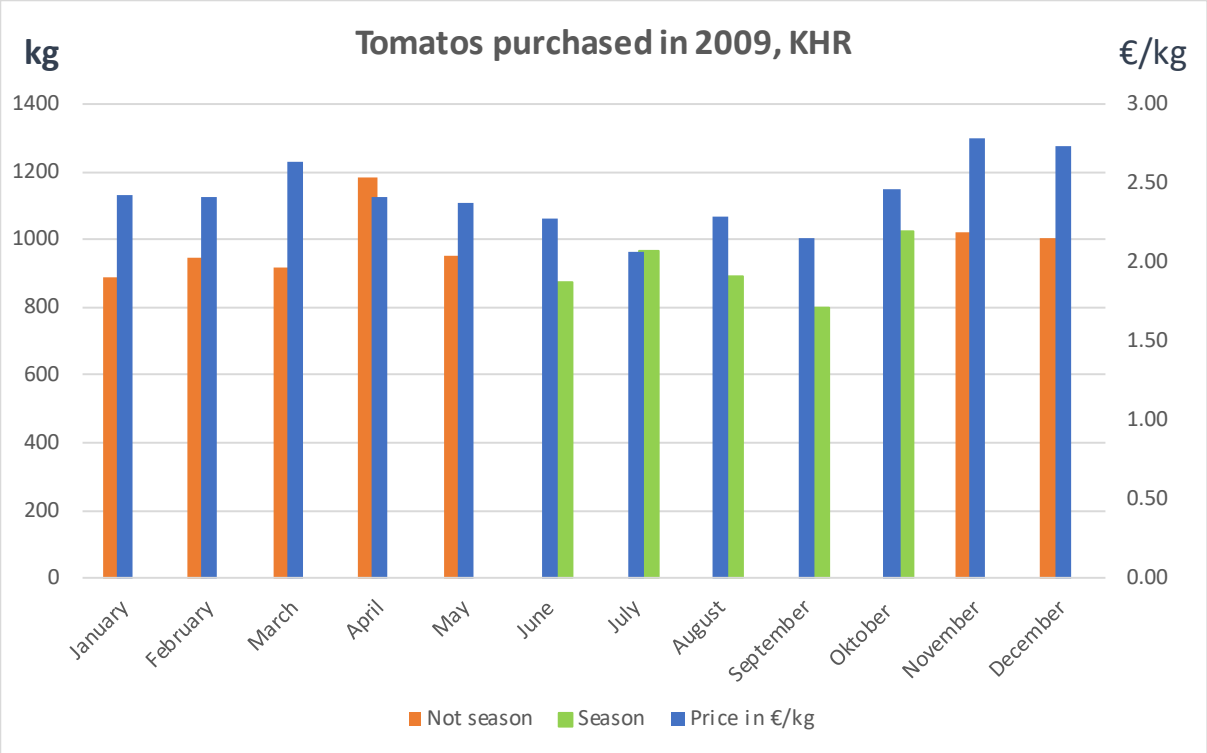

Figure 4-4: Monthly quantity and price per kilogramme for tomatoes in the KHR, 2009 (source: KHR)

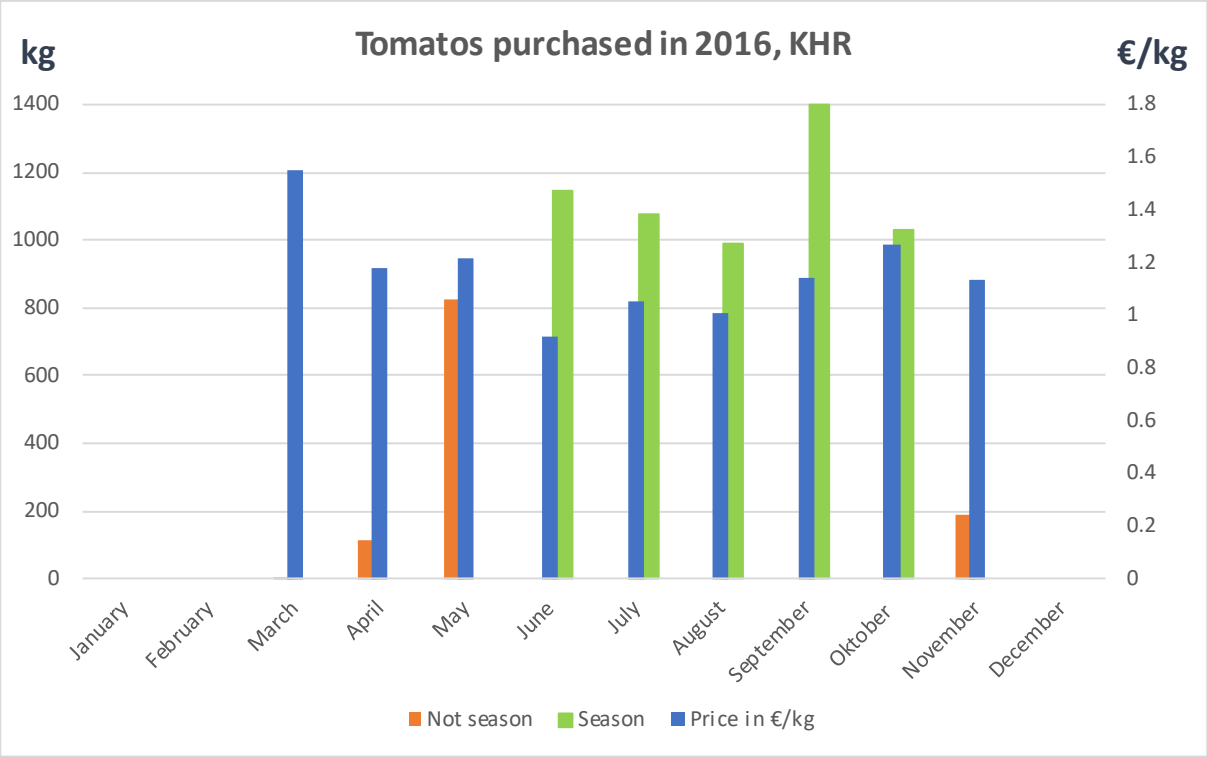

Figure 4-5: Monthly quantity and price per kilogramme for tomatoes in the KHR, 2016 (source: KHR)

On the basis of the results for the KHR, it is assumed for the "natürlich gut Teller" that between 60% and 80% of the quantity of fruit and vegetables is bought seasonally. As a first approximation, € 0.90/kg is chosen as the average saving through seasonal purchasing.

4.2.3.2 Regionality

In 2016, after the introduction of the "natürlich gut Teller", the KFJ reduced its share of tropical fruits by around 2,700 kg. The reductions were in bananas (-15%) and kiwis (-40%) in particular (see Figure 4-6). The data from the KHR (Figure 4-7) shows that over the duration of the "natürlich gut Teller" the overall share of tropical fruits was reduced by around 3,500 kg, in particular for oranges and bananas. The share of tropical fruits in the total fruit used is between 53% and 60% for the KFJ and between 41% and 53% for the KHR.

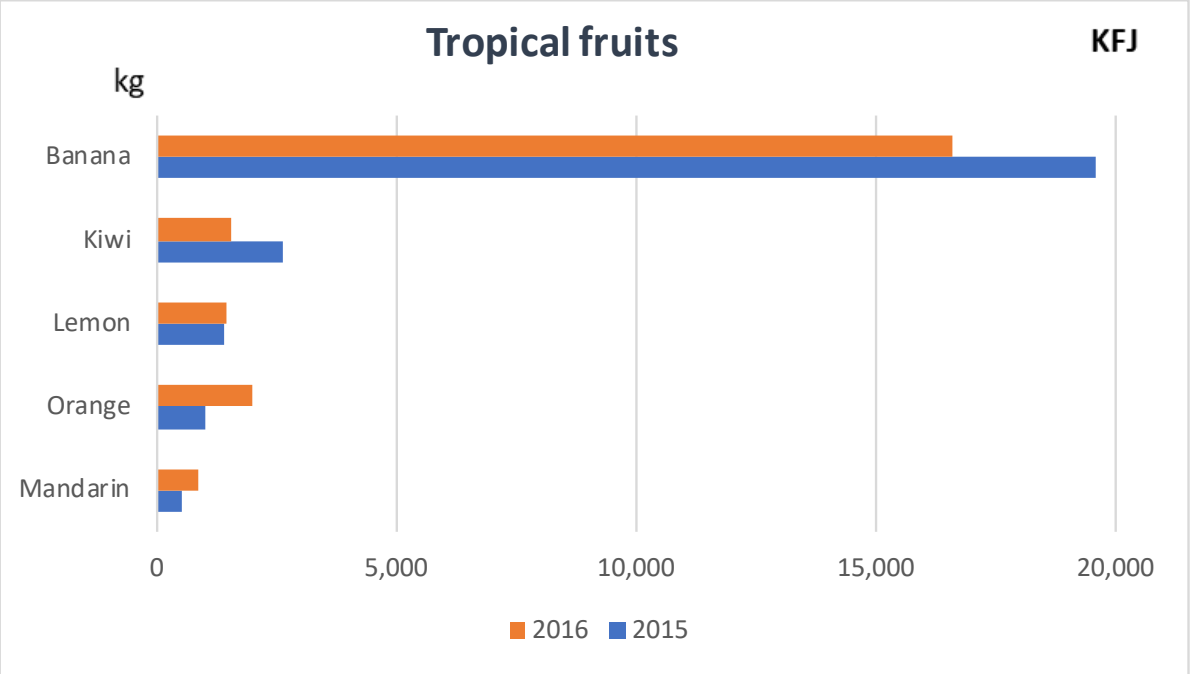

Figure 4-6: Annual quantity of tropical fruits in the KFJ in 2015, 2016 in kg (source: KFJ)

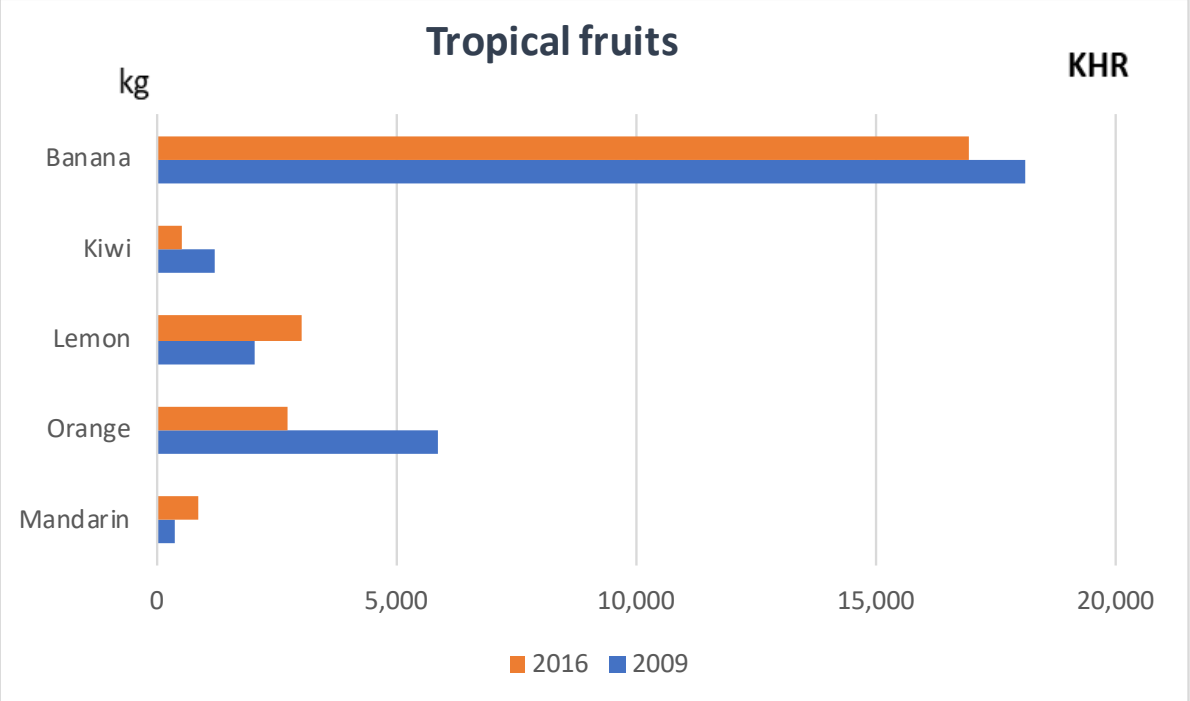

Figure 4-7: Share of tropical fruits in the KHR since the introduction of the NGT (source: KHR)

A possible goal may be to reduce the use of tropical fruits as much as possible by compensating with local fresh fruit.

It is assumed that between 40% and 60% of the food used in the “natürlich gut Teller” is purchased regionally.

4.2.4 Quantity of meat

Table 4-9 gives the annual consumption of meat of the individual users.

Table 4-9: Meat purchases during the project period by the users KWP, KHR, KFJ

Meat	KWP			KHR	KFJ		
[kg]	Conv.	Organic	Overall	Conv.	Conv.	Organic	Overall
2009				72,777			
2010				45,175			
2011				36,549			
2012	100,561	59,901	160,462	35,842			
2013	100,561	59,901	160,462	35,808			
2014	110,844	45,340	156,184	33,839			
2015	103,290	56,790	160,080	35,580	40,003	15,765	55,769
2016	89,228	66,513	155,741	42,131	42,085	13,336	55,420
Total	**504,484**	**288,445**	**792,929**	**337,701**	**82,088**	**29,101**	**111,189**

For the “natürlich gut Teller”, only meat from organic production up to a total quantity of 90 g is allowed. Although contrary to the criteria of the “natürlich gut Teller”, the clear reduction of the size of the portions of conventional meat in the KHR and of organic meat in the KWP should nevertheless be shown.

In the KHR, the quantity of meat was reduced by around 40% from 2009 to 2010. In the following years this process was continued and the quantity of meat in the menu was reduced to around 50% compared with the initial value. (see Figure 4-8)

In 2013, the KWP reduced the meat portion in all customary meat dishes from 180 g to 140 g, a saving of 22%.

The reduction of the amount of meat consumed can be achieved without any loss of quality through the creative combination of several measures such as: dividing the pieces of the meat portion, partial replacement of meat by substitute products (soya) in meat sauces and “juicy meat dishes”

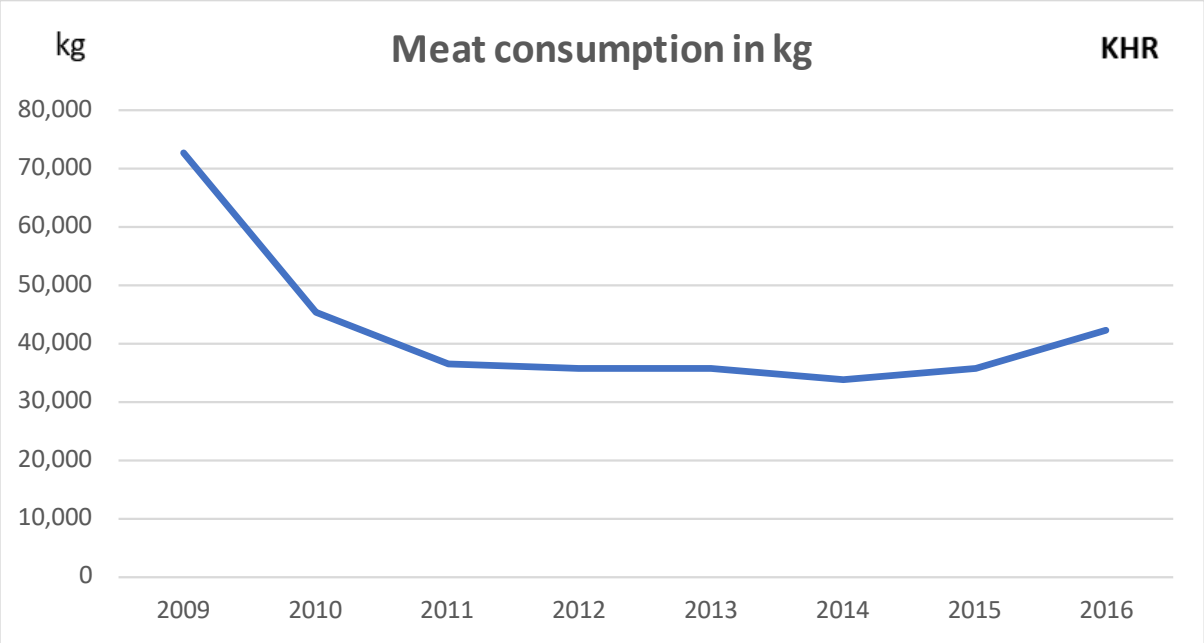

Figure 4-8: Falling meat consumption in the KHR (source: KHR)

4.2.5 Quantity of fish[1]

Table 4-10: Fish consumption of the users KWP, KHR, KFJ

	KHR		KWP			KFJ		Total fresh fish + MSC
Year	Fish overall [kg]	of which frozen MSC fish	Fish overall [kg]	of which fresh fish	of which frozen MSC fish	Fish overall [kg]	of which frozen MSC fish	
2009	7,776	0						
2010	8,080							
2011	7,306							
2012	6,703		65,297	27,926	37,371			65,297
2013	6,703		65,297	27,926	37,371			65,297
2014	8,267		61,556	28,284	33,272			61,556
2015	7,590		59,284	29,642	29,642	7,222	5,744	65,028
2016	7,065	7,065	58,302	30,124	28,178	6,463	4,912	70,279
Total	**59,490**	**7,065**	**309,736**	**143,902**	**165,834**	**13,685**	**10,656**	**327,457**

Table 4-10 presents and breaks down the consumption of fish by the three users KHR, KWP and KFJ. Since 2013 the KHR has been increasingly using fish with an MSC certificate, so that from 2016 all fish used has had the MSC label. The KWP uses either fresh fish, 100%

[1] Since the criteria of the "natürlich gut Teller" in the years 2011 – 2016 included the MSC/ASC label as a characteristic of sustainable fish purchasing, in the evaluations the fish consumption of MSC fish is also evaluated as sustainable (see chapter 3.1.4)

from local production if available, or MSC fish. The share of fresh, local fish in the KWP is between 43% and 52%.

In comparison with the fish requirement for the “natürlich gut Teller” (see Table 4-5) it can be seen, similar to meat, that for the “natürlich gut Teller” only about one third of the quantity of fresh or certified fish is required (see Table 4-11). This confirms that the fish criterion is met by the users. It would even be possible to prepare the “natürlich gut Teller” entirely with local fish.

Table 4-11: Comparison of purchased quantity of sustainable fish with the requirement for the “natürlich gut Teller”

[kg]	Purchased fresh fish + MSC	Total fish requirement of NGT	Difference between food purchased and requirement
2012	65,297	23,713	41,584
2013	65,297	23,713	41,584
2014	61,556	18,483	43,073
2015	65,028	19,183	45,845
2016	70,279	23,914	46,365
Total	**327,457**	**109,006**	**218,451**

For the impact analysis it is assumed that 40% of the fish in the “natürlich gut Teller” comes from local production as fresh fish.The remaining 60% is in the form of frozen goods imported from abroad with an MSC certificate.

4.2.6 Use of convenience products

For the “natürlich gut Teller”, foodstuffs in the processing stages base level (= unprocessed), ready-for-kitchen and ready-to-cook are permitted (see chapter 3.1.8). All higher processing stages are not permitted in purchasing. Frozen vegetables and convenience products are used as indicators.

The data provided by the KWP shows that the quantity of frozen vegetables has been halved in recent years (Figure 4-9). The proportion of convenience products used was also reduced from 4.8% to less than half at 2.1%.

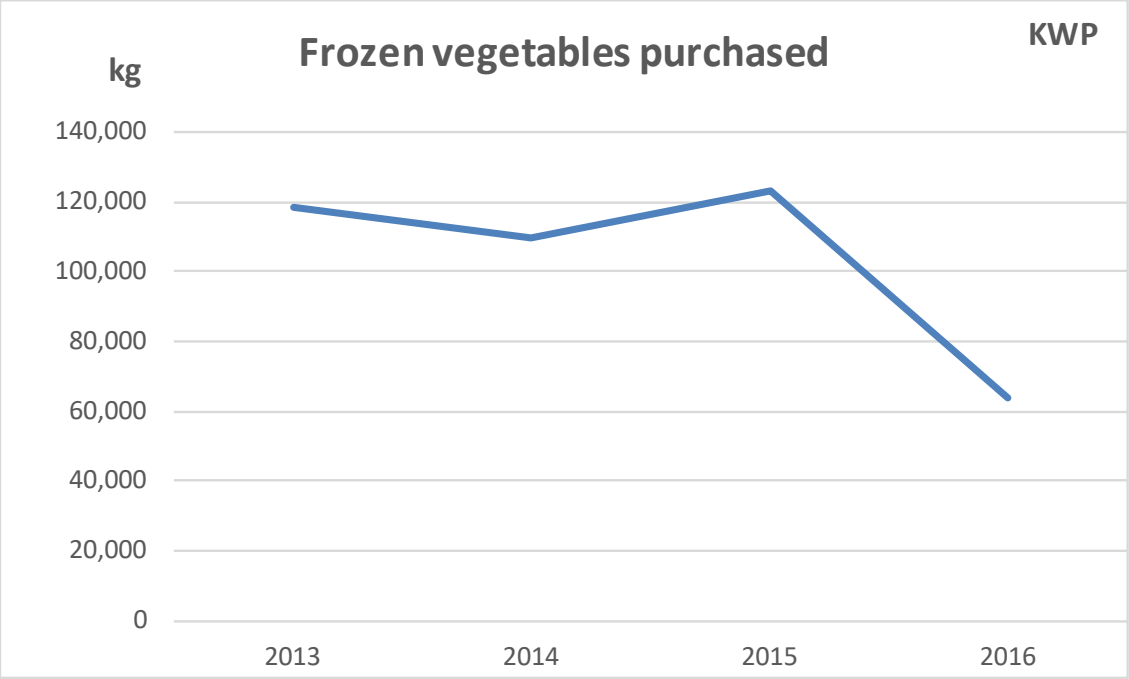

Figure 4-9: Annual quantity of frozen vegetables purchased in all KWP homes (source: KWP)

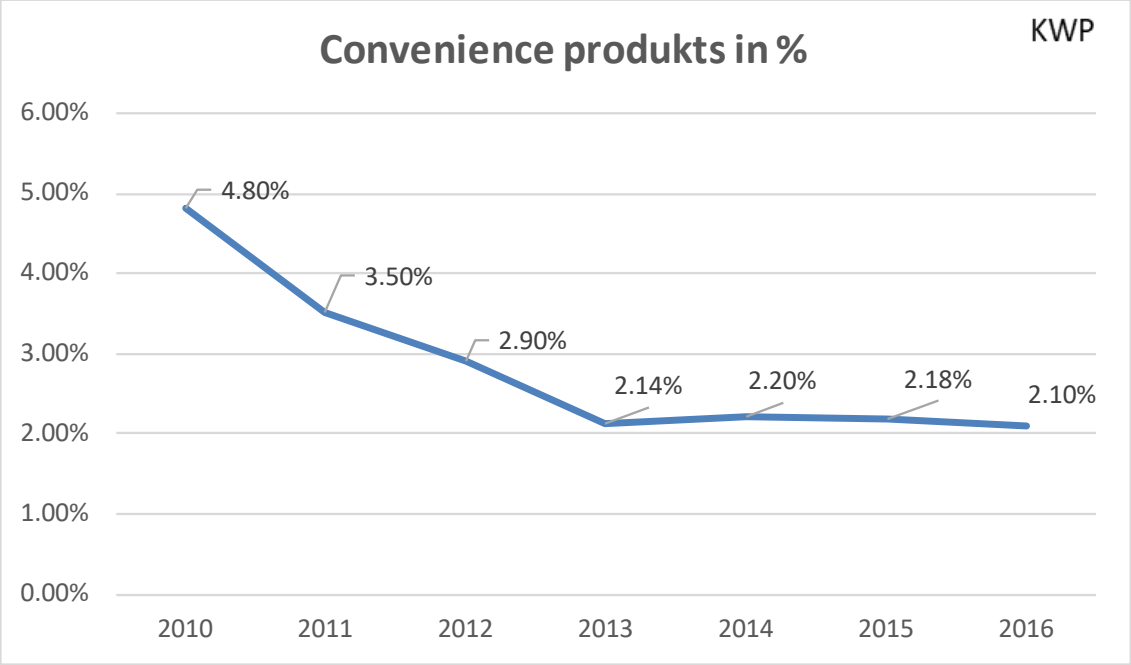

Figure 4-10: The share of convenience products has been reduced in the KWP

At the KHR, too, the quantity of convenience products used has been reduced to about a half in the years since 2009 (see Figure 4-11).

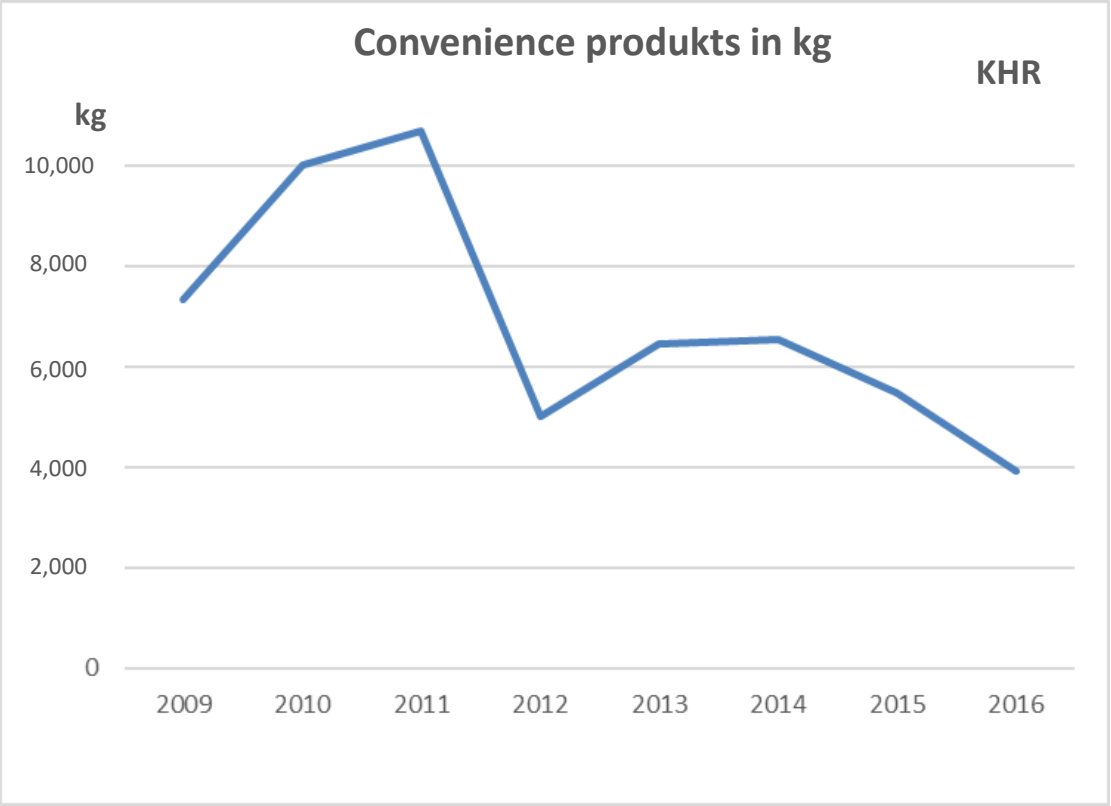

Figure 4-11: Quantity of convenience products in the KHR (source: KHR)

For the "natürlich gut Teller", it is assumed that the quantity of convenience products used halved between 2009 and 2016.

4.3 Summary of the fundamentals and assumptions for determining the impact of the "natürlich gut Teller"

Consumed "natürlich gut Teller"

Table 4-12: Number and composition of consumed "natürlich gut Teller" from 2011 – 2016

Year	Consumed NGT [units]	NGT meat dishes [units]	NGT fish dishes [units]	NGT vegetarian [units]	Meat content of NGT [kg]	Fish content of NGT [kg]	Vegetable content of NGT [kg]	Total weight of NGT [kg]
2011	605,538	121,108	145,329	339,101	10,900	17,439	195,710	**224,049**
2012	823,361	164,672	197,607	461,082	14,820	23,713	266,110	**304,644**
2013	823,361	164,672	197,607	461,082	14,820	23,713	266,110	**304,644**
2014	641,785	128,357	154,028	359,400	11,552	18,483	207,425	**237,460**
2015	666,082	133,216	159,860	373,006	11,989	19,183	215,278	**246,450**
2016	830,332	166,066	199,280	464,986	14,946	23,914	268,363	**307,223**
Total	**4,390,459**	**878,092**	**1,053,710**	**2,458,657**	**79,028**	**126,445**	**1,418,996**	**1,624,470**
Share	**100%**	**20%**	**24%**	**56%**	**5%**	**8%**	**87%**	**100%**

For details see chapter 4.2.1.2

Organic component

For the impact analysis, it is therefore assumed that the entire share of vegetables, fruit and meat comes from organic production. (For details see chapter 4.2.2)

For organic vegetables, a range between 16 – 47 t/ha is chosen for the yield. (see chapter 5.1.1.2)

For fruit, an average yield of 26 t/ha is calculated.

Of all the fruit and vegetables purchased, vegetables account for 47% of the total weight and fruit accounts for 53%. This distribution is used for the “natürlich gut Teller”. (see chapter 5.2.1.2)

Preference for plant-based food

In terms of mass, the “natürlich gut Teller” consists of 87% vegetarian components, fruit, vegetables and salad. (For details see chapter 4.2.1.2)

An average value of 995 l/kg is calculated for the virtual water consumption of fruit and vegetables (see Table 3-5).

Seasonality

It is assumed for the “natürlich gut Teller” that between 60% and 80% of the quantity of fruit and vegetables is bought seasonally. As a first approximation, € 0.90/kg is chosen as the average saving through seasonal purchasing. (For details see chapter 4.2.3.1)

Regionality

It is assumed that between 40% and 60% of the food used in the “natürlich gut Teller” is purchased regionally. (For details see chapter 4.2.3.2)

Meat

Reduction of meat portions by 22% – 40% to a value above 90 g, which thus prevents labelling as “natürlich gut Teller”. (For details see chapter 4.2.4)

The meat used consists of 45% pork, 40% beef and 15% chicken.

The average price for beef is 8.9 €/kg, for pork 4.41 €/kg and for chicken and other poultry 6.23 €/kg.

The production of 1 kg of beef requires 15,400 litres of water, 1 kg of pork requires 6,000 litres, and 1 kg of poultry requires 4,300 litres [Hoekstra et al., 2016].

Fish

For the impact analysis it is assumed that 40% of the fish in the “natürlich gut Teller” comes from local production as fresh fish. The remaining 60% is in the form of frozen goods imported from abroad with an MSC certificate. (For details see chapter 4.2.5)

In the case of fish with MSC certification, the proportion of bycatch of Alaska pollack, which accounts for approximately two thirds of the MSC-certified fish for human consumption for all users, is applied to the other fish species and used for all further calculations.

In fish farming there are about 16 ha per employee.

An optimal stocking density for carp is one carp per 15 m^2 of pond area, which results in 667 carp per hectare.This means that 10,672 carp create one job [Adamek & Kratochvil, 2014]. A carp which is ready for the kitchen is assumed with a weight of 1.5 kg.

As a reference for the prices of the most popular local fish, the price recommendations from the farm of the Styrian Pond Farmers’ Association are used.

Table 4-13: The most popular local fish species and their prices [source: Styrian Pond Farmers’ Association, 2016].

Fish species		Price per kg excl. 10% VAT	Price per kg incl. 10% VAT
Carp	“Boneless” filet	€ 15.18	€ 16.70
Trout	Filet	€ 14.09	€ 15.50
Salmon trout	Filet	€ 15.00	€ 16.50
Catfish	Filet	€ 17.18	€ 18.90
Pike	Whole, cleaned	€ 15.00	€ 16.50
Zander	Whole, cleaned	€ 17.27	€ 19.00
Char	Filet	€ 17,18	€ 18,90

Convenience products

For the “natürlich gut Teller”, it is assumed that the quantity of convenience products used halved between 2009 and 2016.

5 Results

5.1 The impact analysis of the “natürlich gut Teller”

The effects of the evaluated data cannot be related exclusively to the “natürlich gut Teller”, but the responsible kitchen managers and purchasers assured that the introduction of the “natürlich gut Teller” had many positive side effects on sustainable procurement and food handling. Since there is no separate data collection, the following chapter uses figures from total purchasing.

Quantification of mandatory criteria

5.1.1 “Increased use of organic food” (mandatory criterion)

5.1.1.1 Economic effects of the increased use of organic food

In 2016, around 268,000 kg of fruit and vegetables and around 15,000 kg of meat from organic farming were used for the “natürlich gut Teller”. In addition, there are 457,000 kg of fruit and vegetables and 65,000 kg of meat from organic farming which the users did not use in the “natürlich gut Teller” but rather in other dishes.

Over the duration of the “natürlich gut Teller” (2011 – 2016) a total of around 1,420,000 kg of fruit and vegetables and 79,000 kg of meat from organic farming were used and a further 1,500,000 kg of organic fruit and vegetables and 300,000 kg of organic meat were purchased, which were processed into dishes without the “natürlich gut Teller” label.

5.1.1.2 Ecological effects of the increased use of organic food

Bio Austria, which was contacted in the course of the evaluation, explained that there are no general, quantitative statements and reference values on the differences between conventional and organic agriculture. In order to quantify the effects of organic agriculture, long-term trials would have to be carried out directly on the farms. The effects are strongly location-dependent, which is why it is difficult to quantify general statements about the effects. Here only a qualitative representation or evaluation is possible.

[pers. message of Mr. Holler, Bio Austria]

The qualitative impacts of organic agriculture are discussed in more detail in chapter 3.1.1.2.

Organically farmed area for fruit and vegetables:

As established above, all the fruit and vegetables used in the “natürlich gut Teller” come from organic production.

The yield of organic potatoes in Austria is about 16 t/ha [Resl & Brückler, 2015]. The mainly used vegetable varieties are discerned from the data of the 10 top-selling “natürlich gut Teller”: cabbage, carrots, onions, turnips, pumpkin. In organic cultivation these have an average yield of 47 t/ha [Eschlböck, 2017], for courgettes it is 39 t/ha [Hambrusch & Quendler, 2016]. For vegetables, a range between 16 – 47 t/ha is chosen.

For fruit, an average yield of 26 t/ha is calculated from the ha yields of the most purchased fruit varieties apple [Zander & Waibel, 2002], banana, orange [Ökofair, 2015] and pear [Statista, 2017].

Of all the fruit and vegetables purchased, vegetables account for 47% of the total weight and fruit accounts for 53%. This distribution is used for the “natürlich gut Teller”.

Table 5-1: Effect of organically farmed area for the “natürlich gut Teller”

Year	Organic fruit and vegetables in NGT [kg]	Organic vegetables in NGT [kg]	Organic fruit in NGT [kg]	Cultivation area for vegetables		Cultivation area for fruit [ha]
				Min [ha]	Max [ha]	
2016	268,363	126,884	141,479	2.7	7.9	5.4
Total 2011 – 2016	**1,418,996**	**666,928**	**752,068**	**14.2**	**41.7**	**28.9**
Share	**100%**	**47%**	**53%**			

Table 5-2: Effect of organically farmed area for the entire organic food purchased by the users

Year	Organic fruit and vegetables [kg]	Organic vegetables [kg]	Organic fruit [kg]	Cultivation area for vegetables		Cultivation area for fruit [ha]
				Min [ha]	Max [ha]	
2016	725,379	401,811	323,568	8.5	25.1	12.4
Total 2011 – 2016	**2,949,821**	**1,356,797**	**1,593,024**	**28.9**	**84.8**	**61.3**

As shown in Table 5-1 and Table 5-2, the “natürlich gut Teller” ensures the organic use of 3 – 8 ha of vegetable cultivation area and about 5 ha of cultivation area for fruit per year. If we take into account the purchase of all organic food by the users, 9 – 25 ha for vegetables and 12 ha for fruit are tilled annually according to organic criteria.

For the period 2011 – 2016 the total cultivation area for the “natürlich gut Teller” is 14 – 42 ha for vegetables and 29 ha for fruit. For the entire purchase of organic food, the figures are 29 – 85 ha for vegetables and 61 ha for fruit cultivated according to organic criteria.

The specific effect per 1,000 served “natürlich gut Teller” is between 31 – 97 m^2 of organically farmed agricultural land for vegetables. In the case of fruit this figure is 66 m^2 per 1,000 served “natürlich gut Teller”.

5.1.1.3 Social effects of the increased use of organic food

Employed people

On an average organic farm, 2.5 people cultivate an area of 25 ha [Schwaiger et al., 2017]. The purchasing for the “natürlich gut Teller” thus secures the employment of two to three people in organic agriculture and maintains two to three farms.

Animal welfare

Between 2011 and 2016, the users bought approx. 32,000 kg of beef, 36,000 kg of pork and around 12,000 kg of chicken from organic production for the “natürlich gut Teller”. This enabled better animal welfare for around 63 cows, 374 pigs and 6,600 chickens on an organic farm.

5.1.2 “Increased use of seasonal food” (mandatory criterion)

5.1.2.1 Economic effects of the increased use of seasonal food

For the year 2016, the consumption of fruit and vegetables for the “natürlich gut Teller” totals 268,000 kg, for the entire duration this is 1,420,000 kg of fruit and vegetables.

Assuming a seasonal share between 60% and 80% (see chapter 4.2.3.1), between 161,000 kg and 214,000 kg of fruit and vegetables are purchased in season in 2016. Over the entire duration of the “natürlich gut Teller”, between 851,000 kg and 1,140,000 kg of fruit and vegetables were purchased seasonally.

Divided into fruit and vegetables, to cover the requirement for the “natürlich gut Teller” in 2016 between 85,300 kg and 113,000 kg of fruit and between 75,600 kg and 100,000 kg of vegetables were purchased seasonally. Over the entire duration of the “natürlich gut Teller”, between 451,000 kg and 601,000 kg of fruit and between 400,000 kg and 533,000 kg of vegetables were purchased in season by all users.

Assuming that the participants also buy all their fruit and vegetables from organic farming seasonally, for the entire duration of the “natürlich gut Teller” between 830,000 kg and 1,110,000 kg of vegetables and between 940,000 kg and 1,250,000 kg of fruit were purchased seasonally.

As a first approximation, € 0.90 per kilogramme is chosen as the average saving through increased seasonal purchasing. (see chapter 4.2.3.1). Applied to the total quantity of fruit and vegetables for the “natürlich gut Teller”, as initial orientation there is a potential for seasonal purchasing for all types of fruit and vegetables of between € 140,000 and € 190,000 per year.

With the available data it is not possible to check whether the price difference between seasonal and non-seasonal fruit and vegetables is as large for all types of fruit and vegetables as for the shown tomatoes and courgettes. It becomes clear that through increased seasonal purchasing, budget funds can be made available in order to be able to use higher-quality food, e.g. for organic or fair trade food, with a constant budget.

5.1.2.2 Ecological effects of the increased use of seasonal food

In order to calculate saved **transport kilometres**, a transport route of 2,000 km (Spain – Vienna) is allocated to fruit and vegetables purchased out of season and a transport route of 400 km (within Austria) to fruit and vegetables purchased in season.

Through the seasonal purchase of fruit and vegetables for the “natürlich gut Teller”, between 78 million tkm and 164 million tkm of truck trips were saved in 2016. For the entire period 2011 – 2016 there are transport savings of around 420 million tkm to 870 million tkm. This means prevention of CO_2 emissions of up to 15,000 t $CO_{2\ eq.}$ annually and up to 78,000 t $CO_{2\ eq.}$ in the period 2011 – 2016.[1]

5.1.2.3 Social effects of the increased use of seasonal food

Seasonal purchasing is closely linked to the purchase of organic food using regional sources. A division of the social effects into the criteria seasonal, regional and organic does not seem possible and meaningful in the present context. It is therefore assumed that seasonal purchasing also contributes to safeguarding those jobs that are safeguarded by purchasing organic food (see chapter 5.1.1.3 and regional food chapter 5.1.7).

5.1.3 “Reduced meat portions” (mandatory criterion)

For 2016, Table 4-5 shows a quantity of meat of 14,900 kg used in the “natürlich gut Teller”. Without the criterion of the reduced meat portion, a 22% to 40% higher quantity of meat is assumed (see chapter 4.3). This results in quantities of 19,000 kg to 25,000 kg of meat for the year 2016, and for 2011 – 2016 a quantity of 100,000 kg to 132,000 kg of meat. Thus, the criterion “reduced meat portion” saved around 4,000 kg – 10,000 kg of meat for 2016 and

[1] Assumption based on Ecoinvent ttransport, freight, lorry >32 metric ton: 0.09 kg CO_2 eq./1 tkm

22,000 kg – 53,000 kg for the period 2011 – 2016 for the meat dishes of the “natürlich gut Teller” alone. Here the quantities of meat are not taken into account in dishes that are not labelled as “natürlich gut Teller” but in which the size of the meat portion has also been reduced.

5.1.3.1 Economic effects of reduced meat portions

From the average prices listed in chapter 4.3 for the different types of meat, an average price for meat of € 6.23 per kilogramme is chosen. From the quantities given above, the “natürlich gut Teller” has a range of lower purchasing costs from € 26,000 to € 62,000 in 2016, and from € 140,000 to € 330,000 over the entire duration 2011 – 2016.

This results in a cost reduction of € 32 – € 75 per 1,000 “natürlich gut Teller” for the entire duration, and a cost reduction of € 158 – € 374 per 1,000 “natürlich gut Teller” containing meat.

5.1.3.2 Ecological effects of reduced meat portions

Water consumption / virtual water

The effects of the preference for plant-based food are illustrated by the virtual water consumption of food according to [Hoekstra et al., 2016]. The average water footprint/virtual water indicates how much water is consumed on average in the production of a wide variety of foods.

The values for virtual water consumption are taken from Table 3-5. The quantities of fruit, vegetables and meat are taken from Table 4-5, which shows the food requirement of the “natürlich gut Teller”, and are processed as described in chapter 4.3.

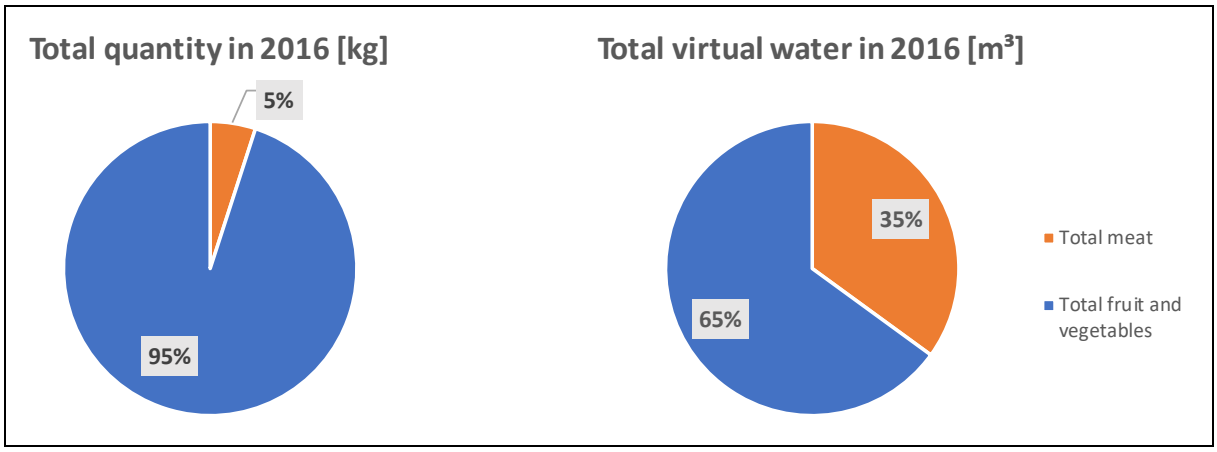

Figure 5-1: Total quantity of fruit & vegetables and meat for 2016 and the virtual water in [m³] used for food production

Figure 5-1 shows the proportion in terms of quantity of vegetables and meat in the consumed "natürlich gut Teller" and the consumption of virtual water for both product groups. The average water consumption of meat is 8.6 times higher than the calculated average water consumption of vegetables.

In contrast to other foods, meat has very high water consumption during production. For the natürlich gut Teller, this results in a range of 147,000 to 249,000 m^3 of virtual water saved in 2016 by the "natürlich gut Teller" of the individual users.

Over the entire duration of the "natürlich gut Teller" the meat reduction meant it was not necessary to use 853,000 m^3 to 1,390,000 m^3 of virtual water in animal breeding. The specific effect per 1,000 served "natürlich gut Teller" is 194 m^3 to 317 m^3 of virtual water saved by reducing meat portions.

5.1.3.3 Social effects of reduced meat portions

For the "natürlich gut Teller", taking into account the assumptions in chapter 4.3, this results in a range of 20 to 63 cows or 20 to 63 livestock units that were saved from the slaughterhouse (with a carcass yield of 300 kg) in 2016.

Over the entire duration of the "natürlich gut Teller", 108 to 176 cows or 108 to 176 livestock units were saved from the slaughterhouse on account of the meat reduction. (See also chapter 5.1.3.3). This means one cow per 24,000 served "natürlich gut Teller".

5.1.4 "Fish from sustainable sources" (mandatory criterion)

The quantity of fish that was needed by all users for the "natürlich gut Teller" in 2016 is 23,900 kg. Of this, there was 9,560 kg of fresh fish from Austria and 14,300 kg of fish with MSC certification. For the entire duration of the "natürlich gut Teller", the quantity of fish is around 130,000 kg, divided into 52,000 kg of fresh fish from Austria and 78,000 kg of fish with MSC certification.

5.1.4.1 Economic effects of fish from sustainable sources

If fish is purchased locally, the added value remains in the country and in the region. Depending on the type of fish, for the year 2016 this is € 134,000 to € 165,000 which remained in the country due to the purchase of local fish by the users. For the entire duration of the "natürlich gut Teller", the range of value added in Austria goes from € 737,000 to € 903,000. For every 1,000 "natürlich gut Teller" this is € 30 to € 38 in 2016, and € 168 to € 206 for every 1,000 "natürlich gut Teller" during the project period 2011 – 2016.

5.1.4.2 Ecological effects of fish from sustainable sources

For Alaska pollack, a bycatch rate of 1% is reported by sustainable fisheries. For comparison, the average for fishing worldwide is a bycatch of 40% (see chapter 3.1.4). In 2016, the use of MSC-certified Alaska pollack prevented up to 5,590 kg of bycatch. Over the entire duration of the “natürlich gut Teller” up to 29,800 kg of bycatch was able to be prevented by using MSC-certified Alaska pollack. Per 1,000 “natürlich gut Teller”, 3 kg of bycatch was prevented. Per 1,000 “natürlich gut Teller”, up to 7 kg of bycatch can be prevented.

5.1.4.3 Social effects of fish from sustainable sources

Using local fish species creates and maintains jobs in Austria. The number of these varies depending on the stocking density and the expense required for breeding each fish species. The calculation is based on the assumptions made in chapter 4.3. The purchase of around 9,600 kg of fresh fish from Austria in 2016 and around 52,000 kg in the period 2011 – 2016 meant that about one person was employed in Austrian pond culture.

5.1.5 Summary of the impact analysis for the mandatory criteria of the "natürlich gut Teller"

Table 5-3: Summary of the impact analysis of the mandatory criteria of the "natürlich gut Teller" in the period 2011 – 2016

	Economic effect	Overall effect	Specific effect per 1,000 NGT	Ecological effect	Overall effect	Specific effect per 1,000 NGT	Social effect	Overall effect	Specific effect per 1,000 NGT
Increased use of organic food	Food from organic farming	1,420,000 kg of fruit and vegetables; 79,000 kg of meat	323 kg of fruit and vegetables; 18 kg of meat	Cultivation area that was organically farmed	14 – 42 ha of vegetables, around 29 ha of fruit. Total 43 – 71 ha	31 – 97 m^2 for vegetables, 66 m^2 for fruit	Organic farms Jobs in organic farming Animal welfare	2 – 3 farms 2 – 3 employees 63 cows, 374 pigs, 6,600 chickens	n.q.
Increased use of seasonal food	Seasonally purchased quantity of fruit and vegetables Cost saving through seasonal purchasing p.a.	851,000 kg to 1,140,000 kg of fruit and vegetables; around € 140,000 to € 190,000 p.a.	194 kg to 260 kg of fruit and vegetables; around € 32 to € 43	Transport savings (tonne km) Prevented greenhouse gas emissions	420 million – 870 million tkm 78,000 t $CO_{2\ eq.}$	96,000 – 200,000 tkm 18 t $CO_{2\ eq.}$	Regional cultivation area that is preserved and jobs that are preserved	As with organic food: around the same 2 – 3 farms 2 – 3 employees	n.q.
Reduced meat portions	Saved amounts of meat Reduced purchasing costs	22,000 kg to 53,000 kg € 140,000 to € 330,000	€ 32 to € 75	Saved virtual water	853,000 m^3 to 1,390,000 m^3 of virtual water	194 m^3 to 317 m^3 of virtual water	Cows saved from the slaughterhouse	194 to 317 cows (livestock units)	1 cow per 24,000 consumed "natürlich gut Teller"
Fish from sustainable sources (acc. to NGT criteria 2016)	Value added in Austria by purchasing local fish	€ 737,000 to € 903,000	€ 168 to € 206	Prevented bycatch on account of salmon with MSC certification	Up to 29,800 kg of bycatch prevented	Up to 7 kg of bycatch prevented	Jobs in pond culture	1 person per year	n.q.

n.q. … not quantifiable | total number of NGT from 2011 – 2016: 4.4 million meals | "Fish from sustainable sources": see footnote in chapter 4.1.4.4.

Table 5-3 shows the effect of the mandatory criteria of the consumed "natürlich gut Teller" of all users of the "natürlich gut Teller" in the period 2011 – 2016.

5.1.6 "Preference for plant-based food" (target criterion)

The "natürlich gut Teller" consists of around 95% fruit and vegetables, based on the total amount of food used. The meat content is only 5%. Since, with an approximately constant portion size per "natürlich gut Teller", the reduction in meat portions is accompanied by an increase in plant-based side dishes, the positive effects of meat reduction can also be attributed to the preference for plant-based food (see chapter 5.1.3). These include:

- the lower specific water consumption of plants,
- better use of the calories produced in the field – when plants are used as animal feed, only about one third of the nutritional value of the plants reaches the plate
- lower price of plant-based foods

5.1.7 "Increased use of regional food" (target criterion)

The increased use of regional food was unable to be quantified on the basis of the available data. During the "natürlich gut Teller" project, the kitchen managers should have requested data on the origin of the food from the suppliers and documented this. What is possible with corresponding expense with fresh meat due to the labelling is connected with substantial additional expenditure for fruit and vegetables on account of the fact that the origin changes with the season.

Using the example of purchasing behaviour for tropical fruits (see chapter 4.2.3.2), under the condition that all other fruit and vegetables come from Austria, it was assumed in a first approximation that between 40% and 60% of the food used in the "natürlich gut Teller" was purchased regionally. From the falling shares of tropical fruits among the purchased fruit, the increased awareness in purchasing can be deduced from a preference for using local fruits in the "natürlich gut Teller". The advantages of regional purchasing include

- reduced transport distances and emissions from traffic
- fresher, riper fruit
- support for local agriculture (cf. fish purchasing chapter 5.1.4.1)

5.1.8 "Use of fair products" (target criterion)

Data on fair trade products in purchasing was not provided. The best known fair trade foods are bananas, cocoa, coffee and chocolate. These are offered mainly for breakfast and also partly for dinner and are not covered by the "natürlich gut Teller". The proportion of fair trade products could not be estimated.

The purchase of fair products has positive social effects in the countries of origin of the mostly exotic products. The aim of Fairtrade certification is to pay the producers a fair, guaranteed price for their raw materials that exceeds the standard world market price by eliminating the profits of the intermediate trade. In addition, social criteria such as working conditions, democratic structures and community projects are demanded and supported locally. Organic cultivation is not a requirement but is promoted within the framework of the

certification system, which is why many fair products are also available in organic quality and carry an additional organic label. [1]

5.1.9 "No convenience products" (target criterion)

The data of all users shows decreasing consumption of convenience products during the project period of the "natürlich gut Teller". For example, since the introduction of the "natürlich gut Teller" in the KHR, the proportion of convenience products has fallen by 60% from a peak of 10,680 kg in 2011 to 3,931 kg in 2016.

It is generally assumed that the quantity of convenience products used halved between 2009 and 2016 (see chapter 4.2.6).

5.1.9.1 Economic effects of not using convenience products

Many convenience products are more expensive than producing them from fresh ingredients. Users of such products pay for the simplicity of preparation and the work steps that are not necessary in the kitchen. By using fresh food at the lowest possible processing level, money can be released from the budget to buy high-quality, fresh food from organic farming (see also BIOFAIR II project [Daxbeck et al., 2005c]).

5.1.9.2 Ecological effects of not using convenience products

On convenience products, individual ingredients do not have to be labelled according to origin, which makes it impossible for the kitchen to make a specific decision for a regional or seasonal product. Not using convenience products thus creates the possibility of buying seasonal products from the region instead, ideally from organic agriculture.

The pre-processing of food often makes it necessary to preserve it, for example by gassing, cooling or deep-freezing. This treatment and the subsequent storage lead to higher energy consumption. Due to the preservation process, the food can be kept for longer and can be transported over longer distances. The transport increases the incorporated energy in the convenience products even further.

[1] https://www.fairtrade.at/was-ist-fairtrade/fairtrade-standards.html

5.1.9.3 Social effects of not using convenience products

The production of meals from fresh, unprocessed food requires more work steps and also qualified staff. With fewer convenience products and the use of fresh food, jobs are therefore safeguarded or created and the qualifications of the staff are used.

5.1.10 “No portion packaging” (target criterion)

Since the “natürlich gut Teller” is mainly offered for lunch and portion packs are mainly offered for breakfast and dinner in the form of butter, honey, jams and numerous spreads, offering the “natürlich gut Teller” is not expected to have had a strong influence on the total consumption of portion packs. Only ketchup, mustard, mayonnaise and similar sauces that are occasionally also offered for lunch can be affected by this.

Since the transmitted consumption data does not allow restriction to “natürlich gut Teller” dishes, it is also not possible to assess whether portion packs are part of the “natürlich gut Teller” at all. It can be shown that with the “natürlich gut Teller” the issue of portion packaging is highlighted and appropriate measures to reduce this are initiated in the kitchens. For example, 2,107 portion packs of ketchup were consumed in the KFJ before the introduction of the “natürlich gut Teller” in 2015. After the introduction of the “natürlich gut Teller” in 2016, 1,367 portion packs of ketchup were used and more ketchup was dispensed in tubes.

5.1.10.1 Economic effects of not using portion packaging

Portion packs are more expensive than the same amount of product in larger containers.

5.1.10.2 Ecological effects of not using portion packaging

Compared to large containers, portion packs increase the volume of waste. This is through the packaging itself but also through the necessary over-packaging.

The packaging also increases the transport volume, and the emissions due to the increased transport can therefore be attributed to this.

5.1.11 “Innovative meals” (target criterion)

The target criterion of “innovative meals” motivates kitchens to try out new dishes and combinations of dishes. As a creative process, a quantitative assessment of the impacts of this criterion is not possible.

6 Other views on the effects of the “natürlich gut Teller”

6.1 Experiences of users of the “natürlich gut Teller” (NGT)

Overall, with its requirements, the “natürlich gut Teller” leads to a more conscious way of dealing with food in the kitchens and to greater orientation towards sustainable aspects in purchasing. The criteria of the “natürlich gut Teller” bring about changes in the entire menu of the participants, even for those dishes that do not meet all the criteria and can therefore not be identified as “natürlich gut Teller”.

“We are purchasing more consciously overall and have reduced the use of convenience products. Instead, we try to produce most of the meal components ourselves. Examples are soups, stocks and strudels. Our own patisserie was set up to produce our own pastries. Not all these efforts are reflected in the impacts of the “natürlich gut Teller”, although the “natürlich gut Teller” has, from the outset, made people rethink. The training courses and workshops of “die Umweltberatung” helped raise awareness of the issue among the kitchen staff and motivate them to take part in changes themselves.”[Ms Obermayr, nutritionist of the KWP]

Fish:
If carp is on the menu, the KWP needs the stock of an entire fish pond. The personal contact to the fish farmer and the mutual trust make a well functioning business relationship possible. The – ecologically sensible – stocking of the pond with 20 percent predatory fish then means that the fish farmer receives good prices in high-end gastronomy for zander, pike, etc. at the same time. [Ökolandbau, 2017]

“The incorporation of fresh, local fish was treated as a priority and integrated into the menu in a fixed sequence. Prior to this change, the chefs of the respective KWP homes were themselves able to choose which fish from the range was to be integrated into the menu. For the supplier, the fixed sequence has the advantage that the supplier is able to carry out exact quantity planning for breeding. It is also ensured that no fish that are on the red list are included in the range.”[Ms Obermayr, nutritionist of the KWP]

“Since the introduction of the “natürlich gut Teller”, the KHR has offered less meat overall, the portion sizes have been reduced and, if possible, are supplemented with vegetables or soya, for example in ragouts, minced meat and casseroles. The gross weight per piece of meat was reduced from 140 g to 120 g. Since 01.01.2013, fish with MSC certification has been used in the KHR.

The use of convenience products has been reduced. For example, instead of wedges that were delivered frozen, freshly cooked wedges made from organic potatoes are now used. When buying vegetables, more attention is now paid to seasonality and fresh vegetables are preferred to frozen goods."[Ms Schmidt, kitchen manager of the KHR]

6.2 Strategic considerations for the further development of the "natürlich gut Teller" (NGT)

6.2.1 Determination of the basic orientation of the "natürlich gut Teller"

The "natürlich gut Teller" was introduced as an important key project of Municipal Department 22 – Environmental Protection with the intention of highlighting the contribution of communal catering to the Vienna Climate Protection Programme KliP and providing individual consumers with help for behaving in a climate-conscious, environmentally compatible way in everyday life. Now, after 7 years of successful application, it seems justified to examine this orientation and to develop it further if necessary.

In a first step, the City of Vienna should clarify whether the desired goal of the "natürlich gut Teller" should be maintained. This has an influence on the subsequent decisions for the further development of the "natürlich gut Teller". The original goal was to promote the orientation of the menus in communal catering according to criteria relevant to climate protection and to enable consumers to make a conscious decision when choosing meals. Based on this, the easy-to-use criteria for labelling the dishes as "natürlich gut Teller" were formulated.

The existing criteria have proved successful for hospitals and pensioner residences. For company catering, the withdrawal of the Erste Bank restaurants in 2014 – after the "natürlich gut Teller" was offered from 2010 to 2014 – means that it is not possible to assess whether the criteria for the "natürlich gut Teller" need to be modified in this subcategory of communal catering.

6.2.2 The "natürlich gut Teller" as a contribution to the KliP

For the following considerations on the further development of the "natürlich gut Teller", it is assumed that the approach will be maintained with reduced CO_2 emissions and reduced energy consumption. Furthermore, it is necessary to retain the advantage that it is quick and easy to check compliance with the criteria of the "natürlich gut Teller".

Do not limit the circle of potential users in catering

So far there is only one catering company offering buffets according to "natürlich gut Teller" criteria. Here it must be taken into consideration that only catering companies with the Austrian Ecolabel (ÖUZ) may offer the "natürlich gut Teller". The ÖUZ, as a very demanding label, severely limits the circle of potential users. It would be productive to offer catering

companies a low-threshold possibility for slowly coming closer to fulfilling the criteria for the Ecolabel by offering the “natürlich gut Teller”.

6.2.3 Other development possibilities for the “natürlich gut Teller”

For the “natürlich gut Teller” as a label there are numerous possibilities for expansion and further development. In addition to coordination with similar labels, there is expansion of the circle of users, e.g. to the gastronomy sector. Here it seems important to maintain what has been tried and tested and, at the same time, to adapt the criteria to current developments. The clear and easy-to-use criteria that enable simple and practice-oriented application must be maintained. For the future regular quantification of the effects of the “natürlich gut Teller”, possibilities for a regular and structured collection and transmission of the necessary data by the users need to be developed.

6.2.3.1 Expansion of the circle of users

Coordination with similar labels from the federal provinces

Coordination with other labels for similar dishes from the federal provinces is a good way to compare procedures and effects. In Styria there is the “Grüner Teller” (green plate) for communal catering and here the menus are checked annually by Styria Vitalis. Here it is not individual dishes that are evaluated according to certain criteria but rather the menus of a whole week and a meal line is labelled as “Grüner Teller”. The criteria are similar to the criteria of the “natürlich gut Teller”, only here it is not individual dishes but rather the menu for a whole week that is evaluated overall. For the “natürlich gut Teller” this would be a possibility to offer the label nevertheless in communal catering facilities where the consumers have no choice between set meals.

In Lower Austria there is a label for the gastronomy sector – the “tut gut” (does good) restaurateur. The focus here is on the optimal nutritional composition of the dishes, vegetarian dishes, an increased fruit and vegetable content and the use of seasonal, regional ingredients. The criterion for the label is completion of an education or training programme. This label is interesting if the “natürlich gut Teller” is to be extended to the gastronomy sector.

Extension to additional subcategories of communal catering

The aim is to expand the acquisition of new canteen kitchens for communal catering to include company catering and canteen kitchens of tertiary educational institutions. For canteen kitchens of tertiary educational institutions the existing criteria can be adopted, for canteen kitchens from the field of company catering modified criteria might have to be considered.

Extension to the gastronomy sector

Another opportunity is to extend the label to gastronomy. One advantage is that the existing mandatory criteria for communal catering are easy to apply. Specific criteria for the gastronomy trade are conceivable, similar to the “natürlich gut Teller” catering criteria. First here it needs to be examined to what extent the criteria for communal catering are applicable to gastronomy and must be extended or adapted.

In the “natürlich gut Teller” final report of 2012 it is mentioned that none of the kitchens requested marketing materials. This is understandable because the kitchens used for communal catering are not in competition with each other. Marketing materials are useful for the expansion into the gastronomy sector. This helps when communicating the offer to the guests.

6.2.3.2 Possibilities of support for the users

Pool of recipes which meet the “natürlich gut Teller” criteria

For newly joining kitchens, as well as for kitchens that already offer the “natürlich gut Teller”, it appears helpful to have an information pool that can be drawn on. The KWP has already set up a pool with over 150 “natürlich gut Teller” recipes for its 30 homes. Accessibility for all participants in the “natürlich gut Teller” would keep the expense and the entry threshold for newly acquired kitchens low. The recipes in this pool can be divided according to seasons or months, and at least according to the summer and winter menu, to make it easier to maintain seasonality.

Regulars’ tables for mutual exchange

Regulars’ tables where kitchen managers can exchange their experiences with other kitchen managers would be a good opportunity to bring kitchens that do not yet offer the “natürlich gut Teller” closer to it without any obligation.

Supervision and monitoring

Supervision is also still required in the kitchens. Monitoring by an external institution is necessary to maintain the quality of the “natürlich gut Teller”. These checks should take place around once a year.

The previous random checks of the menus for the “natürlich gut Teller” have shown that seasonality is often misunderstood and misinterpreted by kitchen managers [Knieli, 2013]. Particularly when applying this criterion, supervision and advice seem necessary. If the label is extended to the gastronomy trade, more frequent checks and information will be useful here in the beginning because the turnover of staff is higher in the gastronomy trade and a loss of information is therefore to be expected. Furthermore, there is a wider range of different dishes that are prepared in smaller quantities.

If the advice in the initial phase should help ensure the correct use of the “natürlich gut Teller”, in the long term the provided advice, in addition to ongoing quality control, should help with the long-term modification of the menu and purchasing with the aim of ensuring sustainability and climate protection.

Competition

One way to motivate the users of the “natürlich gut Teller” would be to award a prize for the most popular “natürlich gut Teller”. Possible selection criteria are popularity among the catering participants and the sale of dishes.

6.2.3.3 Further development of criteria

It is advisable to reconsider the criteria list and, after a successful application phase, to adapt the “natürlich gut Teller” to the situation in the kitchens and the experiences of the users and optimise it.

Incorporate new impacts

It must be considered to what extent, apart from the social and ecological effects already covered, health or nutritional aspects should also be taken into account. Examples include maximum calories per meal, sugar limits, no/little palm fat, etc.

Additional labelling of the menu for one week (meal line)

For providers of communal catering where the labelling of the “natürlich gut Teller” is not possible for administrative reasons or consumers have no choice – as is often the case, for example, in kindergartens – there should be the possibility of designing the entire weekly menu according to “natürlich gut Teller” criteria. For the weekly menu, the criteria that apply to the “natürlich gut Teller” need to be allocated to a calendar week and it must be ensured that, overall, all the dishes offered correspond to the aggregated criteria.

Make it possible to quantify criteria with wide scope for interpretation

The target criterion “innovative meals”, which is difficult to assess and measure, should be replaced by a criterion that is easy to quantify. Possible examples would be:

- avoiding the use of palm fat as a current environmental policy issue.
- avoiding the use of tropical fruits.
- avoiding the use of rice that is cultivated in paddy fields in Southeast Asia and releases methane. Substitution of the rice with dry cultivation rice from Austria/Europe or other side dishes.

Reconsider meat portion

The size of the meat portion needs to be reconsidered and the kitchens given room for manoeuvre. The criterion of 90 g appears to be very restrictive and often impracticable in practice. Although the reduction of meat portions is not disputed among users and, as the

survey results show, is also being implemented ambitiously, the low limit value for the quantity of meat often prevents meals from being labelled as NGT. An evaluation of the limit value and possibly the introduction of a range or an average value per week are proposed.

Maintain and further develop what is tried and tested

It is desirable for the existing criteria to be formulated as clearly and simply as possible. Specifying the existing (target) criteria as quantifiable values, as is the case with most mandatory criteria, would be helpful to make it easier to implement them and check compliance. Users (kitchen managers and/or the person responsible for purchasing) should, in the future, also be able to independently apply the criteria of the label to their menus after training.

Regular quantification of the effects of the "natürlich gut Teller"

In order to quantitatively measure the effect of the "natürlich gut Teller" on an ongoing basis, it would be necessary to obtain suitable data each year from the participating kitchens to show the effects. This documentation represents an additional expense for the kitchens. Here a clear specification and delimitation of the scope of data to be collected by the users is necessary and must be developed. It must be checked to what extent this data and its evaluations can be generated by the IT-supported ordering and warehouse management systems that are in use. The impact analyses drawn up from the data should also be made available to users on an annual basis to support them in their marketing and their communication to the outside world. The presentation of the effects of the "natürlich gut Teller" should be communicated to consumers (also quantitatively) and used to promote the NGT.

The resulting proof for the kitchens and an annual comparison in a standardised report, in which the effects of the "natürlich gut Teller" are presented, can be used by each of the users to determine their individual status. Aggregated over all users, the effects and impacts can be calculated and presented (e.g. cows that survive as a result of the saved meat, organically farmed area in ha on account of the used organic fruit and vegetables, jobs created in the organic sector, prevented bycatch).

7 References

Adamek, Z.; Kratochvil, M. (2014) Teichbewirtschaftung in der Region Trebon und dem Waldviertel - Praxis, Qualität und Umwelt.

APA (2017) Mehr Fleisch, weniger Lebenszeit. https://diepresse.com/home/leben/gesundheit/5151540/Mehr-Fleisch-weniger-Lebenszeit. 12.01.2017.

Barański, M.; Średnicka-Tober, D.; Volakakis, N.; Seal, C.; Sanderson, R.; Stewart, G. B.; Benbrook, C.; Biavati, B.; Markellou, E.; Giotis, C.; Gromadzka-Ostrowska, J.; Rembiałkowska, E.; Skwarło-Sońta, K.; Tahvonen, R.; Janovská, D.; Niggli, U.; Nicot, P.; Leifert, C. (2014) Higher antioxidant and lower cadmium concentrations and lower incidence of pesticide residues in organically grown crops: a systematic literature review and meta-analyses. In: The British Journal of Nutrition. 112. 5. S. 794-811.

Belitz, H. D.; Grosch, W. (2013) Lehrbuch der Lebensmittelchemie. Hrsg. v. Springer Berlin Heidelberg.

Berghofer, E.; Schönlechner, R.; Schmidt, J. (2015) Trends in der Lebensmittelherstellung und Lebensmittelversorgung. Bundesministerium für Gesundheit, Sektion II.

Berghofer, E.; Schönlechner, R.; Schmidt, J. (2016) Trends in der Lebensmittelherstellung und Lebensmittelversorgung. BMGF.

BGBl. II Nr. 304/2001 (2001) Trinkwasserverordnung - TWV. Verordnung des Bundesministers für soziale Sicherheit und Generationen über die Qualität von Wasser für den menschlichen Gebrauch.

Biokontrollservice Österreich (2014) Richtlinien für Biolandbau und Bio-Verarbeitung. Jänner 2014.

Bundesinstitut für Risikobewertung (2009) Studie zu Fleischverzehr und Sterblichkeit, Stellungnahme Nr. 023/2009 des BfR vom 29. Mai 2009.

Bundesministerium für Gesundheit und Frauen (BMGF) (2012) Gesundheitsziele Österreich. BMGF. Ausgabe 2017. Hrsg. v. BMGF. Wien.

Cremer, H.-D. (1951) Über den Einfluß der Verarbeitung und Konservierung auf Bekömmlichkeit und Nährwert der Nahrungsmittel. In: Zeitschrift für Lebensmittel-Untersuchung und Forschung. 92. 6. S. 407-422.

Daschner, F.; Mutter, J. (2001) Mögliche gesundheitliche Auswirkungen von Chloramphenicolrückständen in Garnelen auf den Menschen. Greenpeace Deutschland. Freiburg.

Daxbeck, H.; Kisliakova, N.; Schindler, F. (2017a) Analyse und Auswahl der Lebensmittel und Ihrer Herkunft als Grundlage zur Berechnung der CO2-Emissionen. Zwischenbericht. Projekt EnKü. Ressourcen Management Agentur (RMA). Wien.

Daxbeck, H.; Pawlak, M.; Pinterits, M.; Reisenberger, M.; Sobl, U.; Spitaler, R.; Holler, C. (2005a) Die vier Dimensionen gesunder Ernährung.

Daxbeck, H.; Pawlak, M.; Pinterits, M.; Reisenberger, M.; Sobl, U.; Spitaler, R.; Holler, C. (2005b) Die vier Dimensionen gesunder ERNÄHRUNG (Gesundheit, Ökonomie, Ökologie, Soziales). Projekt KomKon. Ressourcen Management Agentur (RMA). Initiative zur Förderung einer umweltverträglichen nachhaltigen Ressourcenbewirtschaftung. Projekt im Rahmen von "ÖkoKauf Wien". Wien.

Daxbeck, H.; Schindler, F.; Kisliakova, N.; Weintraud, A. (2017b) Smart Food Grid Graz – wie Graz und sein Umland die Nahrungsmittelversorgung des 21. Jahrhunderts meistern - AP 4 - Ist-Analyse der Versorgungssituation in Graz (Gemeinschaftsverpflegung). Projekt SFGG. Ressourcen Management Agentur (RMA). Wien.

Daxbeck, H.; Seibold, E.; Pinterits, M. (2005c) IST-Standserhebung und Potentialanalyse in Großküchen der Stadt Wien zur der Erhöhung des Anteils von Lebensmitteln aus kontrolliert biologischem Anbau. Projekt BIOFAIR II. Ressourcen Management Agentur (RMA). Initiative zur Förderung einer umweltverträglichen nachhaltigen Ressourcenbewirtschaftung. Projekt im Rahmen der INITIATIVE "Abfallvermeidung in Wien". Wien.

Demmeler, M. (2008) Ökologische und ökonomische Effizienzpotenziale einer regionalen Lebensmittelbereitstellung. Analyse ausgewählter Szenarien. Dissertation. Technische Universität München. Lehrstuhl für Wirtschaftslehre des Landbaues. München.

Diercks, R. (1986) Alternativen im Landbau. Hrsg. v. Ulmer. Stuttgart.

Eschlböck, K. (2017) Kraut. LK OÖ, Landwirtschaftskammer Oberösterreich.

Fairtrade Österreich (2017) Fairtrade - Standards. Die Spielregeln des fairen Handelns. https://www.fairtrade.at/was-ist-fairtrade/fairtrade-standards.html.

FiBL; Lori, M.; Symnaczik, S.; Mäder, P.; Deyn, G. D.; Gattinger, A. (2017) Studie zu Biomasse aus Mikroorganismen. PLOS ONE. http://journals.plos.org/plosone/article?id=10.1371/journal.pone.0180442. 12.07.2017.

Food and Agriculture Organisation (FAO) of the United Nations (2014) The State of World Fisheries and Aquaculture - Opportunities and Challenges. S. 243.

Fuchs, D. K.; Fuchs, M. R. (2017) Bericht über den Vertrieb von Antiobiotika in der Veterinärmedizin in Ö 2012-2016. In: AGES. S. 7.

Global 2000, S. (2017) Gütesiegelcheck - Wie gut sind Gütesiegel wirklich.

Gollner, G.; Starz, W. (2015) Biologisch oder konventionell – worin liegt der Unterschied? . In: Land und Raum.

Greenpeace (2003) Die Entwicklung der Shrimp-Industrie und ihre Folgen. Greenpeace Österreich. Wien.

Greenpeace in Zentral- und Osteuropa (2018) Zeichen-Tricks - Der Gütezeichen-Guide von Greenpeace in Österreich. Greenpeace in Zentral- und Osteuropa,. Wien.

Gupfinger, H.; Mraz, G.; Werner, K. (2000) Prost Mahlzeit! Essen und Trinken mit gutem Gewissen. Österreichisches Ökologie Institut für angewandte Umweltforschung. Hrsg. v. Österreichischem Ökologie-Institut für angewandte Umweltforschung. Wien.

Hambrusch, J.; Quendler, E. (2016) Obst- und Gemüsemarkt in Zahlen
Ausgewählte Ergebnisse der Teilanalyse. Wien. Bundesanstalt für Agrarwirtschaft.

Help ORF (2014) Antibiotika im Fleisch und das Problem von Resistenzen. ORF. http://helpv2.orf.at/stories/1749433/index.html. 15.11.2014.

Hoekstra, A.; Heek, M. v.; Network, W. (2016) Product Gallery.

Hofer, D. (2017) Produktionsrichtlinien - Fassung März 2017. BIO Austria Richtlinien. Linz. BIO AUSTRIA. 125.

Holler, C. (2004) Gesundheitsprävention, mit besonderer Beachtung der Klient-Umwelt-Interaktion und deren Einfluss auf das Gesundheitsverhalten. Wien.

Holler, K. (2003) Ist Bio wirklich besser?. Faktensammlung zur Qualität biologisch erzeugter Lebensmittel. Hrsg. v. BIO AUSTRIA. Linz.

Home, R. (2015) Soziale Faktoren der Umstellung auf Biolandbau in der Deutschschweiz. 13. Wissenschaftstagung Ökologischer Landbau.

Huss, H. (2012) Weite Fruchtfolge beugt vor. In: Bio Austria-Zeitung. 4/2012. Fruchtfolge. S. 26-27.

IFOAM Internationale Vereinigung der ökologischen Landbaubewegungen (2005) Principles of organic agriculture. http://www.ifoam.bio/en/organic-landmarks/principles-organic-agriculture.

Katalyse (2004) Umweltlexikon-online. Pflanzenschutzmittel. oekoserve GmbH. http://www.umweltlexikon-online.de/fp/archiv/RUBlandwirtsrohstoffe/Pflanzenschutzmittel.php. 30.11.2004.

Knieli, M. (2013) Endbericht "natürlich gut Teller" 2012. die umweltberatung. Wien.

Knieli, M.; Homolka, G. (2015) Der natürlich gut Teller | Kriterienkatalog für die Gemeinschaftsverpflegung. "die umweltberatung" Wien, im Auftrag des "ÖkoKauf Wien" - Arbeitsgruppe "Lebensmittel".

Koerber, K. v. (2000) Preise von Erzeugnissen aus konventioneller Landwirtschaft vs. Preise von Öko-Lebensmitteln. In: Ecomed. S. 128.

Krell, P. (2009) Der Umgang mit Gülle, Jauche und Mist
als umweltstrafrechtliches Problem. In: Natur und Recht. 31. 5. S. 327 - 333.

Lindenthal, T. (2003) Nachhaltige Landbewirtschaftung. Wien.

Lori, M.; Symnaczik, S.; Mäder, P.; De Deyn, G.; Gattinger, A. (2017) Organic farming enhances soil microbial abundance and activity—A meta-analysis and meta-regression. In: PLOS ONE. 12. 7.

Meyers Lexikonredaktion (1997) Meyers Lexikon in drei Bänden. Hrsg. v. F.A. Brockhaus AG. Mannheim.

Moidl, S.; Lenhart, L.; Schwinghackl, M.; Pekny, W. (2013) Der Ökologische Fußabdruck Österreichs. Plattform Footprint. Wien.

Mößmer, M. (2015) „Giftiger Fisch“? Wir machen’s besser! BioFisch. https://www.biofisch.at/giftiger-fisch-im-orf-weltjournal/. 12.12.2017.

ÖGE Österreichische Gesellschaft für Ernährung (2017) 10 Ernährungsregeln der ÖGE. http://www.oege.at/index.php/bildung-information/empfehlungen. 11.12.2017.

öko-fair (s.a.) Düngung. http://www.oeko-fair.de/ressourcen-bewahren/bio-landbau/erzeugung-der-rohstoffe/pflanzenbau/duengung/duengung2.

Ökofair (2015) Zitrusfrüchte. Bundesverband die Verbrauer Initiative. http://www.oeko-fair.de/index.php/cat/596/title/Zitrusfruechte.

Ökokauf Wien (2012) Positionspapier zum Einsatz von Fisch und Fischprodukten.

Ökolandbau (2017) Nachhaltige Ernährung in den Wiener Pensionistenwohnhäusern. https://www.oekolandbau.de/grossverbraucher/betriebsmanagement/betriebskonzepte/bio-in-pflegeeinrichtungen/nachhaltige-verpflegung-in-den-wiener-pensionisten-wohnhaeusern/. 29.03.2017.

Resl, T.; Brückler, M. (2015) Erträge des Österreichischen Biolandbaus im Vergleich zu konventioneller Produktion Bundesanstalt für Agrarwirtschaft.

Reuter, T. W. (2012) Pestizide in Lebensmitteln und deren Auswirkungen. Online Redaktion. Greenpeace.

Rogall, H. (2008) Ökologische Ökonomie, Eine Einführung. 2., überarb. u. erw. Auflage. Hrsg. v. VS Verlag für Sozialwissenschaften / GWV Fachverlage GmbH. Wiesbaden.

Salmhofer, C.; Strasser, A.; Sopper, M. (2001) Ausgewählte ökologische Auswirkungen unseres Ernährungssystems am Beispiel Klimaschutz. In: Natur und Kultur: Transdisziplinäre Zeitschrift für ökologische Nachhaltigkeit. Vol. 2. Nr. 2. S. 60-81.

Schlatzer, M.; Lindenthal, T. (2018) 100% Biolandbau in Österreich - Machbarkeit und Auswirkungen, Auswirkungen einer kompletten Umstgellung auf biologische Landwirtaschaft in Österreich auf die Ernährungssituation sowie auf ökologische und volkswirtschaftliche Aspekte. Forschungsinstitut für biologischen Landbau (FiBL) Österreich
Zentrum für Globalen Wandel und Nachhaltigkeit, BOKU Wien. Wien.

Schlumberger, A.; Krautter, M. (2003) Pestizide machen krank. In: Greenpeace Factsheet.

Schöne, F.; Zerger, C. (2002) Leistungen des Ökolandbaus für Umweltschutz und Nachhaltigkeit. http://www.nabu.de/m01/m01_02/00563.html. 7.12.2004.

Schubert-Zsilavecz, K. (2015) Risiken und Nebenwirkungen. In: Act. 4. S. 7-9.

Schwaiger, M.; Hofer, O.; Fehrer, R.; Brier, K. (2017) Grüner Bericht 2017.

Seufert, V.; Ramankutty, N.; Foley, J. A. (2012) Comparing the yields of organic an conventional agriculture. In: Nature. 485. S. 229-232.

Statista (2017) Ernteertrag von Birnen in Deutschland seit 2008. https://de.statista.com/statistik/daten/studie/166688/umfrage/ernteertrag-von-birnen-in-deutschland-seit-2008/.

Statistik Austria (2016a) Versorgungsbilanz Fleisch.

Statistik Austria (2016b) Versorgungsbilanz für Fisch.

Umweltbundesamt (2001a) Sechster Umweltkontrollbericht. Umweltbundesamt. Wien.

Umweltbundesamt (2001b) Umweltsituation in Österreich. Wien.

Umweltbundesamt (2004) Biodiversität und ihre Ebenen. Clearing House Mechanism,. http://www.biodiv.at/chm/index.htm. 11.08.2004.

Umweltbundesamt GmbH (2004) Umweltsituation in Österreich. Siebenter Umweltkontrollbericht des Umweltministers an den Nationalrat
Wien.

Velimirov, A. (2003) Nahrungsmittelqualität von Produkten aus biologischer und konventioneller Landwirtschaft im Vergleich. Ludwig Boltzmann Institut für Biologischen Landbau und Angewandte Ökologie. Arbeitsbereich Produktqualität. Hrsg. v. Bundesministerium für Bildung Wissenschaft und Kultur (BMBWK). Wien.

Vorholz, F. (2014) Das Wasser wird schlecht. In: Zeit Online.

Wack, S. M. (2010) Nachhaltigkeit in der Aquakultur – wo steht das Europarecht? In: Natur und Recht. 32. 8. S. 550-556.

Weiger, H.; Willer, H. (1997) Naturschutz durch ökologischen Landbau. Hrsg. v. Bad Dürkheim.

Zander, K.; Waibel, H. (2002) Rentabilität der Umstellung auf ökologischen Apfelanbau. In: Institut für Gartenbauökonomie.